Comment on hess-2021-300

Anonymous Referee #2

Referee comment on "Physical controls and a priori estimation of raising land surface elevation across the southwestern Bangladesh delta using Tidal River Management" by Md Feroz Islam et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-300-RC2, 2021

The authors present an interesting and comprehensive investigation of the physical controls of landscape changes in terms of elevation gain using Tidal River Management (TRM). The authors used a two-dimensional (2D) morphodynamic modeling to explore the sediment deposition in the beels during TRM. In addition, non-linear regression models were developed to analyze the relationship with the selected variables. Overall, the paper attempts to explore the physical controls of five variables: 1) river tidal range, 2) river suspended sediment concentration, 3) inundation depth, 4) width of the inlet, and 5) surface area of the beel. Though the method in itself is not novel, the technique is scalable. Exploring the sensitivity of adding additional variables or removing some of the chosen variables would be better.

The research deserves publication and outreach. However, there are many locations where revisions and modifications are needed. Therefore, I compiled a list including recommendations and questions to the authors.

Overall:

The manuscript is well written and focused on five major variables. I have concerns that are they enough? The relative elevation difference between riverbeds at the inlet and average height of selected beel, river slope, and others may be important variables.

Another concern is that whether the calibrated model for a particular beel is scalable to the entire domain.

Maybe authors can explore the viability of TRM supported by dredging and excavation in future work. Also, since the TRM is participatory, please try to incorporate some social-economic indicators.

Abstract:

The first three sentences of the abstract are not well connected to the storyline of the paper. Therefore, I recommend the authors team to re-write them, showing the significance of the study.

Is it true that the potential of the TRM application is yet to be determined? I could see the paper has cited Adnan et al. (2020), which explored the potential of TRM for 234 beels using different variables. However, it would be better to write in abstract that the potential of TRM remains to be explored, considering several sensitive parameters.

Line 12 – 13: The potential of TRM application in different beels across southwestern Bangladesh, however, still remains to be determined.

Line 24 – 26: I believe the streamflow would be high from the upstream during the monsoon. And also, the sediment transport from the upstream would be substantial. So how effective would it be to operate the TRM during the monsoon season? I assume the TRM process takes full advantage of tidal flow from the sea in bringing the sediment deposited into the selected beel. And for the effective operation of the TRM, minimum upstream flow is recommended. Therefore, how challenging would it be to manage the upstream flow during the monsoon season?

Introduction:

Are five variables enough? Are any variables proposed by Adnan et al. (2020) important to be included, as additional physical controls?

In terms of inlet width (IW), the initial IW slowly enlarged along with the operation of the TRM, as every day, two tides pass in and out. Also, the surface area of beel (BA) is often not fully used if the BA is large enough with respect to an available tidal prism. Meaning they are interdependent to a large extent. It is generally expected that the higher tidal range and suspended sediment concentration (SSC) lead to higher deposition.

How will be the effect of saline sediment is deposited on the selected beel? Do we need to consider the quantification of salinity?

Methods

Is the modeling approach calibrated for Pakhimar Beel applicable and scalable to entire southwestern Bangladesh?

The operation and completion of TRM on adjacent beel play an important role in the sedimentation of current ongoing TRM-operated beel. Because the successful operation of one TRM would decrease the river profile considerably. I could see the paper has cited Talchabhadel et al. (2020). How will you consider such a dynamic effect on sedimentation?

Results

Are there any calibrations of beel sedimentation and river bed changes on seasonal levels (monsoon and nonmonsoon) with ground-based observations?

I believe the streamflow would be high from the upstream during the monsoon. And also, the sediment transport from the upstream would be substantial. So how effective would it be to operate the TRM during the monsoon season? I assume the TRM process takes full advantage of tidal flow from the sea in bringing the sediment deposited into the selected beel. And for the effective operation of the TRM, minimum upstream flow is recommended. Therefore, how challenging would it be to manage the upstream flow during the monsoon season?

Table 3: I think IW (inlet width) and beel area (BA) will be throughout constant for a particular beel, whereas other varies temporally. How did you analyze the Pearson coefficient? Also, why are tidal range (TR) and Inundation depth (ID) negatively correlated?

Discussion

Overall, discussion on the calibrated model on one particular beel to the whole study domain is insufficient. It would be better to highlight some of the results on earlier TRM-operated beels like Khuksia, Bhaina, Kedaria, etc.

Also, it is not clear to me that the number of inlets in all selected over 200 beels on the whole domain. For instance, the operated East Kapalia had one opening at first and two openings later; the closing of these inlets were also at different times.

Also, 6.4 million in Beel Bhaina and 8.2 million in Khuksia are at different years of operation. I guess Bhaina was operated for four years, whereas Khuksia for about seven years. Similarly, Kedaria was operated without embankment breach but using over 20 vents. In addition, Bhaina had no peripheral embankment for the selected beel area, whereas kedaria and khuksia had peripheral embankments. Meaning, the earlier deposition data of operated TRMs had different operation policies and infrastructures and different tidal prisms.

Under different RCPs, it is not only expected to change the relative sea level rise (RSLR) but also many hydroclimatic parameters will change, like precipitation pattern. How would these affect streamflow, river sedimentation, and overall sediment transport?

Conclusion:

Make conclusion concise and focus on reducing the redundant information.

Line 507 -508: It is sudden that the paper talks on socio-economic aspects in conclusion. I could not see sufficient discussion prior in any sections.

Line 509: same as above for rotation scheme

Minor:

Line 34: full form of RCP at first occurrence. [Please check other acronyms thoroughly]

I found acronyms are provided with full form again and again. So it would be good to use

them effectively.