

Review of: "Exploring the Impact of Future Land Uses on Flood Risks and Ecosystem Services, With Limited Data: Coupling a Cellular Automata Markov (CAM) Model, With Hydraulic and Spatial Valuation Models"

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Potential competing interests: No potential competing interests to declare.

Title: "Exploring the impact of future land uses on flood risks and Ecosystem Services, with limited data: Coupling a Cellular Automata Markov (CAM) model with hydraulic and spatial valuation models"

This paper presents a comprehensive study on the impacts of future land cover changes on flood inundation and ecosystem services in northeast Indiana, US. The research utilizes a novel integrated approach, combining the Cellular Automata Markov (CAM) model with Geographic Information Systems (GIS), Python programming, and hydraulic modeling (HEC-RAS). Additionally, it quantifies the economic implications of these changes using a spatial Ecosystem Services Valuation (ESV) model. The study emphasizes the significance of understanding future land cover dynamics for effective environmental management and highlights the potential economic losses associated with land use changes. Moreover, it emphasizes the reproducibility and transferability of the approach by making all data and codes publicly available.

The authors identified gaps as to their knowledge (i) there has not been any application where predicted land uses are analyzed as part of a hydraulic modelling approach to showcase potential flood risks, and (ii) another gap this work aims to bridge is the mapping of the monetary value of these land cover changes in the future, based on the Ecosystem Services (ES). They are trying to fill up the gaps by using this research.

Specific recommendation:

1. Authors should provide more specific details about the key findings and their implications, enhancing their clarity and relevance to readers in the abstract.
2. Methodology: For international readers, methodology is more important than the results, so methodology should be more understandable, concise, and simple, but innovative, which will support the originality of the work. It is very difficult to understand the originality of the paper.
3. Further validation measures and sensitivity analyses could enhance the robustness of the findings, particularly regarding the CAM model's accuracy in predicting land cover changes. As the authors mentioned that Machine Learning can also assist in improving the prediction accuracy, my suggestion is to add ML for further validation of the results.

4. Land cover changes probability was detected using 5 years' interval data of land use, but the author did not mention the date/month/season of the data consideration. There would be seasonal variation in land use which is more important for land cover changes probability study. Do readers assume that the considered months or seasons remained the same?
5. What are the significant results carried out by the predicted land use in Figure 5, which does not show any significant changes over 40 years?
6. Figure 4 and Figure 5 are extensions of Figure 3 and visualizations of individual categories. No new information is carried out.
7. Clarity in Methodological Integration: While the introduction outlines the integration of CAM modeling with hydraulic modeling and ecosystem services valuation, providing more clarity on how these components interact and complement each other could enhance the understanding of the research approach.
8. Further Justification of Research Objectives: Providing additional justification for the specific research objectives, such as why the selected case study area in northeast Indiana was chosen and how it contributes to addressing broader research questions, could strengthen the rationale behind the study.
9. Incorporation of Stakeholder Perspectives: Considering the potential implications of land cover changes on various stakeholders, including local communities, policymakers, and environmental organizations, could enrich the discussion and provide a more holistic understanding of the research context.
10. While the validation methods provide insights into the accuracy of the CAM model's predictions, discussing the inherent uncertainties and limitations of the modeling approach would enhance the transparency of the study. Addressing factors such as data quality, model assumptions, and potential sources of error could strengthen the interpretation of results.
11. Providing a brief discussion or comparison with previous studies that have utilized CAM models for land use change prediction could enrich the section. Highlighting similarities, differences, and advancements in methodology would provide valuable context for readers.
12. Explanation of Rain-on-Grid Approach: Authors should provide additional context or rationale for the selection of the rain-on-grid approach for flood simulation, which would enhance the section.

Very specific:

1. Pixel size should be mentioned.
2. As you mentioned that the urban area is increased over crops and some forest areas, while water and barren land remain almost stable during the predicted years, can you please quantify the areas in categories?
3. "In the present study, it was also observed that deforestation can cause increased flooding" – can you relate that rate of deforestation to the increases in flooding?

Overall Comments: Major revision is needed.

