Hydrology and Earth System Sciences Discussions

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Comment on hess-2021-68

Anonymous Referee #1

Referee comment on "Identifying the dynamic evolution and feedback process of water resources nexus system considering socioeconomic development, ecological protection, and food security: A practical tool for sustainable water use" by Yaogeng Tan et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-68-RC1, 2021

Title: Modeling the integrated framework of water resources system considering socioeconomic development, ecological protection, and food production: A practical tool for sustainable water uses

Authors: Yaogeng Tan et al

Overall recommendation for this paper: reconsider after moderate revision

General:

This paper gives the dynamic evolution and feedback process of the water resources nexus system considering three parts: socio-economic development, ecological protection, and food safety, and applied it in a real case study in Guijiang River Basin. The results have demonstrated the feedback linkages and coevolution process dynamically and give a strong reference for water resources management communities. Although the method and idea are reasonable and the result is abundant, there are still some points that should be put emphasis to improve the quality of the paper.

Specific:

1. There is a little bit of a poor connection between the first two paragraphs. The first paragraph discloses the background of the paper while the second paragraph outlines the main methods to solve the problem of water resources systems. From the perspective of

the entire content of both paragraphs, the first paragraph implies the complexity of the water resources system that is reflected by multiple water uses while the second paragraph implies how to solve this problem. But the first sentence of the second paragraph (L48-50) is a little bit confusing and should tell the readers why "optimal algorithms", "decision support system", "MCDA" (or SAA) are suitable for tackling "water resource problems facing multiple water users". The general sentence that describes the characteristics of the water resources system (e.g. multiple water uses) is needed at the beginning of the second paragraph to connect the logic and then "SAA" is used to solve the problem. The details are marked in the preprint that is uploaded in the supplement.

2. One or two sentences that further describes the optimal approach should be added in Line 59 to better connect the former (complexity of water resources system) and latter (disadvantages of optimal approach) information. I do know the optimal approach is the most effective approach to deal with the water management problems, but from the perspective of English language expression and rhetoric, the combination of optimal approach and water resources system should be added in Line 59 because the title includes "water resources system". Actually, as the author rightly mentioned in Line 40-41, water resources system "is susceptible to the influence of external conditions". From the system perspective, external conditions are influencing the status and performance of a certain system and is able to stimulate both the entire system and its each agent to adjust and strengthen themselves to better adapt to the external changes, which can be explained by "complex adaptive system" theory (See Holland, 1995). Optimal approach can describe and quantify such an adaptive process.

3. L67: There is lack of characteristics of nexus system, and should be described in two or three sentences. For example, its classification, their components, and feedback mechanism, etc. See Zhang et al.

4. The novelty and characteristics are not purely extracted and the relevant language should be more concisely. For example, in line 100-104, the authors should describe the effects and advantages of the method that couples SD and optimal model, instead of just saying "identify the coevolution process and dynamic interactions". Actually, optimal model can give a water allocation scheme in an optimal way but cannot simulate the dynamic process precisely. If coupling it with SD, accurate coordination among different water users can be realized under the dynamic interactions of water resource nexus system, and further improves its reliability.

5. Section 2.1 is the crucial part of the entire paper and should tell the readers why coupling SD and optimal models are applicable. It is necessary to start from the expression of the interaction of external changes on the nexus system and the advantages (see point 4) of both models to describe the reason why coupling SD and optimal models are needed.

6. In section 2.2.4, Line 220-223 and 229-232, it is not clear what the meaning of the symbol "+" and "-" is. I guess it represents increase and decrease. But in the following figures (Figs. 3 and 4) the "+" and "-" denotes the positive and negative feedback linkage.

Are increase/decrease and positive/negative the same thing? If not, please note the meaning of "+" and "-" in lines 220-223 and 229-232, otherwise, it is confusing.

7. Fig 1 outlines the coupling framework of the SD and optimal model, but the internal relationship is not so clear from this figure. That is, the optimal model should be based on the certain interaction simulated by SD model. I guess it is the negative feedback loop that drives the optimal model (as the authors mentioned in Line 625-626), but it still needs to make clear in the Methodology section. Also, consider add it in the abstract if necessary. (Because for readers, they may read the abstract and methodology instead of results & discussion)

8. In conclusion, some expressions of the English language are not so precise, and please see my marked versions in the supplement.

Technical comments:

1. Unify the terms of the entire paper. For example "nexus system", "complex system" (L735, L739). Are they the same thing? If yes, please unify them. Another case "food safety" and "food security"; "crop yield", "crop production", "food production". Different terms make the paper ambiguous, also they are (or exactly are) representing the same thing. (See my comment in Line 20)

2. Title: This paper is about the dynamic process and feedback linkage of a nexus system. I suggest the title should include that. See the marked version in the supplement.

3. Fig. 11: The x-axis should be from 2021 to 2045?

4. Samely Table 5: Why the year in this table is 2016, 2020, 2030, 2040? Typing error or what? It is not consistent with other figures or tables.

5: Line 500: should be sections 5.2 and 5.3?

6. Other technical comments are list in the supplement.

References:

Holland J.H. Complex Adaptive System[M]. Reading Addison Wesley, 1995.

Holland J. H. Hidden Order: How adaptation builds complexity[M]. Perseus Books, 1995.

Zhang C., Chen C., Li Y., Ding W., Fu G.: Water-energy-food nexus: Concepts, questions and methodologies. J Clean Prod. 195: 625-639, 2018.

Please also note the supplement to this comment:
https://hess.copernicus.org/preprints/hess-2021-68/hess-2021-68-RC1-supplement.pdf