

## ***Interactive comment on “Interacting effects of land-use change, natural hazards and climate change on rice agriculture in Vietnam” by Kai Wan Yuen et al.***

### **Anonymous Referee #1**

Received and published: 9 August 2020

Dear Dr Gain,

Thank you for the opportunity to review the paper titled “Interacting effects of land-use change, natural hazards and climate change on rice agriculture in Vietnam” (Manuscript Number: nhess-2020-196) by Kai Wan Yuen and colleagues.

The work submitted covers a subject matter that is relevant for NHESS.

The paper certainly has potential and is interesting to read. At present there are several issues that need to be addressed. Most should be relatively straightforward to resolve. If these can be addressed through revisions, then the paper will provide a valuable study on two important deltas in Asia, both of which are vulnerable to natural

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degradation and anthropogenic impacts.

My overall general criticisms are:

1. That more information/data/evidence is needed in support of the factors and processes that might impact rice cultivation on the two deltas investigated. At present there is mention of salt intrusion, erosion, sediment extraction, deltaic subsidence, fluvial sediment capture by dams, contamination, loss of soil quality, sea-level rise and increasing frequency/intensity of hazards. All of these are no doubt important for the long term sustainability of the MRD and RRD. But at the moment various statements by the authors about the relative importance of these processes need better grounding. There needs to be inclusion of published data where available, in order to help firm up the main arguments in the discussion. I fully understand that the overarching aim of the paper is to enable visualisation on how all the various influences are connected. But additional data from the literature are nonetheless still needed for proper substantiation.
2. Many minor grammatical errors need correcting throughout the manuscript.
3. Figures 2 and 3 need rethinking and should be improved.

Specific comments and recommendations are listed as below. These are in order as they appear in the manuscript. I trust that the authors will not feel these are unnecessarily critical, but are offered in the spirit of improving the paper for eventual publication.

### **ABSTRACT**

L10. The authors use the term ‘mega-deltas’. What does mega-delta mean? This term needs to be defined early on somewhere in the body of the paper.

L12. Remove ‘happening’.

L20. Change ‘development’ to ‘growth’ to avoid repeating ‘development’ in the sentence.

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L21. Use a comma before 'which' or change to 'that'. This error needs correcting throughout the entire manuscript.

L24. Hyphenate 'systems thinking' because this is used as an adjectival phrase, i.e. say 'a systems-thinking approach'. Do this similarly throughout the manuscript.

## INTRODUCTION

L44. Some references are needed here. The following paper and book chapter might be helpful:

'The 'terrific Tongking typhoon' of October 1881 – implications for the Red River Delta (northern Vietnam) in modern times.' Weather, 2012, 67: 72–75. [This gives an example of the severe effect of a typhoon on the rice harvest on the RRD.]

'Impacts of climate change. Challenges of flooding in coastal East Asia.' In: The Routledge Handbook of Environment and Society in Asia. P.G. Harris and G. Lang (Eds), Routledge, Oxford, pp.367–383. Chan, F.K.S., et al. 2015. [Mentions problems of flooding on the RRD and MRD, as well as other deltas in Asia.]

L56. A reference is needed here in support of this statement.

L59. Remove 'related development' (unnecessary text).

L59. Remove 'of'.

L59-62. How can 'coastal dikes ..... lead to a reduction in sediment and water availability...'? This misleading sentence needs rewriting.

L77. Is the mention of 'wicked' problems helpful? What does this even mean? This either needs explaining or omitting.

## METHODS

L96. If the area of the MRD is 4 million ha, then how can the area of rice planted on the delta be 4.2 million ha? This is not possible, unless the authors are adding together

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the areas of subsequent plantings during the year. Please explain or correct.

L101. Is the RRD 'floodplain' area the same as the delta area? Please give the delta area to be consistent with the description of the MRD above.

L107. Thick 'Quaternary accumulation' of what? Sand, silt or clay? Please briefly give more information on the character of the deltaic sediments.

L109. Remove 'slight'.

L110. Be more careful with grammar. The text should read '...the MRD has [not have] .... while the RRD has [not have] a temperature of ...'. This type of error crops up many times throughout the manuscript, e.g. L118, L124, L124. Please ask a native English speaker to check the manuscript carefully for corrections.

L112. Request including climographs for the two deltas, so the reader can more easily understand the annual climatic cycles. Then mark on the graphs the planting, growing and harvesting times of the different rice crops.

L118. Please correct grammar.

L223. Please correct grammar.

L124. Please correct grammar.

L134. Change '...a major rice producing region' to '...major rice producing regions'.

L151. Change 'describe' to 'describes'.

## RESULTS

L193. The authors make a sweeping statement but without supporting data. What is the 'extent of saltwater intrusion'? Is it possible to include a map here to show how saltwater intrusion has been extending into the delta over time?

L196. Where does the arsenic contamination come from? Anthropogenic sources? The authors need to explain otherwise the readers are left guessing.

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L203. How much sand mining is occurring? Is it for the construction of dikes? Again, some supporting data are needed.

L204. Again, another sweeping statement about the 'substantial reduction in sediment', but without any supporting data. Please substantiate better.

L204. How much 'land subsidence' has occurred, and over what period? Give rates if available.

With all of the above, if the authors wish to include saltwater intrusion, sand mining, sediment reduction and land subsidence in their Results section, then some additional supporting data are needed.

L225. This statement is wrong. Thermal expansion of seawater does not accelerate the melting of icecaps! Needs rewriting.

L234. The authors mention that the coastline is eroding at a rate of 5 to 10 mm/year. This rate seems far too low. A 0.5 cm rate of coastal retreat per year (0.5 m per century) is insignificant and suggests that the RRD and MRD have nothing to worry about. For comparison, Thailand's Chao Phraya delta front has experienced several km of shoreline retreat over recent decades. Please check the data.

L244. Change text to '...are affected by...' (similar use of plural also needed elsewhere).

L245. What is the local rate of SLR along the coast of Vietnam or in the wider western South China Sea?

L246. Please give some information on the groundwater salinity thresholds for rice cultivation.

L258. Please correct grammar. Look out for similar errors elsewhere through the document.

L266. Please rephrase this sentence.

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L272. This contradicts what was said in L118. In other words, what about the irrigation canals mentioned earlier in the paper? Aren't these used for rice irrigation in the absence of sufficient rainfall?

L273. Please correct grammar. Look out for similar errors elsewhere through the document.

L280. What is Cyrtorhinus? An insect, snake, bird, mammal? Please give the English name of this predator.

## DISCUSSION

L301. Please correct grammar.

L302. Please correct grammar.

L307. The authors have not provided any information on typhoon and drought frequencies experienced on the two deltas. Please give supporting information earlier in the paper.

L313. '...high arsenic concentrations...likely due to geogenic conditions'. Please elaborate.

L327. Please correct grammar.

L338. Please correct grammar.

L353. Please correct grammar.

L356. Change 'practice' [noun] to 'practise' [verb].

L364. Please correct grammar.

L371. Please correct grammar.

L386. Please correct grammar.

L386. Please correct grammar (later in the sentence).

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## CONCLUSIONS

L391. Use 'Conclusions'.

L411. Please correct grammar.

L414. Needs rephrasing. Do you mean 'supporting large populations'? [the deltas support large populations – the populations do not support the deltas].

## REFERENCES

L521. Reference is in the wrong place.

## FIGURES

Figure 1. A cardinal sin has been committed with the maps! Never use a word scale. '1 cm = 58 km' will be incorrect if the published version of the map is not exactly the same size as the original. In fact, the scales must be wrong already as the three maps shown cannot all have the same scale. Use a scale bar instead on each map. These will be correct whatever size the maps are viewed or printed.

Figure 1. Increase the size of the long/lat text. Too small to read.

Figure 1. Label the countries.

Figure 1. L760-764. Unnecessary repetition. The long list of provinces is not needed, as they are already shown on the map.

Figure 2. Strictly speaking, it is incorrect to call this a causal loop diagram as claimed, because 'rice yield', 'rice growing area' and 'rice quality' do not loop back to affect the initial two sets of drivers (anthropogenic impacts and natural hazards). Instead, this is an example of a flow diagram, with distinct start and end positions.

Figure 2. I am not convinced that the existing figure will be as useful to policy makers as claimed by the authors in the paper. At present the layout is confusing and rather difficult to digest. I believe it could be improved with some rethinking. I suggest at least

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the following:

Use 'Anthropogenic Drivers' and 'Natural Hazard Drivers' as column headings at the top of the figure. Keep the three important outcomes (rice yield, rice growing area and rice quality) in a separate final row at the bottom of the figure.

Figure 2. Several other points:

Typhoon wind speed affects storm surge. The direct link is missing. Does flooding refer to river (freshwater) flooding or sea (saltwater) flooding? These need to be separated out somehow as they can both have major but different consequences, positive (e.g. fertile silt input, salt flushing) or negative (killing of standing crops, salt contamination of soil). Saltwater flooding needs to be linked to saltwater intrusion. Drought affects salt intrusion. The link is missing. Drought affects rice quality directly. The link is missing. Doesn't the flow diagram need an 'erosion' box similar to Figure 3? Natural hazards such as typhoons and anthropogenic impacts (e.g. sediment starvation mentioned in the paper) will have consequences for both coastal erosion and river channel erosion. This needs further clarity.

Figure 3. Again, as with Fig.2, this is not strictly speaking a causal loop diagram, because 'rice yield' and 'rice growing area' do not loop back to the head of the figure to affect 'climate change'. This is a flow diagram.

Figure 3. To improve clarity, keep the outcomes of rice yield and rice growing area in a separate row at the bottom of the figure.

Figure 2. Several other points:

Typhoon wind speed affects storm surge height. The direct link is missing. Surely pests and disease affect rice yield? The direct link is missing. Does the 'erosion' box refer to coastal erosion (shoreline retreat) or river channel erosion? This needs further consideration.

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