Ref: No. hess-2023-228. "Joint optimal operation of the South-to-North Water Diversion Project considering the evenness of water deficit" by Zhou et al.

November 28, 2023

Dear RC #1,

We thank you and the anonymous reviewers for the constructive comments and suggestions on our manuscript entitled "Joint optimal operation of the South-to-North Water Diversion Project considering the evenness of water deficit" (**No. hess-2023-228**).

We have thoroughly revised the original manuscript accordingly. All of the changes we have made are marked in red in the revised manuscript. Point-by-point responses to the comments are attached to this letter. Our responses to comments are marked in **bold blue**. The original manuscript cited is indicated in *black italics*, and the modified text is shown in *red italics*. We hope that you will find this updated manuscript to your satisfaction and consider it for publication in *Hydrology and Earth System Sciences*.

Thank you for taking the time to consider our research and we look forward to hearing from you.

Sincerely,

Prof. Dr. Guohua Fang

College of Water Conservancy and Hydropower Engineering,

Hohai University, Nanjing 210098, P. R. China

E-mail: hhufgh@163.com

Reply to reviewer' comment

Reviewer #1: Manuscript Review

Overall comment:

This manuscript proposed an optimal operating strategy with a focus on alleviating the concentrated water shortage problem of the Jiangsu section of the South-to-North Water Diversion Project. As the authors stated, it is important to balance multiple objectives including social, economic, and ecological objectives, and find the optimal operation rules for efficient water resources utilization. The strategies derived from NSGA-III have been further filtrated with the multi-attribute decision-making method, which is quite innovative and can solve the problem of uneven spatial and temporal distribution of water resources. In general, this manuscript is organized well. I have several suggestions before it can be accepted for publication in Hydrology and Earth System Sciences.

Response:

Thank you very much for your recognition of our work. You have provided us with very valuable comments to improve the quality of this paper. We have tried our best to digest your comments and made corresponding improvements carefully. Point-by-point responses are attached below.

Comment 1. The Introduction section needs to be rewritten/reorganized to be more clear and focused. For a logically sound presentation, this section should start with an overall introduction of IBWD, followed by a generalized discussion of the main research efforts and remaining gaps of IBWD worldwide. Next, China's SNWDP-specific information should be provided in detail, which transitions to the key research objectives and contributions of this paper. With each of the above four aspects occupying at least one dedicated paragraph, I suggest proceeding straight to the point (SNWDP-focused study) after necessary background information (IBWD in general) to avoid blurring of the key message conveyed by the present study.

Response 1:

Thank you for your suggestion. We have reorganized the Introduction section to make it clearer and more appropriately highlight the research focus of the paper. The updated Introduction are shown as follows:

*"**1 Introduction***

Influenced by the impacts of global climate change, human activities, and increasing water demand, issues like regional water resource deficits, flood and drought disasters, and the conflicts between water supply and demand are progressively intensifying (Florke et al., 2018; Kato and Endo, 2017; Ma et al., 2020; Rossi and Peres, 2023). These social issues have become one of the key factors constraining regional and even global sustainable development and environmental protection (Li et al., 2020; Liu et al., 2021; Tian and Destech Publicat, 2017). Inter-basin Water transfer projects have been widely constructed worldwide as an effective way to address water deficit issues caused by uneven distribution of water resources, and improve their utilization efficiency (Medeiros and Sivapalan, 2020; Sun et al., 2021; Wei et al., 2022). At least 10 % of the cities worldwide receive water from IBWD projects (McDonald et al., 2014). The birth of the Lancang-Mekong Cooperation promotes the joint development of six countries, namely China, Cambodia, Laos, Myanmar, Thailand and Vietnam (Ghoreishi et al., 2023). The California State Water Project, the Colorado River Aqueduct (Lopez, 2018), the Senqu-Vaal transfer in South Africa and Lesotho (Gupta and van der Zaag, 2008), the Snowy Mountains Scheme in southeastern Australia (Pigram, 2000), and other inter-basin water transfer projects have all effectively alleviated water scarcity issues in various regions (Lu et al., 2021). The South-to North Water Diversion Project (SNWDP) in China (Guo and Li, 2012) is considered the largest inter-basin water transfer project in the world. The project runs along numerous water users, and the water resources it provides have already benefited hundreds of millions of people, with even more expected to be served in the future (Pohlner, 2016).

There are considerable studies on the water resources operating strategy of the supply-oriented IBWD projects in terms of social, economic, ecological, and environmental

(Gan et al., 2011; Liu and Zheng, 2002; Xu et al., 2013; Zhu et al., 2014). In general, meeting the water demand of various users is the main task of the IBWD project, with the consideration of minimizing water deficit in previous studies (Guo et al., 2020; Wang et al., 2008). Rather than the total amount of water deficit, the crux of the problem may actually be the concentration of water deficit in a certain period of time or region, which has not yet received sufficient attention and remains a major challenge. Therefore, both the total and spatial-temporal distribution of water deficit should be considered in the optimization process (Xu et al., 2013). In addition, users' demands and decision makers' benefits should be considered as priorities (Zhang et al., 2012), so minimizing pumped water (PW) is a direct way to reduce costs. At the same time, the proportion of the amount of abandoned water and the water withdrawn from the river in the process of water diversion should be taken as secondary considerations (Guo et al., 2018). However, due to the data on natural water and user water demand as the determining factors of the operation strategy, and the obvious regional differences, most of the objectives determined by the existing studies can only solve small-scale projects.

As the project continues to operate, the focus of research should be concentrated on the planning of operational strategies to enhance the sustainability of the project. For IBWT projects, due to regional differences, improving operational efficiency and benefits while ensuring water supply is a challenging task. Currently, most IBWT projects primarily adhere to various laws and policies established by the government. These projects comply with annual water demand plans submitted by sectors like agriculture, domestic use, and ecology. The water supply principle is based on 'prioritizing users that are closer in distance, have lower water supply costs, and have larger water demands' to develop operation strategies. Such method of water diversion results in lower satisfaction levels for users that are farther in distance and have higher costs, leading to an imbalance in water supply and causing some users to face significant pressure from concentrated water deficits. Furthermore, these projects lack annual predictive assessments of local hydrological conditions and fail to develop targeted operational strategies for diverse natural inflows or extreme events.

Developing operational strategies without considering the evenness of water deficit and natural inflows is unscientific. This inspires the primary objective of optimization in this paper.

The South-to-North Water Diversion Project (SNWDP) presents a highly complex and dynamic water situation, especially in the Jiangsu section (Vogel et al., 2015). Due to differences in the location and timing of natural inflows and water users, and the aforementioned issues in operational strategies, an imbalance in water supply has arisen. At present, there have been some studies attempting to address this issue, but they tend to focus on meeting the total water demand and improving the overall benefits (Li et al., 2017; Zhuan et al., 2016), neglecting the fairness of water supply among different regions. Water supply may become concentrated on a specific user or time period. Therefore, it is of great theoretical significance and practical application value to optimize the existing operation strategy to alleviate the concentration of water deficit so as to realize the comprehensive benefits of the IBWT project (Nazemi and Wheater, 2015; Peng et al., 2015).

To address the above problem, this paper studies the Jiangsu section of South-to-North Water Diversion project (J-SNWDP). The three main contributions of this paper are as follows: (1) The definition of the Water Deficit Evenness Index (WDEI) and its incorporation into the joint optimal operation model of the J-SNWDP, along with the Total Water Deficit (TWD) and the Pumped Water (PW), aim to satisfy the requirements of both decision-makers and users; (2) The incorporation of the amount of abandoned water and the water withdrawn from the Yangtze River into the decision indicator set, along with the application of the multi-attribute decision making method for filtering the Pareto front strategies of NSGA-III, results in the identification of the optimal operation strategy that balances economic and ecological benefits; (3) The comparison of the optimal operation strategy selected in three typical years (wet, normal, and dry) with the historical operation strategy under identical natural conditions in the paper serves to verify the superiority of the optimization results, offering reasonable optimization suggestions for the J-SNWDP and other similar regions." ***(Lines 31-100 in updated manuscript; Lines 31-127 in old version)***

Comment 2. Line 15, "NSGA" as an acronym should be defined on its first use in the manuscript.

Response 2:

Thank you for your suggestion, we added the full name of "NSGA" in the manuscript upon its first appearance:

"Further, the Nondominated Sorting Genetic Algorithm III (NSGA-III) and multi-attribute decision-making were applied to solve the model and obtain an optimal operation strategy." ***(Lines 15-16 in updated manuscript; Lines 15 in old version)***

Comment 3. Lines 72-74, please add appropriate citations for the sentence "At the same time...".

Response 3:

Thank you for your suggestion. We have added an appropriate citation for this sentence "At the same time..." to indicate the amount of abandoned water and the water withdrawn from the river as important indicators.

"At the same time, the proportion of the amount of abandoned water and the water withdrawn from the river in the process of water diversion should be taken as secondary considerations (Guo et al., 2018)." ***(Lines 59-61 in updated manuscript; Lines 72-74 in old version)***

Comment 4. Line 129, the title should be "2.1 Study area and data"

Response 4:

Thanks for your comments. We have revised the title of Section 2.1. The revisions are shown as follows:

*"**2.1 Study area and data**"* ***(Lines 102 in updated manuscript; Lines 129 in old version)***

Comment 5. Line 192, the title should be "2.2 Water deficit evenness index"

Response 5:

Thanks for your comments. We have revised the title of Section 2.2. The revisions are shown as follows:

"2.2 Water deficit evenness index" (Lines 165 in updated manuscript; Lines 192 in old version)

Comment 6. Section 2.4 lacks the introduction of the specific application of the NSGA-Ⅲ algorithm in the model. In addition, why use the multi-attribute decision to filter again after obtaining a set of operation strategies? Please add the explanation.

Response 6:

Thanks to your suggestion. We have added the introduction of the specific application of the NSGA-III algorithm, and additional information on the reasons for using multi-attribute decision making to filter again.

The NSGA-Ⅲ is used to solve the joint optimal operation model of the J-SNWDP under three typical conditions: wet year, normal year and dry year. The model takes the actual value of the pumped water of each pumping station as the decision variable. The population size, generation, crossover rate and mutation rate are set to 200, 20000, 0.9 and 0.1, respectively. The application of NSGA-III to the model can be summarized as the following steps：(1) Take 12 monthly water pumped of a year as the decision variables and initializes the population of size N based on the physical constraints of operation; (2) Calculate the objectives of TWD, EWD and WP for each chromosome and sort by Nondominated strategy; (3) Select excellent chromosome from population non-dominated as parent chromosome and create child chromosome by the cross and mutation operation. (4) Combine the parent chromosome with the child chromosome and update the population by Nondominated strategy. (5) Repeat the four steps above until the number of iterations is reached.

After solving the model using NSGA-III, we obtained a set of optimized running strategies (i.e., strategies based on the Pareto-ranked top 200). In order to measure the operation effect more comprehensively, more indicators are needed to assist in selecting an optimal operation strategy. Therefore, this paper further applies multi-attribute decision-making methods to screen and determine the optimal operation strategy. The abandoned water reflects the regulation and storage capacity of the lakes, and the water withdrawn from the Yangtze River reflects the impact of the water transferred outside the system on the operation strategy." ***(Lines 248-265 in updated manuscript; Lines 264-269 in old version)***

Comment 7. The text in Fig 4 is not clear, please revise the figure with a dark text color.

Response 7:

Thank you for your suggestion. To avoid duplication and confusion, we have modified Figure 4 to include the original content of the complete optimization process flowchart. The revisions are shown as follows:

"

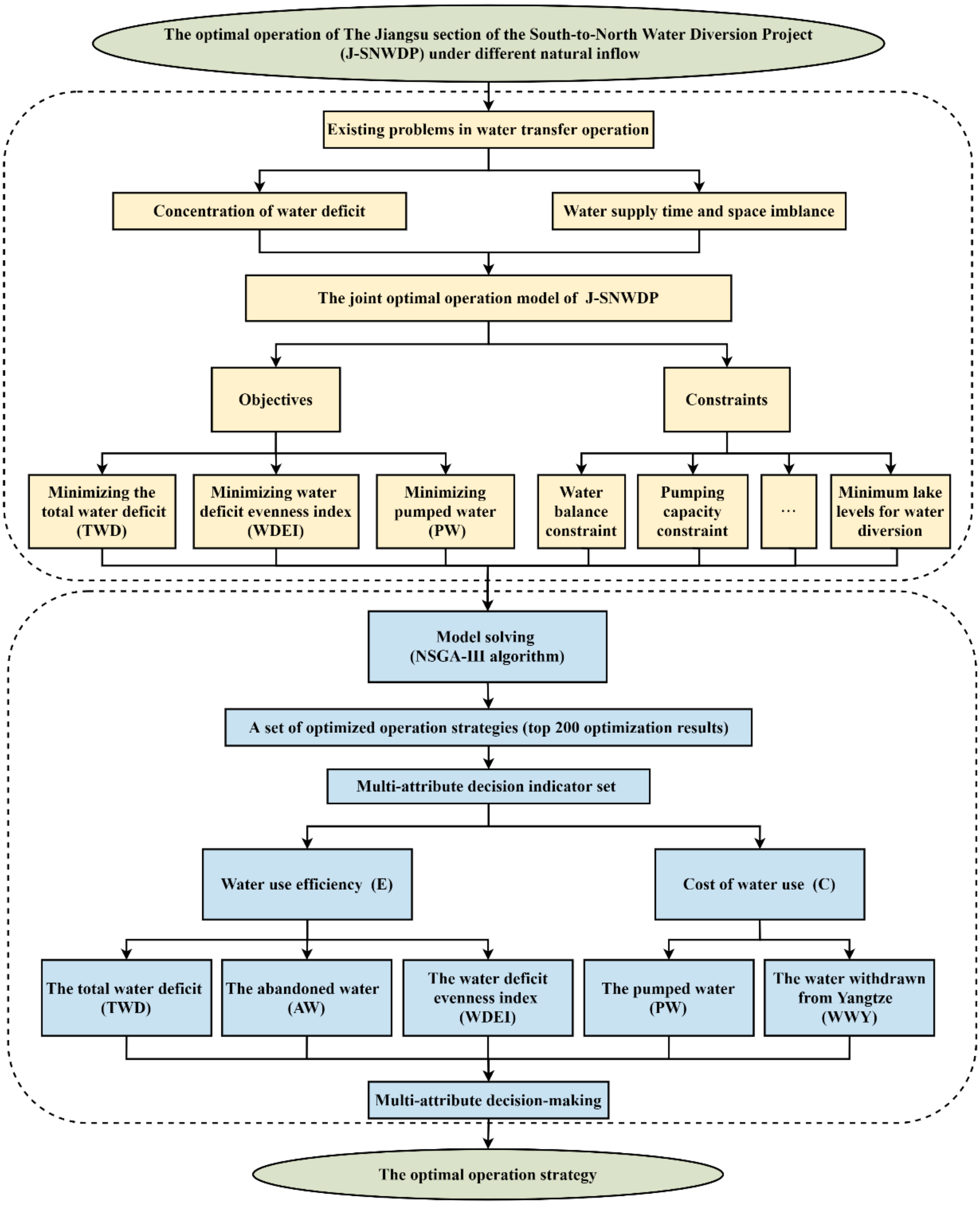

Fig. 4. Optimization process of the Jiangsu section of the South-to-North Water Diversion Project (J-SNWDP).” (Lines 272-274 in updated manuscript; Lines 277-279 in old version)

Comment 8. The study is conducted to address the problem of concentrated water shortage. It is recommended that section 3.2 be specifically divided into several subsections based on the optimization effects from different aspects, so as to highlight the contribution of the Water deficit evenness index.

Response 8:

Thank you for your comments. We have divided section 3.2 into 4 subsections to illustrate the comparison of the optimal operation strategy in different typical years with the historical operation strategy from 4 aspects, including the main operation performance indicators, the water deficit in water users, the operation water level of the Hongze and Luoma lake, and the water distribution of different routes between two adjacent lakes.

*"**3.2.1 Comparison of the main operation performance indicators***

Table 4 shows the …… economic benefits.

3.2.2 Comparison of water deficit in water users

The comparison of …… general public.

3.2.3 Comparison of the operation water level of the Hongze and Luoma lake

Fig. 6 shows the …… TWD and PW.

3.2.4 Comparison of the water distribution of different routes between two adjacent lakes

This paper considers that …… the Jinbao Channel has also increased (see Table 6)." .

(Lines 325-416 in updated manuscript; Lines 330-430 in old version)

Comment 9. Lines 419-430, the authors summarized the control rules for appropriate lake levels and proposed suggestions for actual operation, which is more suitable for the discussion section. Please revise and reorganize the discussion section.

Response 9:

Thank you for your suggestion. We have removed paragraph " Evidence from…" and reorganized the discussion section to make it clear. Some parts of the revisions are as follows:

"4 Discussion

Inter-basin water transfer projects are widely used around the world and are also quite costly to construct. For instance, the Colorado River aqueduct cost approximately 3.5 billion dollars (Witcher, 2017), the Australian Snowy Mountains Scheme was completed in 1974 at a cost of about 500 million dollars (Pigram, 2000), and the South-to-North Water Diversion Project in China, as the largest and most expensive inter-basin water transfer system in the world, is projected to cost 62 billion dollars (Markosov, 2014). The installation and operation maintenance costs are also significantly high. Of this, the investment for just the Eastern Route of the project is around 1 billion dollars (Liu et al., 2022), which is a typical example of a vast and complex water transfer system and has certain representativeness. Therefore, the Jiangsu section of the Eastern Route of the South-to-North Water Diversion Project is selected as the study area for this paper.

The joint optimal operating model is operated based on ecological (the total water deficit), social demand (the evenness of water deficit) and economic (the pumping water) objectives, focusing on the issue of water deficit concentration. Herein, the limited available water is used to minimize the total water deficit of the system and water deficit differences between users and applies to inter-basin water transfer projects with complex systems and a large number of water users. The multi-attribute decision implemented in this study incorporates ecological (the abandoned water) and the water withdrawn from Yangtze River into the multi-attribute decision indicator set, which can provide optimal operation strategy with preferred weights for decision makers who have different preferences.

Evidence from this research suggests that the water extracted from Hongze Lake is much greater than that from other lakes, indicating that Hongze Lake is the main source of water to support water supply and flood control within the system. Therefore, it is important to understand the water storage period. It is important to ensure that the water level of each storage lake reaches the water level at the end of the flood season to complete the water allocation in the non-flood season. If the reservoir water storage *is insufficient, the Yangtze River will be pumped in time to ensure the normal operation of the entire water diversion project. The Yangtze River is the main source of water outside the J-SNWDP system. The proportion of pumping water from the Yangtze River in the pumping water volume of the system plays an important regulatory role. The actual operation should follow the following rules: When the natural inflow is less, mainly through pumping the Yangtze River to complete the task of water supply; when the natural inflow is large, the water withdrawn from Yangtze River is reduced, and the focus of water allocation is shifted to the mutual replenishment between lakes.*

In summary, it can be seen that the water deficit doesn't only occur under less natural inflow conditions, but also there are still serious problems of water deficit and abandonment in wet years. The main reasons for the coexistence of water deficit and water abandonment are lakes' limited water storage capacity and the uneven spatial-temporal distribution of natural inflow. Water deficit and the pumped water are greatly affected by natural inflow; we should not expect to find a general operating strategy optimal in all natural conditions. This paper performs well in water resources allocation and utilization on a monthly time step of three typical years (wet year, normal year and water deficit year), which is representative and universal, and provides a useful guide for IBWT under future uncertainty. Therefore, in addition to implementing the optimal operation strategy, the flood control limit water level should be appropriately increased according to the natural inflow to improve the lake's storage capacity in the flood season. This is a potential way to effectively enhance the operational efficiency of inter-basin water transfer project." ***(Lines 417-459 in updated manuscript; Lines 431-451 in old version)***

Comment 10. The use of (1) or 1) is not uniform throughout the manuscript. Please revise it.

Response 10:

We have revised and unified all similar expressions in the manuscript, which can be found in the latest manuscript.

Comment 11. Is this method universal? Are the results of this research capable of being applied to other similar cases? Please add some necessary sentences to illustrate this clearly in the conclusion.

Response 11:

Thank you for your suggestion. To avoid any confusion, we have added a statement about the method's universality in the conclusion. The revisions are shown as follows:

"(3) After optimization, the rising trend of water level in Hongze Lake and Luoma Lake reflects the enhanced storage capacity of the lake, and the water allocation between different water transmission routes is more balanced, which improves water utilization and water supply efficiency. Moreover, this paper proposes water transfer prioritization rules and suggests appropriately increasing the flood control limit water level, aimed at protecting the water diversion and enhancing operational efficiency. The sources of uncertainty, such as natural inflow and societal water demand, are worthy of further study.

Overall, the successful application of the optimal operation strategy in the Jiangsu section of the South-to-North Water Transfer Project also demonstrates the feasibility of the research. It is hoped that this method can be attempted in other similar watersheds worldwide in order to revalidate this method in other circumstances, demonstrate its universality. This would provide the scientific basis and operating suggestions for the inter-basin water diversion project." ***(Lines 502-513 in updated manuscript; Lines 468-471 in old version)***

Comment 12. There are a few typos and grammar errors in the manuscript. English should be improved.

Response 12:

Thanks to your suggestions, we have checked and revised the entire manuscript for typos and grammar.

Reference

Deb, K., Jain, H., 2014. An Evolutionary Many-Objective Optimization Algorithm Using Reference-Point-Based Nondominated Sorting Approach, Part I: Solving Problems With Box Constraints. Ieee Transactions on Evolutionary Computation 18, 577-601. http://dx.doi.org/10.1109/tevc.2013.2281535

Florke, M., Schneider, C., McDonald, R.I., 2018. Water competition between cities and agriculture driven by climate change and urban growth. Nature Sustainability 1, 51-58. http://dx.doi.org/10.1038/s41893-017-0006-8

Gan, Z.G., Zhao, H.L., Jiang, Y.Z., You, J.J., Kang, J., 2011. River Basin Water Resources Multi- Objective Regulation Theory And Method Research. GBMCE 2011 71-78. http://dx.doi.org/10.4028/www.scientific.net/AMM.71-78.4721

Ghoreishi, M., Elshorbagy, A., Razavi, S., Bloeschl, G., Sivapalan, M., Abdelkader, A., 2023. Cooperation in a transboundary river basin: a large-scale socio-hydrological model of the Eastern Nile. Hydrology and Earth System Sciences 27, 1201-1219. http://dx.doi.org/10.5194/hess-27-1201-2023

Guo, X.Y., Ma, C., Tang, Z.B., 2018. Multi-Timescale Joint Optimal Dispatch Model Considering Environmental Flow Requirements for a Dewatered River Channel: Case Study of Jinping Cascade Hydropower Stations. Journal of Water Resources Planning and Management 144. http://dx.doi.org/10.1061/(asce)wr.1943-5452.0000981

Guo, Y.C., Li, J.L., 2012. Practice and Improvement of Agent Construction System in Hydraulic Engineering, 2nd International Conference on Civil Engineering and Transportation (ICCET 2012), Guilin, PEOPLES R CHINA, pp. 2611-2615.

Guo, Y.X., Tian, X., Fang, G.H., Xu, Y.P., 2020. Many-objective optimization with improved shuffled frog leaping algorithm for inter-basin water transfers. Advances in Water Resources 138. http://dx.doi.org/10.1016/j.advwatres.2020.103531

Gupta, J., van der Zaag, P., 2008. Interbasin water transfers and integrated water resources management: Where engineering, science and politics interlock. Physics and Chemistry of the Earth 33, 28-40. http://dx.doi.org/10.1016/j.pce.2007.04.003

Kato, T., Endo, A., 2017. Contrasting Two Dimensions of Disaster-Induced Water-Shortage Experiences: Water Availability and Access. Water 9. http://dx.doi.org/10.3390/w9120982

Li, J.H., Lei, X.H., Qiao, Y., Kang, A.Q., Yan, P.R., 2020. The Water Status in China and an Adaptive Governance Frame for Water Management. International Journal of Environmental Research and Public Health 17. http://dx.doi.org/10.3390/ijerph17062085

Li, Y.Y., Cui, Q., Li, C.H., Wang, X., Cai, Y.P., Cui, G.N., Yang, Z.F., 2017. An improved multi-objective optimization model for supporting reservoir operation of China's South-to-North Water Diversion Project. Science of the Total Environment 575, 970-981. http://dx.doi.org/10.1016/j.scitotenv.2016.09.165

Liu, C.M., Zheng, H.X., 2002. South-to-north water transfer schemes for China. International Journal of Water Resources Development 18, 453-471. http://dx.doi.org/10.1080/0790062022000006934

Liu, D.C., Li, Y., Wang, P.F., Zhong, H.Q., Wang, P., 2021. Sustainable Agriculture Development in Northwest China Under the Impacts of Global Climate Change. Frontiers in Nutrition 8. http://dx.doi.org/10.3389/fnut.2021.706552

Liu, Y., Chong, F.T., Jia, J.J., Cao, S.L., Wang, J., 2022. Proper Pricing Approach to the Water Supply Cost Sharing: A Case Study of the Eastern Route of the South to North Water Diversion Project in China. Water 14. http://dx.doi.org/10.3390/w14182842

Lopez, J.C., 2018. Interbasin water transfers and the size of regions: An economic geography example. Water Resources and Economics 21, 40-54. http://dx.doi.org/10.1016/j.wre.2017.10.005

Lu, Y., Tian, F.Q., Guo, L.Y., Borzì, I., Patil, R., Wei, J., Liu, D.F., Wei, Y.P., Yu, D.J., Sivapalan, M., 2021. Socio-hydrologic modeling of the dynamics of cooperation in the transboundary Lancang-Mekong River. Hydrology and Earth System Sciences 25, 1883-1903. http://dx.doi.org/10.5194/hess-25-1883-2021

Ma, T., Sun, S., Fu, G.T., Hall, J.W., Ni, Y., He, L.H., Yi, J.W., Zhao, N., Du, Y.Y., Pei, T., Cheng, W.M., Song, C., Fang, C.L., Zhou, C.H., 2020. Pollution exacerbates China's water scarcity and its regional inequality. Nature Communications 11. http://dx.doi.org/10.1038/s41467-020-14532-5

Markosov, A.I., 2014. Does Transferring Water Present an Efficient Way of Solving Water Scarcity in China's Northeast?

McDonald, R.I., Weber, K., Padowski, J., Florke, M., Schneider, C., Green, P.A., Gleeson, T., Eckman, S., Lehner, B., Balk, D., Boucher, T., Grill, G., Montgomery, M., 2014. Water on an urban planet: Urbanization and the reach of urban water infrastructure. Global Environmental Change-Human and Policy Dimensions 27, 96-105. http://dx.doi.org/10.1016/j.gloenvcha.2014.04.022

Medeiros, P., Sivapalan, M., 2020. From hard-path to soft-path solutions: slow-fast dynamics of human adaptation to droughts in a water scarce environment. Hydrological Sciences Journal-Journal Des Sciences Hydrologiques 65, 1803-1814. http://dx.doi.org/10.1080/02626667.2020.1770258

Nazemi, A., Wheater, H.S., 2015. On inclusion of water resource management in Earth system models - Part 2: Representation of water supply and allocation and opportunities for improved modeling. Hydrology and Earth System Sciences 19, 63-90. http://dx.doi.org/10.5194/hess-19-63-2015

Ni, X.K., Dong, Z.C., Xie, W., Jia, W.H., Duan, C.G., Yao, H.Y., 2019. Research on the Multi-Objective Cooperative Competition Mechanism of Jinsha River Downstream Cascade Reservoirs during the Flood Season Based on Optimized NSGA-III. Water 11. http://dx.doi.org/10.3390/w11040849

Peng, Y., Chu, J.G., Peng, A.B., Zhou, H.C., 2015. Optimization Operation Model Coupled with Improving Water-Transfer Rules and Hedging Rules for Inter-Basin Water Transfer-Supply Systems. Water Resources Management 29, 3787-3806. http://dx.doi.org/10.1007/s11269-015-1029-4

Pigram, J.J., 2000. Options for rehabilitation of Australia's Snowy River: An economic perspective. Regulated Rivers-Research & Management 16, 363-373. http://dx.doi.org/10.1002/1099-1646(200007/08)16:4<363::Aid-rrr610>3.0.Co;2-i

Pohlner, H., 2016. Institutional change and the political economy of water megaprojects: China's south-north water transfer. Global Environmental Change-Human and Policy Dimensions 38, 205-216. http://dx.doi.org/10.1016/j.gloenvcha.2016.03.015

Rossi, G., Peres, D.J., 2023. Climatic and Other Global Changes as Current Challenges in Improving Water Systems Management: Lessons from the Case of Italy. Water Resources Management 37, 2387-2402. http://dx.doi.org/10.1007/s11269-023-03424-0

Sun, S., Zhou, X., Liu, H.X., Jiang, Y.Z., Zhou, H.C., Zhang, C., Fu, G.T., 2021. Unraveling the effect of inter-basin water transfer on reducing water scarcity and its inequality in China. Water Research 194. http://dx.doi.org/10.1016/j.watres.2021.116931

Tang, X.Y., He, Y., Qi, P., Chang, Z.H., Jiang, M., Dai, Z.B., 2021. A New Multi-Objective Optimization Model of Water Resources Considering Fairness and Water Shortage Risk. Water 13. http://dx.doi.org/10.3390/w13192648

Tian, H.G., Destech Publicat, I., 2017. Research on Scientific Development Strategy of Water Conservancy Economy Based on Sustainable Development, 3rd International Conference on Social Science, Management and Economics (SSME), Guangzhou, PEOPLES R CHINA, pp. 476-481.

Vogel, R.M., Lall, U., Cai, X.M., Rajagopalan, B., Weiskel, P.K., Hooper, R.P., Matalas, N.C., 2015. Hydrology: The interdisciplinary science of water. Water Resources Research 51, 4409-4430. http://dx.doi.org/10.1002/2015wr017049

Wang, L.Z., Fang, L.P., Hipel, K.W., 2008. Basin-wide cooperative water resources allocation. European Journal of Operational Research 190, 798-817. http://dx.doi.org/10.1016/j.ejor.2007.06.045

Wei, Y.P., Wei, J., Li, G., Wu, S.L., Yu, D., Ghoreishi, M., Lu, Y., Souza, F.A.A., Sivapalan, M., Tian, F.Q., 2022. A socio-hydrological framework for understanding conflict and cooperation with respect to transboundary rivers. Hydrology and Earth System Sciences 26, 2131-2146. http://dx.doi.org/10.5194/hess-26-2131-2022

Witcher, T.R., 2017. The Colorado River Aqueduct. Civil Engineering 87, 46-49. http://dx.doi.org/10.1061/ciegag.0001187

Xu, J.P., Tu, Y., Zeng, Z.Q., 2013. Bilevel Optimization of Regional Water Resources Allocation Problem under Fuzzy Random Environment. Journal of Water Resources Planning and Management 139, 246-264. http://dx.doi.org/10.1061/(asce)wr.1943-5452.0000248

Zhang, C., Wang, G.L., Peng, Y., Tang, G.L., Liang, G.H., 2012. A Negotiation-Based Multi-Objective, Multi-Party Decision-Making Model for Inter-Basin Water Transfer Scheme Optimization. Water Resources Management 26, 4029-4038. http://dx.doi.org/10.1007/s11269-012-0127-9

Zhou, B.W., Liu, B.Y., Yang, D.S., Cao, J., Littler, T., 2020. Multi-objective optimal operation of coastal hydro-electrical energy system with seawater reverse osmosis desalination based on constrained NSGA-III. Energy Conversion and Management 207. http://dx.doi.org/10.1016/j.enconman.2020.112533

Zhu, X.P., Zhang, C., Yin, J.X., Zhou, H.C., Jiang, Y.Z., 2014. Optimization of Water Diversion Based on Reservoir Operating Rules: Analysis of the Biliu River Reservoir, China. Journal of Hydrologic Engineering 19, 411-421. http://dx.doi.org/10.1061/(asce)he.1943-5584.0000805

Zhuan, X.T., Li, W., Yang, F., 2016. Optimal operation scheduling of a pumping station in east route of South-to-North water diversion project. ICAE 105, 3031-3037. http://dx.doi.org/10.1016/j.egypro.2017.03.623