Journal: NHESS
Title: **Assessing Chinese flood protection and its social divergence**
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The objective of the paper is to develop and validates a Flood Protection Level (FPL) dataset for China, which is based on current Chinese policy on FPLs. Accordingly, base data and methodologies for its development are first discussed, and then results are critically analysed.
Although the paper does not represent any significant improvement in research, it supplies relevant information for flood risk management in one of the biggest and most flood prone area of the world; and thus, it can be of interest for the journal audience.

The paper is generally well written and organised; data, methods and results are quite well explained. However, before results can be published, shared and made available to the research community, I think that some conceptual aspects deserve more attention and clarification.

General comments

1.   The FPL generated by the dataset is a theoretical one (i.e. designed based) and not the real one. This must be very clear since the beginning of the paper and not marginally discussed at the end. Accordingly, authors should stress since the beginning why this information is useful, how it can be used for risk management, e.g. as a proxy of the flood risk in an area?
2.   With respect to the last point, the second research question could then be changed in: Is FPL representative of the real risk in the area or its definition/evaluation should be changed? In fact, the present second research question (i.e. does the FPL policy take into account relevant demographics of the exposed population, such as elders and children who are known to be most vulnerable to floods?) is not clear at this point of the paper (i.e. why exactly this question?) as it is too much linked to an evidence that comes out only at the end of the manuscript
3.   The validation process is very weak, so I do not agree with authors that theoretical FPL agrees with real one very well (see section 4.3). The validation process was carried out only for 51 (about 2%) out of 2237 counties and a match was observed only for 66.7% of the counties (abut 1,5%). This has important implication on the use of results (see comment 1)
4.   The calculation of FPL is based on the assumption that the exposed area coincides with the 100 years return period flooded area. As this critically affects the estimation of FPL, authors should explain the reasons of this assumption. Moreover, how such an area was derived? does the modelling consider or not the existence of flood protections? What this implies?

Minor comments

Section 1: Introduction

Pg. 1 line 21 "With the emergence of large-scale flood models, the necessity to quantify FPLs has increased in recent years" → the cause-effect relation is not clear to me, could authors comment more on this?

Pg. 1 line 27 → what "improved FPLs" means?

Pg. 2 line 37 "China is one of the countries that experience the most serious floods and the fastest urbanization. Each year between 1990 and 2017, floods in China affected 149 million people, led to 2165 deaths, and caused an economic damage of US$ 34 billion" → I guess these figures refer to average data

Section 2

Pg. 4 line 85 "It originally has a spatial resolution of 100 m and is aggregated to a 1 km resolution to match the flood depth data, further to get population exposure using methods described in Fang et al. (2018)" → I think that a brief explanation/recall of how the data were elaborated is required.

Section 3

Pg. 7 line 151 "In 34 (66.7%) out of the 51 verification counties, the FPLs agree with the local official protection plans (full information in Supplement). The FPLs in the dataset are overestimated in four counties and underestimated in five counties" → what about the other 8 counties?

Pg. 8 line 176 "These counties within the "low-high" FPL clusters can be more vulnerable when they are needed to sacrifice to protect their surrounding large cities that are more expensive to be flooded" → not clear, more vulnerable than what? Could authors explain?

Section 4

Pg. 10 line 217 "The newly developed data show that almost one third (33.1%, 741) of the evaluated Chinese counties are protected with a ≥30-year FPL" → should be protected…. It's a theoretical FPL

Pg. 10 line 224 "For instance, global flood risk assessments show huge flood risk across Chinese provinces both in current condition and future scenarios (Willner et al., 2018a), which are considered to further propagate a devastating indirect impact to other countries through the global trade and supply network (Willner et al., 2018b). However, those global assessments are based on the FLOPROS database, which significantly underestimate Chinese FPLs, e.g., presenting Beijing with a 20-year FPL, which should be 200 years in the newly developed result (Fig. 3) and in the local official document (full information in Supplement). The real flood risk should thus be much lower than the estimates in previously studies if the new FPL is considered" → The authors cannot made this statement as the correspondence between theoretical and real FPLs have been evaluated only for 51 out of 2237 counties; the case of Beijing is a fortunate one where a perfect match occurs. But, can authors exclude that counties exist where there is not a FPL at all in practice, in front of a theoretical FPL, or a real FPL that is lower to designed based one? In this case, the risk can be underestimated. Please, comment.

Pg. 11 line 245 "A neglect of the real-world flood protection lagging behind the policy-based flood protection can distort the selection of adaptation measures" → this is exactly the point. Then, how theoretical FPL can be used (see general comment 1)?

Pg. 12 line 266 "Such a strategy, however, may aggregate flood risk because the less protected areas coincide with high social vulnerability that is caused by a disproportional distribution of vulnerable people, particularly elders" → what authors mean with "aggregate flood risk"

Section 5

Pg. 13 line 300 "This study thus agrees with the argument 300 of Scussolini et al. (2016) that flood protection policy is a valid proxy for actual FPL" → I do not agree, see general comment 4

Table and Figures

Figure 1 → I think that a full description of the framework is required in the text, i.e. in Section 2.1, to support readers in the full comprehension of following contents.

Figure 3 → colours used for the FPLs 30-50 and 50-100 cannot be distinguished in the figure.