

Interactive comment on “An examination of land use impacts of sea level rise induced flooding” by Jie Song et al.

Anonymous Referee #1

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The authors have addressed an important issue in Land Change Science by addressing multiple issues relevant to the field simultaneously. First, they employed a CA model to understand historical parameters of land use change in the area of interest. Second, they used this information to explore future scenarios of generalized land use policy cross-dimensionally with different levels of SLR. The issue of managing SLR adaptation in low-lying areas is absolutely critical and so this research is of great urgency.

Having said that, I do have some comments on the methods used to reach the conclusions cited at the end of this paper. First, the authors borrow from the techniques developed by Onsted and Roy Chowdhury (2014) but they missed one of the most important points of that paper: measuring urban growth over an entire zone is not an accurate way of understanding differential impacts over a heterogeneous landscape.

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The results of their work show that utilizing such a technique results in worse goodness of fit metrics than treating the landscape as homogeneous. Instead, the authors recommend using the AMLEG technique which helps to address distance decay effects that dilute the efficacy of measuring all urban growth in a large zone. I strongly suggest the authors take a look at this technique (in Onsted and Roy Chowdhury (2014)) as its employment will increase the accuracy of the E values in the E-1 scenario.

Second, the authors made no attempt to scientifically derive the differences amongst the land use zoning categories in their construction of E2 as they did for E1. Instead, they just guessed because others have done so. However, other results from Onsted and Roy Chowdhury (2014) suggest that guessing results in poor accuracy as well, or at least worse than treating the entire area as homogeneous.

Third, best practice usually discourages forecasting further into the future than you have calibrated in the past. The authors have data from 1974 to 2013, which is 39 years of data. But they use this to forecast 67 years into the future. Please see the figure from Goldstein et al. (2014).

Goldstein, N.C., J.T. Candau, and K.C. Clarke. 2004. “Approaches to simulating the “March of Bricks And Mortar””. *Computers, Environment and Urban Systems* 28:125-147.

Fourth, the future scenario results are less emergent from interacting and hard to predict factors than they were engineered by the authors to fit a priori expectations. For example, a sprawl scenario was designed by tweaking the model's growth parameters until sprawl was achieved. However, it is important to reflect upon the utility of such scenarios for understanding the nature of urban growth in the area as well as how it can help us improve our modeling methods. For example, from a policy maker point of view, what suite of policies will lead to such a sprawl scenario? What suite of policies will lead to a compact growth scenario? The sprawl and compact growth scenarios are implicit in the sense that they suggest “if a series of circumstances happen that result

C2

in sprawl, this is what sprawl would look like". However, do we need a model to tell us what future sprawl will look like if we already decide what that future is? The more the outcome is controlled the less predictive quality the model has.

I suggest that authors, at most, redo the aspects of the methods described above. However, at the least, the issues I mention above should be discussed in the article as possible deficiencies in the current methodology.

The strongest aspect of this work is the integration of SLR scenarios vis-à-vis future urban growth scenarios. This line of inquiry is absolutely critical for coastal resilience and thus the authors should be applauded for the great importance this kind of research has on the sustainability of our worldwide coastal civilizations.

Minor Comments:

Page 4, Lines 25 thru 30: The impervious surface percentages for the various zoning categories mentioned are incorrect (I checked). The authors need to revise this accordingly.

Page 6, Line 12: This should read "percentage slope" instead of percentage rise since percent slope is rise over run.

Page 10, Line 14: Increased SST does not cause higher pressure over the ocean, but lower pressure. The magnitude of a hurricane is often directly related to how LOW the pressure in the eye is, thus Lower is stronger. The authors seem to have this reversed.

Page 11, Lines 12 thru 18: The methods the authors list (differences of 25, etc.) does not match what they actually have listed in Table 5.

Page 14, Line 14: The authors seem to suggest that sprawl leads to less vulnerability in all coastal areas and thus policy makers must choose as a tradeoff between sprawl with all of its negative environmental consequences or flooding. However, the most important factor is not necessarily proximity to the coast but, rather, simple elevation. Thus Panama City is not necessarily representative of the topographical constraints

C3

and opportunities in all coastal areas.

Page 14, Lines 28 – 29: As Florida sits on porous limestone a seawall will not keep out SLR since the ocean will just come up underneath on the other side.

Figure 1: There are three maps at three different scales but only one scale bar is used. Each frame should have its own scale bar.

Figure 6: Though technically an Excluded Layer can be portrayed however one wants in the actual publication it is confusing to see the actual Excluded Layer in grayscale but portraying the opposite grayscale values of their E scores. Thus the ocean should be 100 or over, but instead is represented as 0, etc. It could be helpful to those in the SLEUTH community if the authors showed the grayscale Gif Excluded layers exactly as they are.

Figure 9A, 10A, and 11 A: The bounding boxes should be removed as they serve no purpose. They should instead be used in Figure 12 as it appears that is where they correspond.

Figure 13: The dark blue color appearing in the maps of this Figure does not appear in the legend. I am assuming it is urbanized land that is also flooded. However, guesswork should not be required by the reader.

Technical: There are numerous spelling issues, missing articles, etc. throughout the manuscript. For example, "Talbe 4 About here". Or poses "unnecessarily" risk instead of poses "unnecessary" risk in the abstract. Another pass of proofreading is recommended.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., doi:10.5194/nhess-2016-157, 2016.

C4