Natural Hazards
and Earth System
Sciences
Discussions

Interactive comment on "Impacts of the emergency operation of the South-to-North Water Diversion Project's eastern route on flooding and drainage in the water-receiving area: An empirical case from China" *by* Kun Wang et al.

Siebert (Referee)

christian.siebert@ufz.de

Received and published: 28 November 2018

The authors present an interesting study on the effects of a giant water diversion system, installed in China to transfer water from Yangtze River to provinces/regions further in the north, e.g., water scarce Shandong Peninsula. Due to the continuous water shortage in the receiving areas, the channel is operating continuously, though there are considerable amounts of rainfall along the way. The study explains, how local weather phenomenon interacts with an almost transcontinental water diversion scheme. Since it is not my primary field of research, it is difficult to evaluate whether the presented

study reveals some new concepts, tools or methods. However, the scientific methodology and input data are valid, the scenario selection is relevant and fits the requirements of the study. And finally, the authors reach substantial conclusions and clearly show the hazard of a water transfer project like the SNWDP.

However, the manuscript is generally and particularly in the introduction part weak in English. Not only, but seriously influenced by that comes the second, much larger weakness. The presentation of the general setting and conditions of the study, the problem and why certain technical/hydraulic activities are done to manage/control water flow to, within and out of the Nansi Basin are not clearly described. The introduction is immature and also the presentation of the scenarios must be seriously improved. Particularly the wording is difficult, but also the description of figures lacks sufficient details. A lot of (at least to me) unknown technical phrases are used instead of international terminology. The figures have to be improved to meet journal requirements (e.g. include numbering of each figure, descriptions must be improved to allow understanding of each figure by itself). Finally, I strongly suggest to involve a native speaker. Doing so, the manuscript will surely meet the journal's requirements to be published in NHESS.

In addition to my general comments some specific in the following:

Introduction. The introduction is written in a way, that one can follow the author's arguments only, if one has already considerable knowledge about the ER-SNWDP. Too many things are just mentioned and terms are not described in a sufficient way. In particular, the following issues are difficult and not understandable:

Page 1 L15: What is a waterlogging simulation and wouldn't be flood simulation the better term? Which interactions are meant? L28: a map showing the most important geographical places, including contour lines and information about elevations would be required. Furthermore, some climatic characterisations (annual rainfall as colour-code) would help understanding the general conditions. L29: development of what?

L30: which lake and what does the lakeside area mean? It is somehow indicated in Fig. 1, but what are the borders, how are they defined, etc. L31: what does "blocking of the rising lake level" means and what are subsequent "waterlogging disasters"? The entire process chain is not clear to me. L34: There is no reason to distrust the publication of Webber et al., however, aren't there better information about intended water volumes from official authorities/reports, etc.? L34: what is the "water diversion period"? L35: does the project stops and runs in intervals? And why is it obvious, that water tables rise? If water is consumed the same amounts as brought into the basins, nothing happens. The operational scheme does not become clear. L37: what is "emergency water diversion"? I can imagine the possible meaning, but it has to be clarified. Why did water supply occurred sung flood period? L38: The sentence: "Furthermore, considering the rigid demand for water resources caused by rapid economic and social development, extreme hydrological events caused by environment changes have increased along the ER-SNWDP." is unclear.

Page 2 L3-6: Please rephrase the sentence the way you split it at least into 2-3. In the current version and with the amounts of questions, which rose at the passage before, the reason to do these simulations is still not clear. L6: which situation? L7-8: if there are studies, why is there a gap in the literature? L12: again, which gap? L14: why is it an important storage node? This is important to state. L15: again, the authors base on preliminary knowledge: it is not introduced, that the lake is separated into 2 halves by a dam. How can one know about the upper and the lower lake since the lake is just mentioned as the Nansi Lake. L17: what is the phenomenon, where explained, etc. L17-L19: I have difficulties to follow the argumentation, too many things are written in a row without making it clear. L20: as far as I understood, NLB is a flow-through basin, where water tables are fluctuating due to natural floods and droughts and additionally due to water pumped into the basin, which will be pumped out as it comes in. Why is it a water receiving area? L21: what are "structures under water diversion"? L34: what is "the world's annual water intake"? The world's water budget is closed.

Page 3 L24-26: please explain that corresponding effects by using the correct hydrological terminology. L30: what is the "disaster risk", which exact disaster(s) is/are meant?

Page 4: L5: why "land"? L15: the elevation is in respect to what: main sea level? L16: please explain slope in degrees. L20: please explain what you mean by: "waterlogging in lakeside areas can no longer directly drain into rivers and lakes" and how does it work: "The waterlogging water is primarily carried into rivers and NL by pumping stations in the lakeside area." L22: What does it mean the rainfall is concentrated? How high is the rate?

Page 5 Fig. 1: Please add (a), (b) and (c) to the single figures, as it is usual. In the upper right map: why is China's SE not continuously bordered? What does the inset map express and why is the international border southwards dashed? In the upper left map: please name the rivers In the lower map: please indicate the location of the dam, Description of Fig. 5: delete "The logo of Copernicus publications"

L4: what is Yangzhou? L5-8: please indicate the location of sluices and dams in Fig. 1, otherwise it is impossible to follow L8: what is the 1st phase, how is it defined, when does it end, etc. L8: what is the Liangji River mouth, 24.6 km up- or downstream? L9: "project operation": during which phase? Water table in respect to mean sea level?

Page 6: L1-3: "project operation": during which phase? Water table in respect to mean sea level? L9: river channel bathymetry of which river? L11: please indicate the location of rainfall stations in map of Fig. 1 L13: please indicate the location of water level recording stations in Fig. 1 L17: what are "hydraulic engineering data"?

Page7 Fig. 2: where is MIKE FLOOD integrated into the workflow? L8-9: Equations are usually cited in the text.

Page 8 L5: again, elevation reference is missing L6 1000 pump stations are situated in the lakeside area, are they taking water out of the lake or from the rivers? L18-19:

Equations should be cited in the text. L32: where is the model area and how was it chosen? L32: If I understand it right, lakeside area is outlined by the 36.79 m contour line. How was that contour line derived? Does the DEM resolve elevation in 1cm steps? Above, it is given; the area given by that contour line has an area of 3969 km2, now it is 4750 km2 large, which is almost $\frac{1}{4}$ larger. L35-36: why only 5 out of the 7 stations?

Page9 L1-6: The entire passage is not clear, particularly due to the use of unusual terms like "into-lake river". L16: I do not understand, why the Lake receives a roughness coefficient?

Page 10 L10: loss of what? L10: The information concerning the locations of the stations is missing to follow argumentation L18: not the paper, but the study, please change. L19: please explain "ecological water" and what is the "emergency transfer" L22: I assume the "emergency transfer" follows some kind of a pre-set protocoll, which means, it must be possible to request its starting and ending time from the SNWDP operating authorities. L22: rainfall where and why does the diversion now only affects NL? L25: in line 22 it is stated emergency diversion ended, here you state it continues... L26: what is the flood season, is it somehow restricted?

Page 11: L1-2: what is "the situation"? L4: what is "this condition"?

Unfortunately, the entire paragraph is not very clear. To me it stays unclear, when wis which scenario calculated and why (due to which conditions). It is a general difficulty in the entire paper. Due to unclear terminology, even headlines like 5.2 are not clear and it is impossible to follow the argumentation.

Page 12 L1-2 I don't understand the difference between scenarios 1 and 2, different initial water tables? If yes, what was the water table of Scenario 1? Table 2 is not clear, please re-organize it and give exact numbers L4-7: Here, for the first time, the reason for the study is clearly described and one can follow the intention of the authors. This should be integrated into the introduction, of course in a different way, but that's the reason for the study, I guess. L4-7: indicate the scenario number behind each

C5

pre-condition and refer to table 2 directly, not at the next paragraph. L8: prevent one-sentence paragraphs.

L10: why are areas of 0.1 and 0.5 considered? L20: 0.99% of what? L25: EASTERN portion of the lake is mountainous... L26: the interaction is either given or not. There is no option to interact larger or less. Please describe what you want to say differently: e.g. The influence of...results in increased... L36: compared to what, scenario 1? Please describe sharply and refer to fig. 6.

Page 13 L6-7: please check, which one is correct: Figure 7 a and b or the reference in the text, in the moment it is switched. Fig. 7: Please explain a and b in Figure description L9-11: again, please be very clear in describing the effects of with/without active diversion. L18: in Fig. 8a it doe not look like 36 hours, more like 31 hours. Wrong figure? L20-25: please use some different descriptions for time: 30th hour is very uncommon and "e36 hours" is unclear to me. L25 reference is wrong, it is fig. 8c

Page 14: Fig. 8: please explain a, b, c in the figure description.