

We appreciate the reviewers' time and effort in reviewing our paper. We believe that these comments will improve the paper. This document contains copies of all the comments of the Reviewers (in blue text) and our responses to them (in black text).

## **Response to Reviewer 2:**

This paper investigated the main factors in the riparian countries' willingness to cooperate in the Eastern Nile River Basin, involving Ethiopia, Sudan, and Egypt, from 1983 to 2016. A quantitative model of the willingness to cooperate at the national and river basin scales. was developed. It was found that relative political stability and foreign direct investment can explain Ethiopia's decreasing willingness to cooperate between 2009 and 2016.

Several key points for improvement of this manuscript:

R2.1. Since 2012 even earlier, the socio-hydrological community has developed a lot of socio-hydrological models to simulate various emergent human-water phenomena. Recently, on the same issue, the socio-hydrological models on conflict and cooperation either conceptually or empirically have been published. I do not understand the authors can ignore them. This leads to another concern: What is New in this manuscript?

Thank you for raising this issue. In the revised manuscript, we will strengthen the literature review on socio-hydrology, including those published regarding the conflict and cooperation phenomenon (e.g., Lu et al., (2021)). According to our response to the first reviewer (R1.1), we believe that quantifying the dynamics of cooperation value with both socio-political and hydrological factors has been elusive in the literature of conflict and cooperation studies, including socio-hydrological research. In fact, the contribution of this study is to quantify riparian countries' willingness to cooperate as well as basin cooperation over time after investigating the important socio-political and hydrological factors in the Eastern Nile River Basin using causal feedback.

R2.2. The conceptualization model should appear in the beginning of Section Methods. Otherwise, the readers could not understand what you talked about.

We regret that the current method section has led to confusion. We do believe that we need to identify and introduce all variables before explaining their causal relationship. However, to address your valid concern, we will add a description at the beginning of the method section to explain the big picture of this study and the overall methodology.

R2.4. More theoretical evidence should be given to justify your selection on those societal variables.

Lines 83-133 suggested the most important socio-political and hydrological factors in conflict and cooperation dynamics in the Eastern Nile Basin (ENB) in a qualitative manner. These factors were taken into account in the following section (3.1 variables). Section 3.1 provides a detailed

explanation of each social variable with theoretical evidence. This selection was supported by both local studies and general literature of transboundary rivers. However, we will add more references to address your concern.

R2.5. Should have more direction discussion/comparison on your simulated C&C and those from independent sources. I am shocked by the manuscript does not have a discussion/implication section. After you present your results. SO WHAT?

The result section provides an explanation of the dynamics of cooperation in the ENB, supported by local studies in the basin. In fact, each country's simulated willingness to cooperate was compared to independent qualitative sources. Also, there are some implications in the middle of the discussion (e.g., lines 471-473 provide the implication of the sensitivity analysis). However, to address your concern, we will strive to add more implications in the section without increasing the paper length significantly, as it is already lengthy. We regret that the take-home message is not as clear as we thought. We will also improve the conclusion section to clarify the take-home message.