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Comment on nhess-2020-399

Anonymous Referee #3

Referee comment on "Integrated Multi-parametric Analytic Hierarchy Process (AHP) and Geographic Information System (GIS) based Spatial modelling for Water logging Susceptibility Mapping: A case study of English Bazar Municipality of Malda, West Bengal, India" by Diyali Chattaraj et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2020-399-RC3>, 2021

This manuscript is a case study of using an integrated AHP-GIS approach to the English Bazar Municipality in West Bengal, India.

Overall—this case study, if significantly revised to put it into the context of the broader literature and to carefully consider how uncertainty in the data (including years of input for different data values) than it might become useful for the broader community. But, as it now stands, it is a case study without a lot of relevance outside of the region that it has been done, either for broader learnings of the methodology benchmarked in this region, or comparison of this method with other regions, or comparison of this methodology with other methodologies. Without this, it is difficult to see how it might be useable, used, and useful for other colleagues. What should they make of it, as it seems like a lot of variables, with a result that has little understanding if it is meaningful. If some of this can be adjusted in a major revision, this would make a useful case study contribution to NHESS. My comments are as follows:

- The manuscript is very much a case study, and it is difficult to see how someone else should apply the study to their region, or what has been learned that is new. If the element of what is being done to either confront this method with this case study and benchmark results (and thus be useful to others) or to put this methodology in the context of other studies (and thus be useful to others), this would be fine. I suggest then the authors consider carefully how they are constructing their argument. One way is to introduce a section at the beginning that is a background which includes:
 - Waterlogging analytic approaches currently being used.
 - A critical review (even brief, of a dozen studies) of where AHP-GIS has been used in similar situations (not necessarily in India, this could be worldwide).
 - A critical presentation of variables that have been used to with regards to influence waterlogging (from the literature).

- From this background, then you can state you will go into a specific case study.
- Then in the discussion, it is important to come back to the bigger picture, as to what has been learned from this methodology to make this 'more' than just a case study, such that the case study is in the context of the wider literature.
- Uncertainty. Although you discuss accuracy in places of input data, when I get to Figure 15, I don't have a good understanding of how much the accuracy is influencing the final flood susceptibility map, nor how much the influence of the equations and parameters is influencing it. So if one of my input variables changed 'a bit' how much would this change? I believe much more needs to be done with discussing the influence of the accuracy (e.g., of data, and inputs) and the method used, on the results.
- The method and the equations quoted seem to be from the 1980s. How has this methodology progressed beyond the 1980s?
- Other:
 - Please go through and check all items for typos (e.g., line 126 Ci is CI,
 - Line 69: [Minor, my preference] Human-made not 'mand-made'
 - Avoid acronyms in figure captions.
 - Figure captions. Please make these more self-standing (e.g., so one does not need to go to the text to figure them out, and including and sources of data used for the figure).
 - Figures: Please ensure all acronyms used in the figure are defined in the figure caption. Otherwise it makes the figures really hard to read. Figure 3: NBSS, LUP, LULC, TIN, DEM, are all used.
 - For equations, it seems odd to use words instead of variables. For example $dist_i$ would be much better as d_i (d subscript i), radius would be much better as r . Having words just makes these difficult to read. Density could be ρ .
 - Because of the importance of the variables, please create a table of variables, which is introduced towards the beginning, including units.
 - For data such as the soil map, how will the influence of when it has been collected influence the results? How much will it have changed over time. Can you do the same for ALL input, discussing carefully the year of collection of the data and how it might have changed.
 - Accuracy of your reporting of data in places seems a bit optimistic. For example, Table 2, you report to the nearest 0.01 mm. That seems a bit over-optimistic for the data you are working with.
 - Because of the importance of rainfall, I'd like to better understand its variation over the last 36 years, and within a year.
 - For your reporting of metres, this should be m, and it should be m above sea level (asl) as just stating 'm' is sort of meaningless without a reference point.
 - For the slope map, please clarify what the resolution of the grid that is used to construct it.
 - Line 188. Do you mean Table 7? This is many pages later. Please put 'cells' after 4139 for clarity, and check everywhere for units after numbers.
 - Figures everywhere, hard to see because of their size, so will need a careful look at these.
 - Please do look at the formatting guidelines for NHESS papers at <https://www.natural-hazards-and-earth-system-sciences.net/submission.html>.