

Hydrol. Earth Syst. Sci. Discuss., referee comment RC3
<https://doi.org/10.5194/hess-2021-68-RC3>, 2021
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Review comments on hess-2021-68

Anonymous Referee #3

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-RC3>, 2021

This paper presented a very interesting study on the nexus system of water resources and applied it in the case study of UGRB. It comprises a relatively detailed mechanism of dynamic interaction and feedback loops across socio-economy, ecological protection, and food safety by incorporating the SD model and optimal model. The paper also makes the initial analysis of the model's uncertainty and robustness which helps improve the reliability of the nexus system.

I greatly agree with another two referees that this is a well-written, solid manuscript and keeps pace with the state-of-the-art approaches of the scientific problems of hydrology & water resources, and also well fit the scope of HESS communities. I recommend the editor accept this paper after some minor revisions, as noted below:

1. The naming scheme of the "SEF" nexus, which also noted socioeconomic, ecology, and food, has no core basis. After all, our subject (or academic discipline) is hydrology & water resources. I do know water resources is one of the key support of these three items but, from the perspective of "nexus" naming, water should be included in the nexus terminology (or jargon), that is, water-socioeconomy-ecology-food nexus (WSEF nexus). Or it will be confusing.

2. Section 2.4 (start with L399): evaluation index system seems to be widely used in other studies and not specific. I don't know the difference when the same evaluation system is used in other studies because it's also suitable in other studies. So, how can the indicator evaluation system represent the sustainable development of a nexus system? (I don't know if my understanding is right, just my personal view.)

3. The paper lacks the calibration and validation part. Conceptual models should be

calibrated and validated before using and simulating in a real case study. Please add such analysis (even the result).

4. The nexus system used in this paper is a case study of the humid region of south China but lacks universality analysis, that is, is the model only suitable for the humid region or all-region? Are dry regions also suitable?

5. Results: Section 4.2.3: socioeconomy-food response linkage. It seems that carrying population/GDP is in direct proportion to crop yield from this paper. But in real cases, the relationship between crop production and carrying population is not as simple as a linear relation. Their relations are really complex and cannot simply be analyzed from a quantified trend. See Lyu et al., 2020.

For points 4 and 5, they are the main research limitations of this study. And such limitations should be acknowledged if this paper is finally accepted. But generally, this paper is good with an interesting topic.

Technical:

L32: agricultural water uses have nothing to do with rainfall, it should be a "process of agricultural water demand". As authors rightly said in Section 2.2.3, food production is greatly related to W_p (Crop water demand, see Eq.9), which substantially related to ET_0 , instead of rainfall.

L43: Add "However," before "the dynamic interactions....." to connect the logic. These two sentences have an adversative relation.

References:

Lyu H, Dong Z, Pande S. Interlinkages between human agency, water use efficiency and sustainable food production. *Journal of Hydrology*, 2020, 582: 124524.