Dear Author,

I would like to inform you that your submission to HESS is subject to major revisions as outlined by the two reviewers. Please ensure you address all the points raised by the reviewers in your manuscript.

Specifically, please improve the text readability, correct any grammatical errors, and avoid inconsistencies in the use of abbreviations (consider reducing them if possible). Avoid adding a table for abbreviations; they should be limited in number and explained the first time they appear in the text. Additionally, make sure the overall message, novelty, and significance of the paper are clear to the readers. Avoid presenting your results in the methods section.

Please bear in mind that the writing quality needs significant improvement before your manuscript will be suitable for publication in HESS.

I look forward to receiving your revised manuscript.

Best regards,

Elham Freund

Dear Elham Freund,

We wish to thank you for handling the review of our manuscript submitted to HESS for possible publication. We wish to sincerely thank the reviewers for their extensive and thoughtful comments on our manuscript which we have addressed in the revised manuscript as discussed below. Throughout, *reviewer comments* are in *blue* font and *italic* type, and **our response** in **black** font. OM and RM stand for original and revised manuscript, respectively.

There have been textual changes throughout the manuscript, mostly in Introduction, Method, Result and Discussion. Firstly, we made great efforts to improve our writing. We asked an English-specialist colleague to proof-read our final manuscript to eliminate language problems as much as possible. Secondly, we have normalized the abbreviations and explained the first time they appear in the text. Thirdly, we have emphasized the significance and novelty of this study in the introduction and discussion section and moved the results of the calibration and validation to the results section. All the changes were given in the marked version.

Thanks a lot for your consideration.

Thank you and with regards.

Sincerely,

Xuezhi Tan

RC1:

The manuscript "Combined Impacts of Climate Change and Human Activities on Blue and Green Water Resources in the High-Intensity Development Watershed" presents a comprehensive and insightful study on the variations in blue water (BW) and green water (GW) resources in the Dongjiang River Basin (DRB). The use of the Soil and Water Assessment Tool (SWAT) model to quantify the impacts of climate change and land use change (LUCC) on BW and GW provides robust and valuable findings. The study's relevance to the Guangdong-Hong Kong-Macao Greater Bay Area (GBA) underscores its importance in guiding sustainable water resource management in a rapidly developing region. However, several issues need addressing to enhance the paper's clarity and impact.

We wish to sincerely thank the reviewers for their extensive and thoughtful comments on our manuscript which we have addressed in the revised manuscript as discussed below. Throughout, reviewer comments are in *blue* font and *italic* type, and **our response** in **black** font.

Major Concerns:

1. Formulation and Demonstration of GW and BW Derivation: The paper should clearly formulate and demonstrate how GW and BW are derived using the SWAT model. Without this critical information, the reader's understanding of the methodology and results is hindered. Additionally, for equations 10-11, it is necessary to specify clearly what "X" represents. This clarification is essential for comprehending these equations fully.

Response: We have added the formulation and demonstration of *GW* and *BW* derivation. Lines 176-185 in the revised manuscript:

2.3.1 Calculation of blue and green water

BW is calculated from the sum of water yield (SWAT output WYLD) and groundwater storage. The former refers to the amount of water that leaves the HRU *and enters the channel. The latter represents the net amount of water recharged to aquifers (SWAT output GW_RCHG) and the amount of aquifer water discharges to the main channel (SWAT output GW_W) during a time step (Hordofa et al., 2023). GW can be divided into two components including GWF which is the actual evapotranspiration (SWAT output ET) from the HRU, and GWS which is the soil water moisture (SWAT output SW) (Nie et al., 2023; Veettil and Mishra, 2018). The calculation of the Green Water Index (GWI) involves dividing the quantity of GW by the sum of BW and GW (Ding et al., 2024; Nie et al., 2023).*

In addition, we have added explanations for Equations 10 and 11. Lines 229-237 in the revised manuscript:

Climate change contribution to BW and GW change is estimated by:

$$CR_C = \frac{|X_2 - X_1|}{|X_2 - X_1| + |X_3 - X_2|} \times 100\% \quad (10)$$

where X_1, X_2, and X_3 are the amount of water including BW or GWF and GWS, respectively for scenario S1, S2, and S3.

The contribution of LUCC to changes in BW and GW are estimated by Equations 11.

$$CR_L = \frac{|X_3 - X_2|}{|X_3 - X_2| + |X_2 - X_1|} \times 100\% \quad (11)$$

2. Language and Readability: The overall readability of the English text needs improvement. For example, in Line 162, "Both stations had simulation streamflow ..." should be corrected to "Both stations had simulated streamflow ...". Similar issues with unclear English should be checked and corrected throughout the manuscript to ensure the text is polished and easily understandable.

Response: Thanks for your good suggestion. We made great efforts to improve our writing. We asked an English-specialist colleague to proof-read our final manuscript to eliminate language problem as many as possible. All the changes were given in the marked version.

3. Abbreviation Clarity: The use of abbreviations in the paper often feels unnatural and can be confusing. Typically, abbreviations are created using the initial letters of the terms they represent. Abbreviations such as LUCC (Land Use Change) and BWR (BW withdrawals) do not follow this convention and may lead to confusion. Clear and consistent use of abbreviations is necessary.

Response: We have normalized the abbreviations and explained the first time they appear in the text. The following Table 1 did not appear in the manuscript.

Table 1 List of abbreviations

Abbreviation	Full name	Abbreviation	Full name
BW	Blue water	*GW*	Green water
GWF	Green water flow	*GWS*	Green water storage
BWSC	Blue water scarcity	*GWSC*	Green water scarcity
EFR	Environmental flow requirements	*BWW*	Blue water withdrawals
BWA	Blue water availability	*GWFO*	Green water footprint
GWA	Green water availability	*P*	Precipitation
T	Temperature	*PET*	Potential evapotranspiration
ET	Evapotranspiration	LUCC	Land use and land cover change

4. Contradictions in Precipitation Trends: It is evident from Figure 3a that there are no significant increases or decreases in precipitation trends. However, the Discussion and main text cite precipitation trends as reasons for certain results, which appears contradictory. It would be more appropriate to present a figure showing statistically significant trends in precipitation and base the discussion on those results. Additionally, Table 3 is unclear and requires revision for better comprehension.

Response: Although from the point of view of the stations, the trend of changes in precipitation in the Dongjiang River basin is not statistically significant (Figure 3a). The average precipitation of Dongjiang River basin can be obtained from the precipitation of these station using the Voronoi method. The average precipitation in Dongjiang River basin decreased at a rate of 0.51 mm year^{-1} (p>0.05) (Figure S3). Since the change in average precipitation is not statistically significant, we have revised the discussion on precipitation change. We have added descriptions of temporal changes in mean precipitation, temperature, and potential evapotranspiration in the basin (lines 314-319 in the revised manuscript), and removed the discussion of the relationship between precipitation and total water resources (lines 498-500 in the revised manuscript).

The mean precipitation, temperature, and potential evapotranspiration of DRB can be obtained from the precipitation, temperature, and potential evapotranspiration of stations using the Tyson polygon method. The inter-annual variation of annual precipitation in DRB showed an insignificant decreasing trend (-0.51mm a^{-1}). The annual mean temperature showed a significant increasing trend (0.024℃ a^{-1}). The annual potential evapotranspiration showed a significant decreasing trend (-0.38mm a^{-1}) (Figure S3).

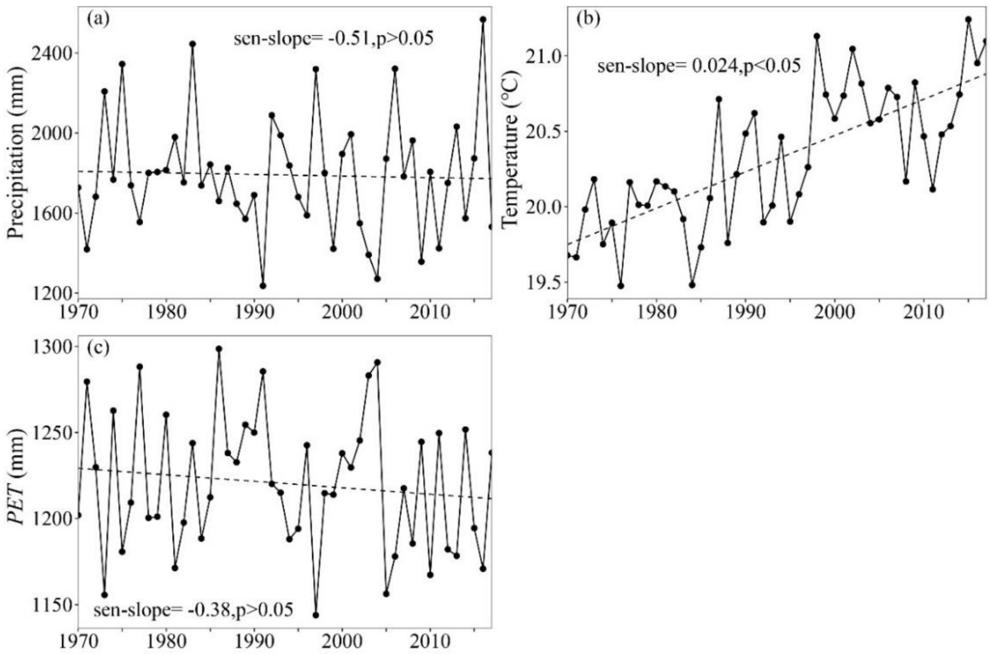

Figure S3. Interannual variation of (a) precipitation, (b) temperature, and (c) potential evapotranspiration in the Dongjiang River basin from 1970 to 2017.

5. Additional References: I recommend adding the following papers to the citation in Line 24 to enhance the literature review and context:

- *S. Berezovskaya et al. (2004), DOI: 10.1029/2004gl021277*
- *Suzuki et al. (2021), DOI: 10.3390/rs13214389*

Response: We have added the references in the literature review. Lines 23-28 in the revised manuscript:

Land use and land cover change (LUCC) and climate variability may alter hydrological processes in watersheds (Berezovskaya et al., 2004; Chagas et al., 2022; Konapala et al., 2020; Tan et al., 2022)*, which successively affect variations of regional water resources (Hoek van Dijke et al., 2022; Pokhrel et al., 2021; Stocker et al., 2023; Suzuki et al., 2021), potentially leading to ecosystem degradation and severe water shortage crises (Aghakhani Afshar et al., 2018; Zuo et al., 2015).*

By addressing these concerns, the manuscript's quality and clarity will be significantly improved, making it more accessible and informative to the readers.

References

Aghakhani Afshar, A., Hassanzadeh, Y., Pourreza-Bilondi, M., Ahmadi, A., 2018. Analyzing long-term spatial variability of blue and green water footprints in a semi-arid mountainous basin with MIROC-ESM model (case study: Kashafrood River Basin, Iran). Theoretical and Applied Climatology 134, 885–899. https://doi.org/10.1007/s00704-017-2309-0

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RC2:

General Comments

The manuscript "Combined Impacts of Climate Change and Human Activities on Blue and Green Water Resources in the High-Intensity Development Watershed" presents an intriguing analysis of the variations in blue water (BW) and green water (GW) resources in the study area.

We wish to sincerely thank the reviewers for their extensive and thoughtful comments on our manuscript which we have addressed in the revised manuscript as discussed below. Throughout, reviewer comments are in *blue* font and *italic* type, and **our response** in **black** font.

Major Comments:

Readability (Grammar): The overall readability of the English text needs improvement. There are several grammatical issues and problems that complicate the readability of the text. I suggest a thorough review and editing of the text to enhance its clarity and fluency before it can be considered for publication.

Response: Thanks for your good suggestion. We have made great efforts to improve our writing. We asked an English-specialist colleague to proof-read our final manuscript to eliminate language problem as many as possible. All the changes were given in the marked version.

Literature Review: The literature review lacks some recent works that have also analyzed the effects of climate change and landscape change on the water cycle. Specifically, a refined search for studies using the SWAT model would reveal many works that should be mentioned in the introduction to provide a more comprehensive background.

Response: We have added some recent references in the literature review. Lines 80-93 in the revised manuscript:

Water resources management is the primary issue to be addressed for water security. Hydrological models are important tools to meet various needs in water *resource management. Hydrological model simulation is an effective method to evaluate changes in blue and green water resources. As a widely used semi-distributed parametric hydrological model, the SWAT model, which typically subdivides watershed into smaller subbasins, is increasingly used in water resources management at the watershed scale. Based on the SWAT model, researchers simulated the spatiotemporal changes in blue and green water resources in Iran (Jeyrani et al., 2021), the Yangtze River basin (Nie et al., 2023), the Poyang Lake basin (Liu et al., 2023), India (Sharma et al., 2023). Some studies have also used model simulations to analyze the effects of climate change and human activities on water resource changes in China (Liu et al., 2022), Meki River basin (Hordofa et al., 2023), and Ningxia (Wu et al., 2021), etc. However, most of the hydrological models used in the study were calibrated and validated using only observed streamflow data without checking the accuracy of other simulated water variables, which can lead to uncertainties in modeling soil moisture and evapotranspiration (Nie et al., 2023).*

Presentation of Results: The results of the calibration and validation are currently presented in the methods section. These should be moved to the results section for better coherence and logical flow of the manuscript.

Response: We have moved the results of the calibration and validation to the results section.

Scenario Definition: The definition of the three scenarios is still confusing. Please clarify how each scenario was considered and defined to ensure readers can easily understand the distinctions and implications of each scenario.

Response: We have added the definitions of the three scenarios. To distinguish the single and combined effects of land use change and climate change on the water resources of DRB, three scenarios listed below were established in this study. The land use map was fixed when simulating the influences of climate change on blue and green water (S2-S1), while climate conditions was fixed when simulating the influences of LUCC on blue and green water (S3-S2). The climate conditions and the land use were altered when assessing the joint influences of climate change and LUCC on blue and green water (S3-S1). Lines 220-227 in the revised manuscript:

Three scenarios were constructed to assess the impacts of climate change and LUCC on BW and GW by changing climate conditions (land use) while holding land use (climate conditions) for the three scenarios simulation each (Table 2). The land use map was fixed when simulating the influences of climate change on blue and green water (S2-S1), while climate conditions was fixed when simulating the influences of LUCC on blue and green water (S3-S2). The climate conditions and the land use were altered when assessing the joint influences of climate change and LUCC on blue and green water (S3-S1).

Table 2 Scenario settings for the simulation of effects of climate change and LUCC on blue and green water

Scenarios	Land use	Climate period	Combined effects	Land use change effects	Climate change effects
S1	1980	1970-1993			
S2	1980	1994-2017			S2-S1
S3	2015	1994-2017	S3-S1	S3-S2	

By addressing these concerns, the manuscript can be further evaluated and considered for publication.

References

Hordofa, A.T., Leta, O.T., Alamirew, T., Chukalla, A.D., 2023. Climate Change Impacts on Blue and Green Water of Meki River Sub-Basin. Water Resour Manage 37, 2835–2851. https://doi.org/10.1007/s11269-023-03490-4

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Nie, N., Li, T., Miao, Y., Zhang, W., Gao, H., He, H., Zhao, D., Liu, M., 2023. Asymmetry of blue and green water changes in the Yangtze river basin, China, examined by multi-water-variable calibrated SWAT model. Journal of Hydrology 625, 130099. https://doi.org/10.1016/j.jhydrol.2023.130099

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