

Authors' response to comments by Reviewer #2:

We thank the reviewer for the valuable comments and suggestions to improve our manuscript. Point by-point responses to the comments of are provided in the following text.

Comment: The submission entitled by 'Assessing ecosystem services under water stress in the largest inland river basin in China based on hydro-ecological modeling' is well written with clear objectives and convinced results. Current water cycle and ecosystem protection measures were simulated, and future land use change scenarios were proposed accordingly. China is on the frontline of ecosystem protection and afforestation, but according to the simulation results, the available water resources cannot support more vegetation in its largest inland river basin. Without an additional water supply, 25.9% of the existing area of natural vegetation will be degraded by 2050. After reading the manuscript, I would like to give a few comments to improve the quality of the submission.

Reply: we thank the reviewer for the positive comments on our paper. The afforestation of China has drawn worldwide attention in recent years. But now a small fraction of researchers begin to question water availability under such large-scale tree-planting actions, especially in arid regions (e.g. Loess Plateau, Tarim Basin). Our Sino-German cooperative research studied water conditions in the largest inland river basin in China. Our results clearly indicate the current unsustainable water-ecosystem nexus. Such results give warnings to local decision-making and policies. We think our results shall be interesting to certain governments, public and scientific communities. Thanks the reviewer for the kind words.

Comment: 1. Ecosystem services should be shorted as ESs instead of ESS.

Reply: indeed, ESs is the standard writing. We have revised it in the manuscript.

Comment: 2. Due to model complexity and computational time, it is very difficult for a single model to consider both hydrological processes and ESS changes. Two hydrological models (MIKE HYDRO and MODFLOW) were employed simulate hydro-ecological processes and assess ESS changes, but the theory of ESs assessment is still not clear in current version, please introduce more details about the methodology to assess ESs and include necessary references.

Reply: we agree more details about the theory of ESs assessment will improve the manuscript. The methodology mainly includes fuzzy logic, equations and expert knowledges, which are compiled by C++ programs. Such methodologies will be added in the revised manuscript, along with necessary references.

Comment: 3. How to calculated carbon storage, wind erosion control, dust control services, please introduce more details and include necessary references.

Reply: carbon storage, wind erosion control and dust control services are calculated by fuzzy logics which are formed by our expert knowledge. We will introduce more details and add relevant references in the revised manuscript.

Comment: 4. Did you do the comparison between ESs estimated by your model with previous studies?

Reply: not yet. But this is a very good point and valuable suggestion. We will make some comparison with previous studies.

Comment: 5. Did you validate the ESs estimation results?

Reply: in the last 2 weeks, we have done a preliminary validation on the ESs estimation results (on several indicators) based on collected data. The preliminary results show good agreements. We prepare to conduct a thorough validation on all the indicators.

Comment: 6. Both the MIKE HYDRO and MODFLOW models were fully calibrated and validated to precisely simulate the water cycle, but the ESs estimation results should also be validated.

Reply: we also agree that this is very important, to make our results more scientific and convincing. In the next step, we will validate the ESs results.

Comment: 7. Please declare your main objectives of this study in a clear and concise manner in Introduction Section.

Reply: the main objective of this study is to find out whether water availability is able to support afforestation and ecosystem protection in a sustainable way in the largest inland river basin in China. The assessments of ESs will help us evaluate current situations and achieve socio-economic and ecological benefits in a sustainable way. The main objectives will be added in the revised manuscript.

Comment: 8. The figures made by Excel should be replotted by other software, because they are ugly and no Y axis was clearly labeled in current version.

Reply: we agree to replot the Excel figures by other software (e.g. MATLAB), to make the figures clear and standard.

Comment: 9. Conclusions and discussion should be written in two sections, and the current discussion is still shallow, please add more in depth discussion.

Reply: we agree to separate conclusions and discussion into 2 sections. Indeed, it is very important to explain our results and add more discussion. We will include more in depth discussion in the revised manuscript.

Comment: 10. Conclusion should be declared in a concise and clear manner.

Reply: yes. As the conclusion and discussion sections would be separated, the conclusion will be revised in a concise and clear manner, to improve the manuscript.

Comment: 11. I do not think the ESs estimated by your model are reliable without validations and comparisons with previous results.

Reply: we agree. We prepare to make a thorough validation for the ESs results with collected data, and we will compare the results with previous studies in the revised manuscript.

Comment: 12. Explain more about the resources of each variables in Fig. 9, how did you get the outcome and whether they are convinced.

Reply: we will explain more about the variables in Fig.9. Cotton production, farmer's income, drifting dust control, mean species of plants, biomass production and sand mobilization control are

calculated by fuzzy logic and equations. The standard methods were improved by our expert knowledges. More details and references would be added in the revised manuscript.

**Comment: 13.** It is a big challenge to include all the things in one or two models, so how to combine ESs and hydrological process is still a big question that should be replied in your study, and more work is needed.

**Reply:** we agree. It is a big challenge to combine hydrological models with ESs outputs. This is an innovative part of our study. We used fuzzy logic, equations and expert knowledge, and complied them with C++ programs. We will add more details in the manuscript in this regard, and an ESs validation process will be performed.

**Comment: 14.** Section three should be results and discussions.

**Reply:** we also think it's better to make section 3 results and discussions. We are truly very grateful for the reviewer's comments that will help us largely improve the quality of our manuscript.