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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Building Asset Value Mapping in Support of Flood Risk Assessment: A Case Study of Shanghai, China" *by* Jidong Wu et al.

Anonymous Referee #2

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The paper presents a method to disaggregate (i.e., downscale) building assets values from census information at the district level to a finer resolution (grid of 2.5 x 2.5 m) using information on population distribution (from LandScan, resolution of ∼800m) and building footprint maps. As a case study, the proposed method is applied to the City of Shanghai (China). The topic is relevant and certainly meets the potential interest of the readers of NHESS. However, I have major concerns with the method proposed and with some of its basic assumptions. Moreover, the presentation of the paper is too lacking to allow a deep and clear understanding of both the scientific significance and the novelty of the work. For these reasons, I suggest rejection and resubmission of a new, improved paper.

The points that need to be considerably improved are detailed in the following, along with some minor comments.

Major points

1) The paper need a thorough English revision, which now is not acceptable for publication. Lot of typos, awkward and incorrect sentences are present in the text, and should be fixed preferably with the help of a native speaker.

2) The use of terminology needs much care. Clear definitions should be given before describing the method. E.g., does the buildings floor area (BFA) from census refer to a single storey or to all the storeys of a building? Moreover, the procedure should be better outlined introducing clear notation and using a suitable number of equations. Importantly, the variables in every equations should be unequivocally linked to the quantities referred to in the text. E.g., I really did not understand what variable, in the equations shown, denotes the BFA.

3) The description of the overall method is very tangled, and it should be made considerably clearer. Specifically, the description of available data, of their use, and of the overall method are all mixed together, in a way that it is very difficult to grasp a clear understanding of the method proposed by the Authors.

4) The method used to evaluate of the accuracy of the building footprints is dubious. For example, based on the definition of the accuracy ratio (Eq. 1), if the correspondence between vector building footprints and aerial images is equal to 51% in each one of the 25 cells (i.e., a total discrepancy of 49%), the accuracy ratio for the entire place is equal to 1! Moreover, Fig. 1 suggests that the building area from vector building footprint always underestimates the building area provided by the aerial images.

5) I have concerns about the resolution of the final grid (2.5 x 2.5 m) given the resolution of the input data. The buildings footprints are the only data comparable in terms of resolution (as they are provided in vector form), whereas the assumption of invariant

distributions at finer scales are incompatible with the final resolution of the grid, as clearly explained and demonstrated by, e.g., Figueiredo and Martina (2016).

6) Sec. 2.3.3 “Valuation of building assets”: the Authors refers to reconstruction costs and to construction costs without a clear distinction of the two. Moreover, flooding of nearly flat urban areas is unlikely to cause the reconstruction of buildings (i.e., walls, etc., which are accounted for in the construction cost). Rather, major economic losses are linked to damage of goods. Moreover, damages are likely to affect only the ground floor, so I don’t understand the reason why high-storey buildings should have a loss per unit area that is more than twice that of a low-storey building.

7) Evaluation of the proposed method. Fig.5 shows a comparison between modeled and real statistical building floor area (BFA). Despite the fact that the comparison is carried out at the district level (i.e., at a very coarse resolution), substantial discrepancies are shown, particularly for small values of BFA. Why?

8) The flooding scenario used in the final application of the exposure dataset in order to produce estimates of economic losses is far from reality. The return period (10’000 years) is extremely high if compared with common return periods used in the engineering practice. The text says that no flood protection are assumed in the modeling of flooding. It is not clear if flood protections (e.g., levee) actually exist but they have been disregarded in the calculation of the flooding scenario, or if they do not exist (if this is the case, why saying “assuming no flood protection”?).

Minor points

1) “Methodology” is not correct in this context; authors should use “method” instead. “Methodology” pertains to the “study of methods”. This issue applies to paper’s entire text.

2) Authors should pay attention to properly define abbreviations. E.g., “LULC” is never defined; “BFA” is defined only in the Abstract, and should be redefined when first used

within the paper (i.e., at page 2, line 20).

3) Abstract. What does the “immense analytical flexibility” refer to? To the usefulness of the exposure dataset? It seems to me an overstatement.

4) Pag. 2, l 2-3: “The main cause for this uncertainty is . . . of water inundation depth” could be supported by additional references, e.g. “. . .of water inundation depth, both in urban and rural areas (e.g., Apel et al., 2016 and Viero et al., 2014, respectively)”.

5) Fig. 1: a horizontal line is missing in panels b and e, respectively. Please consider increasing the thickness of the grid lines in the lateral panels. Please control “townership”.

6) Sec. 2.2: Point (4) is not devoted to produce the high resolution building asset value map, as it concerns the test for the application of the final result of the proposed method.

7) The names of the variables that appear in the (few) equations are very little informative, and should be chosen with greater care. In many cases, the names of variables should be exchanged with the subscript. Indeed, the name of the variable commonly identifies the kind of measure (e.g., A for areas, C for costs, and so on. . .), and the subscripts should provide further specifications (e.g., the level at which the area refer to, such as district or township).

8) Eq. (3): ’ is not defined. What does the summation refer to?

9) Eq. 5: unit, not uint.

Additional references

Apel, H., Martìnez Trepat, O., Hung, N. N., Chinh, D. T., Merz, B., Dung, N. V., 2016. Combined fluvial and pluvial urban flood hazard analysis: concept development and application to Can Tho city, Mekong Delta, Vietnam, Nat. Hazards Earth Syst. Sci., 16, 941–961, doi:10.5194/nhess-16-941-2016.

Viero, D. P., Peruzzo, P., Carniello, L., Defina, A., 2016. Integrated mathematical modeling of hydrological and hydrodynamic response to rainfall events in rural lowland catchments, Water Resources Research, 50(7), 5941–5957, doi:10.1002/2013WR014293.

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