water

MDPI

Editorial

Yellow River Basin Management under Pressure: Present State, Restoration and Protection II: Lessons from a Special Issue

Qiting Zuo [1,2], Xiangyi Ding [3], Guotao Cui [4] and Wei Zhang [2,5,*]

[1] School of Water Conservancy and Transportation, Zhengzhou University, Zhengzhou 450001, China; zuoqt@zzu.edu.cn
[2] Yellow River Institute for Ecological Protection & Regional Coordinated Development, Zhengzhou University, Zhengzhou 450001, China
[3] Department of Water Resources, China Institute of Water Resources and Hydropower Research, Beijing 100038, China
[4] School of Geography and Planning, Sun Yat-sen University, Guangzhou 510006, China
[5] School of Ecology and Environment, Zhengzhou University, Zhengzhou 450001, China
* Correspondence: zhangwei88@zzu.edu.cn

1. Introduction

This Special Issue is the second edition following the publication of the first Issue, "Yellow River Basin Management under Pressure: Present State, Restoration and Protection", in 2021. This Special Issue focuses on the current state, challenges, and suggestions relating to Yellow River basin management and sustainable development under pressure, aiming to help improve ecological protection and achieve high-quality development. The topics included Yellow River basin management, the restoration and protection of the Yellow River basin, and the harmonious regulation of the human–water relationship. This Special Issue has aroused widespread interest among scholars, with a total of 20 related academic papers recently being published online.

2. Overview of This Special Issue

This Special Issue includes twenty original contributions focused on Yellow River basin management under pressure. Considering the unique regional characteristics of the Yellow River in China, the contributions mainly result from research conducted by Chinese universities and research and development institutions. The twenty articles in this Special Issue can be divided into six categories: category A, "Characteristics of Yellow River basin"; category B, "Water system and economic society system"; category C, "Water resources allocation and efficient utilization", category D, "Basin ecological protection and environmental pollution remediation"; category E, "Water–sediment relationship of the Yellow River Basin"; category F, "Yellow River governance".

In category A, "Characteristics of Yellow River basin", Zuoqiang Han et al. (contribution 1) studied the influence of climate change on natural runoff of the Yellow River Basin between 1961 and 2020, indicating that the decrease in natural runoff was primarily attributed to a reduction in precipitation rather than regional warming. The study by Sen Wang et al. (contribution 2) developed a hybrid GPR and cooperation search algorithm (CSA) model, aiming to improve the effectiveness of predicting non-stationary hydrological data sequences. Xiaomei Fan et al. (contribution 3) monitored and analyzed the spatio-temporal dynamics of groundwater level and salinity based on the robust seasonal trend decomposition technique (STL). Based on the comprehensive evaluation model, Xinze Han et al. (contribution 4) assessed the impact of climate change on the headwaters of the Yellow River, further analyzing the effects of permafrost degradation and the interaction between climate and permafrost regarding runoff changes. Haipeng Niu et al. (contribution 5) quantitatively investigated the landscape pattern evolution characteristics of the

check for updates

Citation: Zuo, Q.; Ding, X.; Cui, G.; Zhang, W. Yellow River Basin Management under Pressure: Present State, Restoration and Protection II: Lessons from a Special Issue. *Water* **2024**, *16*, 999. https://doi.org/10.3390/w16070999

Received: 23 March 2024
Accepted: 25 March 2024
Published: 29 March 2024

Yellow River Basin (Henan section), further revealing the influencing factors of landscape pattern evolution.

In category B, "Water system and economic society system", Jianhua Liu et al. (contribution 6) investigated the effect of the industrial restructuring factor on carbon dioxide emissions and conducted a scenario simulation of the Yellow River Basin using the Stochastic Impacts by Regression on Population, Affluence, and Technology (STIRPAT) model. In the study by Suming Ren et al. (contribution 7), the effect of natural and social economic factors on landscape pattern indices in Henan province was investigated through the bivariate local spatial autocorrelation method. Zening Wu et al. (contribution 8) evaluated the regional water ecological–economic system's sustainability by quantifying the water energy's ecological footprint, preliminarily analyzing the key factors that constrain the sustainable development of the Yellow River Basin.

For category C, "Water resources allocation and efficient utilization", Qiting Zuo et al. (contribution 9) proposed solutions to the Yellow River water distribution dilemma from the perspective of the human–water relationship discipline, further analyzing the potential of applying the human–water relationship to research on complex basin problems. In the study by Meng Qiu et al. (contribution 10), the "synthesis–dynamic–harmonious" water distribution method (SDH) was proposed and applied to analyze the real condition of the Yellow River. Using the SDH method, the authors recalculated the new water distribution scheme for the Yellow River. Jinxin Zhang et al. (contribution 11) introduced the theory of human–water harmony to guide the allocation of regional water resources. Weinan Lu et al. (contribution 12) studied the spatial–temporal dynamics and influencing factors of green efficiency of agricultural water use in the Yellow River Basin, aiming to improve the green efficiency of agricultural water use (AWGE). The study by Cui Chang et al. (contribution 13) preliminarily established the thresholds for agricultural water-saving measures in the Helan Irrigation Area of Ningxia, taking the constraints of groundwater depth into account.

In category D, "Basin Ecological Protection and Environmental pollution remediation", the study by Yi Cheng et al. (contribution 14) analyzed the spatiotemporal variations in vegetation cover in the Yellow River Basin from 1982 to 2021 and their primary influencing factors. The vegetation cover was jointly affected by climate change and human activities, where human activities commonly have a more significant impact on vegetation cover. Ying Liu et al. (contribution 15) initially established a watershed ecological compensation mechanism based on evolutionary game theory and random processes, laying a theoretical foundation for the systematic establishment of ecological compensation mechanisms in the Yellow River Basin. In the study by Huaibin Wei et al. (contribution 16), potential ecological risks and sources of heavy metal pollutants were found in river sediments of a certain city in the water diversion area of the Yellow River, indicating that the highest potential ecological risk level is associated with mercury (Hg). Xiaoming Mao et al. (contribution 17) analyzed and discussed the types of chemicals and sources of groundwater in a landfill site and its surrounding area in a downstream city of the Yellow River, further evaluating the risks of groundwater contamination to human health.

In category E, "Water–sediment relationship of the Yellow River Basin", Suiji Wang et al. (contribution 18) analyzed the changes in the water–sediment process of the Yellow River. As time progresses, variations in annual runoff and sediment content exhibit disparities, primarily stemming from activities such as afforestation, terrace construction, check dam construction, and the adoption of new river management measures.

For category F, "Yellow River Governance", Li Gong et al. (contribution 19) numerically analyzed the collision process between an ice body and a tunnel, aiming to reduce the risk of water transmission tunnels being damaged by drift ice. The study by Jianyong Hu et al. (contribution 20) investigated the effect of multi-cross structures on the flood discharge capacity of mountain rivers of the Yellow River Basin, showcasing the significant impact of multi-cross structures.

3. Research Progress on Key Scientific Issues in the Yellow River Basin

3.1. Water System and Economic Society System

Scholars have conducted extensive explorations of the relationship between water resource utilization and the development of the economic society in the Yellow River Basin [1–3]. Research perspectives include harmony, matching, balance, coordination, and decoupling. The specific research content includes the supportive role of water resource utilization in the development of an economic society, the stress effect of economic society development on the water system, and their bidirectional feedback mechanism. This can be distinguished from the analysis of the correlation between representative elements of the two systems. It is essential to delve into the interaction mechanisms between systems during the evolution process and elucidate the impact mechanisms of internal elements and external factors on the evolution of the coupled system. Secondly, it is crucial to elucidate the mechanisms of water consumption in response to the environmental changes within the Yellow River Basin. Research on the impact of factors such as climate change, population growth, and industrial restructuring on the water demands of various industries can reveal the dynamic evolution mechanisms of water consumption in everyday living, as well as the agricultural and industrial sectors. Then, the possible nodes and potential causes of water use peaks can be analyzed. Thirdly, there is an urgent need to conduct a special study on the threshold of water resource utilization [4]. In the context of the prominent contradictions between water supply and demand and the insufficient water environment carrying capacity, it is significant to coordinate ecological water demand and the economic society's water use, determining the threshold of water resource utilization, which is also a prerequisite for optimizing water resource allocation. Lastly, an optimal study of the coordinated development path of water resources, economic society, and the ecological environment is crucial [5]. Exploring the best strategies for coordinated development to balance water resource utilization, economic growth, and ecological protection can provide scientific guidance for managing the human–water relationship and achieving the sustainable development of the Yellow River Basin.

3.2. Water Resources Allocation

The current water resources allocation of the provinces in the Yellow River Basin is primarily based on the "87 water division" plan of the Yellow River Basin, which was promulgated in 1987. This plan has significantly contributed to fostering the coordinated development of the economy, society, and ecology within the basin. However, given the progress made in the economy and society, as well as the implementation of a national water network strategy, it is imperative to explore water resource allocation and network construction within the Yellow River basin from diverse research perspectives. Scholars have examined the water resources allocation scheme in this region, considering aspects such as equity, efficiency, and environmental flow requirements. Considering national water network construction demands, there is an urgent need to investigate how such construction influences patterns of water resource allocation [6,7]. Although a limited number of scholars have explored water resource allocation patterns related to transfer projects, relevant studies remain scarce [8]. As development continues along the western route of the South-to-North Water Transfer Project, researching water resource allocation during water network construction will become a crucial issue for stakeholders within the Yellow River basin. Furthermore, it is essential to enhance research on the simulation of various aspects related to water network facilities like river network runoff and pipe network drainage systems so that they can serve as references when studying water resources allocation during water network construction [9,10].

3.3. Efficient Utilization of Water Resources

The water resource base in the Yellow River Basin is insufficient, with a per capita water availability of only 18% of the national average. However, the intensity of development and utilization far exceeds the typical threshold for river systems [11]. Moreover, the water utilization efficiency in the Yellow River Basin is relatively low, with a staggering water consumption of 56 m^3 per unit of GDP in 2020, significantly surpassing levels observed in advanced regions both domestically and internationally. After the introduction of the significant national strategy for ecological protection and high-quality development in the Yellow River Basin, efficient water resource utilization has become a fundamental objective for the future development of the basin [12]. Research on the efficient utilization of water resources in the Yellow River Basin has garnered attention, yielding high-quality research outcomes in areas such as water-saving irrigation techniques [13], water rights trading systems [14], efficiency assessments of water resource utilization [15], and models for water resource management [16]. It can be asserted that there is a wealth of theoretical exploration and applied practices in the research addressing the efficient utilization of water resources in the Yellow River Basin. Despite the continuous improvements in the level of water resource utilization in the Yellow River Basin in recent years, the intensity of water resource development and utilization has approached its upper limit, while the scale of economic and social development in the basin continues to expand rapidly. Given the fragile water resource foundation in the Yellow River Basin, conducting specific research on the efficient utilization of water resources for specific purposes remains of significant importance. The Yellow River Basin still grapples with numerous pressing challenges in water resource utilization. These include issues such as the need for improvements in the construction of inter-basin water transfer projects and the optimization of water supply security layout [17]. Challenges also arise in the comprehensive utilization and unified allocation of unconventional water sources [18]. Additionally, there is a need to address smart water-saving management in the Yellow River irrigation areas [19]. The resolution of the aforementioned issues would play a crucial role in comprehensively achieving water resource conservation and intensive utilization in the Yellow River Basin. It also represents an incremental requirement for future research in the field of efficient water resource utilization.

3.4. Basin Ecological Protection and Environmental Restoration

In the realm of ecological preservation, the Yellow River Basin stands out due to its pronounced ecological fragility when juxtaposed with the comparatively more resilient Yangtze River Basin. This fragility is exacerbated by the prevailing developmental trajectory of resource-based industries within the basin [20]. Concurrently, certain regions within the basin are experiencing heightened levels of ecological degradation, revealing an imbalance in ecological restoration and governance efforts. It is imperative to establish a comprehensive ecological management and restoration framework. Such a framework must encompass fundamental ecological priorities, the constraints dictated by carrying capacity considerations, and the intricate interplay of both internal and external driving forces [21]. For the environmental protection issues, significant achievements have been made in the protection of the aquatic ecosystem in the Yellow River Basin. However, this still faces numerous bottlenecks, constraints, and challenges, with many urgent and prominent issues awaiting resolution. The current water quality assessment system does not incorporate the monitoring of indicators of emerging pollutants, such as microplastics, polycyclic aromatic hydrocarbons, antibiotic pollutants, and PFAS pollutants. For instance, microplastic pollutants and antibiotics have been detected in multiple sections of the Yellow River [22–25]. Overall, the key issue facing the Yellow River Basin at present is the coexistence of traditional and emerging pollutants jointly affecting the pollution status and ecological risks of the basin's water environment. Although traditional pollutants have met the required standards throughout the main stream of the Yellow River Basin, the achievement of comprehensive improvements in water quality still faces a complex and challenging situation, with significant tasks remaining regarding the prevention and control of pollution in tributaries. Emerging pollutants have not yet been effectively incorporated into the monitoring system. Their complex molecules and microstructures lead to a diverse and unpredictable interface for physicochemical interactions and migration mechanisms.

Under the conditions of a high sediment content and historically high sediment flux in the Yellow River, it is of great significance to conduct an in-depth study of the existence and migration potential of diverse pollutants in the Yellow River Basin based on the interface properties of the basin sediment and pollutants. When relying on the potential degradation mechanism of the Yellow River sediment to degrade pollutants when predicting the environmental restoration potential of sediment interfaces [26], it is essential to conduct an in-depth study of pollutant migration and removal in the Yellow River.

3.5. Water–Sediment Relationship in the Yellow River Basin

The Yellow River boasts the world's highest sediment concentration, presenting a complex challenge, expressed as follows: "less water but more sediment, plus the imbalance of water-sediment relationship". Water–sediment regulation in the Yellow River Basin is of pivotal importance in China's water resources management. Numerous scholars have systematically researched the characteristics, causes, patterns, and development trends of water–sediment changes in the Yellow River, laying an essential scientific foundation for its governance and development [27,28]. With the development of the economy and society, coupled with the impact of climate change, the balance of the water–sediment relationship faces escalating challenges [29]. In response to this evolving scenario, the following research areas are imperative: (a) establishing a more comprehensive and refined water–sediment monitoring system to explore the integrated use of remote sensing, ground monitoring, sensor networks, and numerical simulation methods to achieve the high spatiotemporal resolution monitoring of hydrological elements and sediment movement within the basin; (b) furthering research on the interaction mechanisms between water and sediment under climate change and human activities [30] to dynamically simulate the interaction process between water and sediment under climate change and strengthen research on the impact of human activities on the water–sediment relationship, particularly factors like urbanization, agricultural development, and industrialization; (c) constructing a multi-level and multi-dimensional water–sediment balance threshold system for the Yellow River Basin, as different balance states exist for water–sediment processes in the Yellow River during various periods and under diverse boundary conditions, making it essential to determine indicators and thresholds for coordinated water–sediment regulation across the entire basin under the demand of high-quality development; (d) conducting special research on intelligent water–sediment regulation technology and decision-making systems [31], including the development of multi-objective joint optimization scheduling technology for water and sediment, the construction of intelligent models to simulate and regulate the water–sediment evolution, and the building of a decision support system for the comprehensive management of river channels and beaches.

3.6. Outlook on Yellow River Governance and Cultural Excavation

As the mother river of China, the governance and historical evolution of the Yellow River not only reflect the millennium of struggle and harmony between the Chinese people and the natural environment, but also embody profound cultural values. The governance of the Yellow River Basin has a long history of development, and the research results have been fruitful. However, with the changes in the characteristics of the new era, the demands for Yellow River management have also changed. At present, there is still a lack of research on the modern water management strategy of the Yellow River Basin in combination with the characteristics of China's new era. For example, the current water conservancy development in the new era requires that the Yellow River governance pays attention to development quality, ecological protection, the human–water relationship, scientific and technological innovation, and institutional changes [32–35]. In general, with the development of the times, research on the governance of the Yellow River Basin cannot remain unchanged. It is necessary to study the modern water control strategy of the Yellow River to meet the needs of the new era. This includes further research on governance strategies for the Yellow River Basin against the background of high-quality development, more in-depth research on the relationship between humans and water with the goal of the harmonious coexistence of humans and nature, and strengthening research on smart technology for watershed governance in changing environments. In addition, long-term environmental pressure and rapid socio-economic development have put some of China's cultural heritage at risk of disappearing. This necessitates the gradual integration of cultural heritage preservation and an exploration into historical values as crucial components in addressing this issue [36]. In the future, the Yellow River governance needs to strengthen its integration with cultural excavation. Through scientific and technological means and interdisciplinary research, digital and virtual reality technologies should be fully utilized to conduct systematic research on the excavation, protection, and restoration of cultural heritage in the governance process of the Yellow River Basin. This will lead to new contributions to the research and protection of this great river by carrying out the bidirectional work of the comprehensive management and cultural excavation of the Yellow River basin.

Author Contributions: Methodology, Q.Z.; investigation, X.D. and G.C.; writing—original draft preparation, W.Z.; writing—review and editing, Q.Z.; supervision, Q.Z. All authors have read and agreed to the published version of the manuscript.

Funding: This research was supported by the China Engineering Science and Technology Development Strategy Henan Research Institute Strategic Consulting Research Project (2024HENYB01), the National Key R&D Program of China (2023YFC3208605), and Key Research Project on Decision Consultation of the Strategic Development Department of China Association for Science and Technology (2023070615CG111504).

Acknowledgments: I acknowledge the contributions of all authors of the 20 papers in this Special Issue.

Conflicts of Interest: The author declares no conflicts of interest.

List of Contributions

1. Han, Z.; Zuo, Q.; Wang, C.; Gan, R. Impacts of Climate Change on Natural Runoff in the Yellow River Basin of China during 1961–2020. *Water* **2023**, *15*, 929. https://doi.org/10.3390/w15050929.
2. Wang, S.; Gong, J.; Gao, H.; Liu, W.; Feng, Z. Gaussian Process Regression and Cooperation Search Algorithm for Forecasting Nonstationary Runoff Time Series. *Water* **2023**, *15*, 2111. https://doi.org/10.3390/w15112111.
3. Fan, X.; Min, T.; Dai, X. The Spatio-Temporal Dynamic Patterns of Shallow Groundwater Level and Salinity: The Yellow River Delta, China. *Water* **2023**, *15*, 1426. https://doi.org/10.3390/w15071426.
4. Han, X.; Sun, A.; Meng, X.; Liang, Y.; Shen, Y.; Bai, Y.; Wang, B.; Meng, H.; He, R. Recognition and Prediction of Collaborative Response Characteristics of Runoff and Permafrost to Climate Changes in the Headwaters of the Yellow River. *Water* **2023**, *15*, 2347. https://doi.org/10.3390/w15132347.
5. Niu, H.; Zhao, X.; Xiao, D.; Liu, M.; An, R.; Fan, L. Evolution and Influencing Factors of Landscape Pattern in the Yellow River Basin (Henan Section) Due to Land Use Changes. *Water* **2022**, *14*, 3872. https://doi.org/10.3390/w14233872.
6. Liu, J.; Shi, T.; Huang, L. A Study on the Impact of Industrial Restructuring on Carbon Dioxide Emissions and Scenario Simulation in the Yellow River Basin. *Water* **2022**, *14*, 3833. https://doi.org/10.3390/w14233833.
7. Ren, S.; Zhao, H.; Zhang, H.; Wang, F.; Yang, H. Influence of Natural and Social Economic Factors on Landscape Pattern Indices—The Case of the Yellow River Basin in Henan Province. *Water* **2023**, *15*, 4174. https://doi.org/10.3390/w15234174.
8. Wu, Z.; Chen, X.; Di, D. Evaluation of Regional Water Ecological Economic System Sustainability Based on Emergy Water Ecological Footprint Theory—Taking the Yellow River Basin as an Example. *Water* **2023**, *15*, 3137. https://doi.org/10.3390/w15173137.
9. Zuo, Q.; Zhang, Z.; Ma, J.; Li, J. Solutions to Difficult Problems Caused by the Complexity of Human–Water Relationship in the Yellow River Basin: Based on the Perspective of Human–Water Relationship Discipline. *Water* **2022**, *14*, 2868. https://doi.org/10.3390/w14182868.
10. Qiu, M.; Zuo, Q.; Wu, Q.; Wu, B.; Ma, J.; Zhang, J. Optimizing Water Distribution in Transboundary Rivers Based on a Synthesis–Dynamic–Harmonious Approach: A Case Study of the Yellow River Basin, China. *Water* **2023**, *15*, 1207. https://doi.org/10.3390/w15061207.

11. Zhang, J.; Tang, D.; Wang, M.; Ahamd, I.; Hu, J.; Meng, Z.; Liu, D.; Pan, S. A Regional Water Resource Allocation Model Based on the Human–Water Harmony Theory in the Yellow River Basin. *Water* **2023**, *15*, 1388. https://doi.org/10.3390/w15071388.
12. Lu, W.; Guo, X.; Liu, W.; Du, R.; Chi, S.; Zhou, B. Spatial–Temporal Dynamic Evolution and Influencing Factors of Green Efficiency of Agricultural Water Use in the Yellow River Basin, China. *Water* **2023**, *15*, 143. https://doi.org/10.3390/w15010143.
13. Chang, C.; Yang, G.; Li, S.; Wang, H. Evolution Trend of Depth to Groundwater and Agricultural Water-Saving Measure Threshold under Its Constraints: A Case Study in Helan Irrigated Areas, Northwest China. *Water* **2024**, *16*, 220. https://doi.org/10.3390/w16020220.
14. Cheng, Y.; Zhang, L.; Zhang, Z.; Li, X.; Wang, H.; Xi, X. Spatiotemporal Variation and Influence Factors of Vegetation Cover in the Yellow River Basin (1982–2021) Based on GIMMS NDVI and MOD13A1. *Water* **2022**, *14*, 3274. https://doi.org/10.3390/w14203274.
15. Liu, Y.; Jiang, E.; Qu, B.; Zhu, Y.; Liu, C. Watershed Ecological Compensation Mechanism for Mainstream and Branches Based on Stochastic Evolutionary Game: A Case of the Middle Yellow River. *Water* **2022**, *14*, 4038. https://doi.org/10.3390/w14244038.
16. Wei, H.; Wang, Y.; Liu, J.; Zeng, R. Heavy Metal in River Sediments of Huanghua City in Water Diversion Area from Yellow River, China: Contamination, Ecological Risks, and Sources. *Water* **2023**, *15*, 58. https://doi.org/10.3390/w15010058.
17. Mao, X.; Zhang, S.; Wang, S.; Li, T.; Hu, S.; Zhou, X. Evaluation of Human Health Risks Associated with Groundwater Contamination and Groundwater Pollution Prediction in a Landfill and Surrounding Area in Kaifeng City, China. *Water* **2023**, *15*, 723. https://doi.org/10.3390/w15040723.
18. Wang, S.; Wang, X. Changes in Water and Sediment Processes in the Yellow River and Their Responses to Ecological Protection during the Last Six Decades. *Water* **2023**, *15*, 2285. https://doi.org/10.3390/w15122285.
19. Gong, L.; Dong, Z.; Jin, C.; Jia, Z.; Yang, T. Flow–Solid Coupling Analysis of Ice–Concrete Collision Nonlinear Problems in the Yellow River Basin. *Water* **2023**, *15*, 643. https://doi.org/10.3390/w15040643.
20. Hu, J.; Shen, H.; Zhang, J.; Meng, Z.; Zhang, Y.; Han, W. Influence of Multi-Cross Structures on the Flood Discharge Capacity of Mountain Rivers in the Yellow River Basin. *Water* **2023**, *15*, 2719. https://doi.org/10.3390/w15152719.

References

1. Li, J.; Liu, X.; Huang, W.; Wei, L.; Li, X.; Gao, H. Investigation of the interactions and influencing variables between water and land resources in the upper yellow river's wind-sand region. *Ecol. Indic.* **2023**, *154*, 110554. [CrossRef]
2. Zhang, X.; Xu, L.; Li, C. Sustainability of water resources in shandong province based on a system dynamics model of water–economy–society for the lower yellow river. *Sustainability* **2022**, *14*, 3412. [CrossRef]
3. Zhao, M.; Li, J.; Zhang, Y.; Han, Y.; Wei, J. Water cycle health assessment based on combined weight and hook trapezoid fuzzy topsis model: A case study of nine provinces in the yellow river basin, China. *Ecol. Indic.* **2023**, *147*, 109977. [CrossRef]
4. Wohlfart, C.; Kuenzer, C.; Chen, C.; Liu, G. Social–ecological challenges in the yellow river basin (China): A review. *Environ. Earth Sci.* **2016**, *75*, 1066. [CrossRef]
5. Wang, T.; Jian, S.; Wang, J.; Yan, D. Dynamic interaction of water–economic–social–ecological environment complex system under the framework of water resources carrying capacity. *J. Clean. Prod.* **2022**, *368*, 133132. [CrossRef]
6. Wang, D.; Jia, Y.; Niu, C.; Yan, X.; Hao, C. A multiple criteria decision-making approach for water allocation of environmental flows considering the value trade-offs—A case study of fen river in China. *Sci. Total Environ.* **2024**, *912*, 169588. [CrossRef] [PubMed]
7. Niu, C.; Wang, X.; Chang, J.; Wang, Y.; Guo, A.; Ye, X.; Wang, Q.; Li, Z. Integrated model for optimal scheduling and allocation of water resources considering fairness and efficiency: A case study of the yellow river basin. *J. Hydrol.* **2023**, *626*, 130236. [CrossRef]
8. Jia, D.; Zhang, T.; Wu, L.; Su, X.; Bai, T.; Huang, Q. Multi-objective cooperative optimization of reservoir scheduling and water resources allocation for inter-basin water transfer project based on multi-stage coupling model. *J. Hydrol.* **2024**, *630*, 130673. [CrossRef]
9. Xue, Y.; Qin, C.; Wu, B.; Zhang, G.; Fu, X.; Ma, H.; Li, D.; Wang, B. Simulation of runoff process based on the 3-d river network. *J. Hydrol.* **2023**, *626*, 130192. [CrossRef]
10. Liu, L.; Luo, Y.; He, C.; Lai, J.; Li, X. Roles of the combined irrigation, drainage, and storage of the canal network in improving water reuse in the irrigation districts along the lower yellow river, China. *J. Hydrol.* **2010**, *391*, 157–174. [CrossRef]
11. Xie, P.; Zhuo, L.; Yang, X.; Huang, H.; Gao, X.; Wu, P. Spatial-temporal variations in blue and green water resources, water footprints and water scarcities in a large river basin: A case for the yellow river basin. *J. Hydrol.* **2020**, *590*, 125222. [CrossRef]
12. Chen, Y.-P.; Fu, B.-J.; Zhao, Y.; Wang, K.-B.; Zhao, M.M.; Ma, J.-F.; Wu, J.-H.; Xu, C.; Liu, W.-G.; Wang, H. Sustainable development in the yellow river basin: Issues and strategies. *J. Clean. Prod.* **2020**, *263*, 121223. [CrossRef]

13. Xu, H.; Song, J. Drivers of the irrigation water rebound effect: A case study of hetao irrigation district in yellow river basin, China. *Agric. Water Manag.* **2022**, *266*, 107567. [CrossRef]
14. Di, D.; Wu, Z.; Wang, H.; Huang, S. Optimal water distribution system based on water rights transaction with administrative management, marketization, and quantification of sediment transport value: A case study of the yellow river basin, China. *Sci. Total Environ.* **2020**, *722*, 137801. [CrossRef] [PubMed]
15. Wei, J.; Lei, Y.; Yao, H.; Ge, J.; Wu, S.; Liu, L. Estimation and influencing factors of agricultural water efficiency in the yellow river basin, China. *J. Clean. Prod.* **2021**, *308*, 127249. [CrossRef]
16. Song, S.; Wang, S.; Wu, X.; Wei, Y.; Cumming, G.S.; Qin, Y.; Wu, X.; Fu, B. Identifying regime transitions for water governance in the yellow river basin, China. *Water Resour. Res.* **2023**, *59*, e2022WR033819. [CrossRef]
17. Niu, C.; Chang, J.; Wang, Y.; Shi, X.; Wang, X.; Guo, A.; Jin, W.; Zhou, S. A water resource equilibrium regulation model under water resource utilization conflict: A case study in the yellow river basin. *Water Resour. Res.* **2022**, *58*, e2021WR030779. [CrossRef]
18. Yin, C.-Y.; Zhao, J.; Chen, X.-B.; Li, L.-J.; Liu, H.; Hu, Q.-L. Desalination characteristics and efficiency of high saline soil leached by brackish water and yellow river water. *Agric. Water Manag.* **2022**, *263*, 107461. [CrossRef]
19. Zhang, Y.; Yang, P.; Liu, J.; Zhang, X.; Zhao, Y.; Zhang, Q.; Li, L. Sustainable agricultural water management in the yellow river basin, China. *Agric. Water Manag.* **2023**, *288*, 108473. [CrossRef]
20. Du, L.; Dong, C.; Kang, X.; Qian, X.; Gu, L. Spatiotemporal evolution of land cover changes and landscape ecological risk assessment in the yellow river basin, 2015–2020. *J. Environ. Manag.* **2023**, *332*, 117149. [CrossRef]
21. Xu, Y.; Wang, C. Ecological protection and high-quality development in the yellow river basin: Framework, path, and countermeasure. *Bull. Chin. Acad. Sci.* **2020**, *35*, 875–883.
22. Ding, L.; Mao, R.F.; Guo, X.; Yang, X.; Zhang, Q.; Yang, C. Microplastics in surface waters and sediments of the wei river, in the northwest of China. *Sci. Total Environ.* **2019**, *667*, 427–434. [CrossRef] [PubMed]
23. Han, M.; Niu, X.; Tang, M.; Zhang, B.-T.; Wang, G.; Yue, W.; Kong, X.; Zhu, J. Distribution of microplastics in surface water of the lower yellow river near estuary. *Sci. Total Environ.* **2020**, *707*, 135601. [CrossRef]
24. Yuan, H.; Li, T.; Ding, X.; Zhao, G.; Ye, S. Distribution, sources and potential toxicological significance of polycyclic aromatic hydrocarbons (pahs) in surface soils of the yellow river delta, China. *Mar. Pollut. Bull.* **2014**, *83*, 258–264. [CrossRef] [PubMed]
25. Zhang, J.; Zhang, X.; Hu, T.; Xu, X.; Zhao, D.; Wang, X.; Li, L.; Yuan, X.; Song, C.; Zhao, S. Polycyclic aromatic hydrocarbons (pahs) and antibiotics in oil-contaminated aquaculture areas: Bioaccumulation, influencing factors, and human health risks. *J. Hazard. Mater.* **2022**, *437*, 129365. [CrossRef] [PubMed]
26. Cui, Q.; Liu, J.; Tang, Y.; Ma, Y.; Lin, G.; Wang, R.; Zhang, W.; Zuo, Q.; Zhao, X.; Wu, F. Study of the adsorption behavior of tetracycline onto suspended sediments in the yellow river, China: Insights into the transportation and mechanism. *Sci. Total Environ.* **2023**, *889*, 164242. [CrossRef]
27. Zhang, Y.; Cao, Z.; Wang, W.; Jin, X. Using systems thinking to study the coordination of the water–sediment–electricity coupling system: A case study on the yellow river. *Sci. Rep.* **2021**, *11*, 21974. [CrossRef] [PubMed]
28. Yin, S.; Gao, G.; Huang, A.; Li, D.; Ran, L.; Nawaz, M.; Xu, Y.J.; Fu, B. Streamflow and sediment load changes from China's large rivers: Quantitative contributions of climate and human activity factors. *Sci. Total Environ.* **2023**, *876*, 162758. [CrossRef]
29. Wu, G.; Wang, K.; Liang, B.; Wu, X.; Wang, H.; Li, H.; Shi, B. Modeling the morphological responses of the yellow river delta to the water-sediment regulation scheme: The role of impulsive river floods and density-driven flows. *Water Resour. Res.* **2023**, *59*, e2022WR033003. [CrossRef]
30. Zhang, Y.; Wu, M.; Yang, F.; Yao, Q. Effect of natural flood and water-sediment regulation processes on nutrient concentration and transport in the yellow river. *Appl. Geochem.* **2023**, *159*, 105853. [CrossRef]
31. Chen, L.; Hou, B.; Zhan, T.; Ge, L.; Qin, Y.; Zhong, W. Water-sediment-energy joint operation model of large-scale reservoir group for sediment-laden rivers. *J. Clean. Prod.* **2022**, *370*, 133271. [CrossRef]
32. Wang, P.; Fu, Y.; Liu, P.; Zhu, B.; Wang, F.; Pamucar, D. Evaluation of ecological governance in the yellow river basin based on uninorm combination weight and multimoora-borda method. *Expert Syst. Appl.* **2024**, *235*, 121227. [CrossRef]
33. Song, S.; Wen, H.; Wang, S.; Wu, X.; Cumming, G.S.; Fu, B. Quantifying the effects of institutional shifts on water governance in the yellow river basin: A social-ecological system perspective. *J. Hydrol.* **2024**, *629*, 130638. [CrossRef]
34. Li, T.; Li, J.; Zhang, D.D. Yellow river flooding during the past two millennia from historical documents. *Prog. Phys. Geogr. Earth Environ.* **2020**, *44*, 661–678. [CrossRef]
35. Ci, F.; Wang, Z.; Hu, Q. Spatial pattern characteristics and optimization policies of low-carbon innovation levels in the urban agglomerations in the yellow river basin. *J. Clean. Prod.* **2024**, *439*, 140856. [CrossRef]
36. Nie, X.; Xie, Y.; Xie, X.; Zheng, L. The characteristics and influencing factors of the spatial distribution of intangible cultural heritage in the yellow river basin of China. *Herit. Sci.* **2022**, *10*, 121. [CrossRef]