Reply to Referee #1

Dear Reviewer

Thank you very much for your comprehensive review of our manuscript. We have endeavored to address all your comments as clearly as possible and have thoroughly revised the manuscript accordingly. Your insightful review has significantly enhanced the quality of our work. If any points remain unclear or require further clarification, we would be delighted to provide additional explanations.

On behalf of all authors, I would like to express our sincere gratitude for your rigorous and meticulous work.

Kind regards

Yang You

This manuscript develops a WSDR analytical framework based on the PLUS-InVEST model to quantify the impacts of climate change and human activities on water supply and demand patterns and their associated risks in the TRB. The study is complete and has some policy implications. However, there is significant potential to improve the words and figures. Specific questions are listed below.

Q1: The scientific issues are not clearly stated in the abstract. It is recommended that the authors focus on methodological refinement rather than the lack of research in a particular region. In terms of length, the abstract needs to be further refined. In addition, logically, whether water resources in the current drylands are in balance between supply and demand is not supported by relevant results. Therefore, it is not reasonable for the abstract to state that large-scale expansion of arable land breaks the balance between water supply and demand.

Response: We sincerely appreciate your valuable comments. After carefully considering all feedback from both reviewers, we have revised the abstract to better highlight and elaborate on the scientific questions addressed in this study. Your suggestions were crucial in enhancing the quality of the abstract. In addition to these revisions, we have further refined the logical flow of both the abstract and the manuscript as a whole.

Q2: The introduction section needs to move quickly to the topic of the study. In the current

manuscript, the first paragraph of the introduction describes the existence of a mismatch between water supply and demand, and the second paragraph describes the potential impacts of water mismatch. However, it is difficult for the reader to get through these two lengthy paragraphs to the main challenges and research questions that the article focuses on. Therefore, it is recommended that these two paragraphs be merged to provide a brief overview of the mismatch between water supply and demand and its impacts due to irrigated agriculture and climate change.

Response: We sincerely appreciate your valuable comments. In response to your suggestions and those of Reviewer 2 regarding the introduction section, we have implemented the following revisions:(1) Comprehensively revised the introduction to emphasize key information and reduce unnecessary descriptions;(2) Conducted a literature review on the impacts of irrigated agriculture and climate change on water resource supply-demand mismatches and their implications.

Q3: The manuscript focuses on water use in agriculture, but the excessive use of 'human activities' in the introduction may mislead the reader because human activities are diverse. Therefore, I suggest replacing 'human activities' with 'agricultural activities' in the third paragraph of the introduction to ensure that the introduction is centred on the impacts of climate change and agricultural activities on water resources.

Response: We sincerely appreciate your valuable suggestion. We have revised the term "human activities" to "agricultural activities" in the third paragraph of the introduction to ensure a stronger alignment with the core focus of this study.

Q4: There is a logical problem in the fourth paragraph of the introduction: the PLUS model, which is used to simulate land use, and the InVEST model, which is used to calculate ecosystem services, cannot be directly used to investigate the mechanisms by which regional water supply and demand responds to the combined effects of climate change and human activities. This may be due to a lack of logic. It is suggested to change it to 'Explore the dynamics of regional water supply and demand under climate change and irrigated agriculture'.

Response: We sincerely appreciate your valuable comment. We have revised the aforementioned sentence accordingly.

Q5: The introduction of arid zones in the fifth paragraph of the introduction is incongruous because it comes out of nowhere. The arid zone is an undeniable mismatch between water

supply and demand. The background of these studies should have been presented clearly in the first paragraph of the introduction. In addition, the literature review section, should focus on relevant studies in arid zones and incorporate the special characteristics of arid zones.

Response: We sincerely appreciate your valuable suggestion. We have revised the introduction section by moving the discussion on water supply-demand issues in arid regions to the first paragraph for greater prominence. Additionally, we have adjusted the content of this paragraph by incorporating a review of relevant studies on arid regions and explicitly highlighting the specificities of these areas to better articulate the central theme of this paper.

Q6: The methodology is sound, but the technical framework diagram of the study is so complex that it is difficult to obtain valid information. For example, the data pre-processing section could be simplified as the reader does not expect to get detailed information about the data in the diagram. Also, the section on scenario setting is too complex. It is recommended to describe the scenario preferences in one sentence. Note that the connotations of the abbreviations of the scenarios were not given before this, so please add them.

Response: We sincerely appreciate your valuable comments. In response to your suggestions, we have implemented the following revisions:(1) Modified the data preprocessing and scenario setting sections in the technical framework diagram;(2) Added the full names of the scenario settings.

Q7: Figures 3, 4, Tables 3 and 5 are redundant for the main information of the manuscript and it is suggested to move them to the supplementary material. Tables 1 and 2 could be combined. Figure 1a is missing the compass. If the figure involves abbreviations for scenarios, please add the connotations of the abbreviations in all figure titles. Please standardize the style of the north pointer.

Response: We sincerely appreciate your valuable comments. In response to your suggestions, we have implemented the following revisions:(1) Moved content beyond the main figures of the manuscript to the supplementary materials;(2) Merged Table 1 and Table 2;(3) Added a north arrow to Figure 1;(4) Thoroughly reviewed all figures and tables to include full names of scenario abbreviations where applicable, and standardized the style of north arrows throughout the manuscript. Thank you once again for your thorough and meticulous review.

Q8: The discussion section has problems similar to the introduction section. When I read through the first two paragraphs of the discussion, I had a hard time finding water-related

discourse. Most of the discourse is about land use change, urban and cropland expansion. Therefore, it is recommended to keep the first part of the discussion to water-related research contributions and model sensitivity explanations only.

Response: We sincerely appreciate your valuable comments. In response to your concerns and those of Reviewer 2 regarding the discussion section, we have revised the content of Section 4.1 by streamlining non-core statements and adding further elaboration on aspects related to water issues. Thank you once again for your constructive suggestions.

In summary, your suggestions have been invaluable to the improvement of this manuscript. We have addressed each of your comments point-by-point, and the revisions made based on your recommendations have significantly enhanced the scientific rigor and precision of our work. On behalf of all co-authors, I would like to express our deepest gratitude for your thorough and meticulous review.