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.

General Considerations

The study proposes an innovative, integrated methodology to evaluate the impact of land use changes on flooding using the Cedar Creek Watershed as a case study. The future land use scenarios are predicted using a Cellular Automata Markov model, and the resulting maps are used as input parameters in a hydrological-hydraulic model to test the different flooding impacts under a designed storm. Land use changes are furthermore evaluated from a monetary point of view using spatial Ecosystem Services Valuation (ESV).

The manuscript is globally well structured and illustrates consistent results using an innovative methodology. The purpose of the study is clear and well described. This study is of great interest as it proposes a methodology capable of providing good results with little input data. However, in order to support the scientific soundness of the obtained results, the proposed hydrologic-hydraulic model must be better described and properly calibrated and validated (if possible). Details of the calibration procedure, or the reasons why it could not be carried out, must be included in the revised version of the manuscript.

To my knowledge, the CAM model and the ESV are consistent, accurate, and provide good performance.

The hydrologic-hydraulic model’s description is too brief and must be expanded according to the comments which are provided below.

The manuscript deserves minor revision for typos correction.

Introduction

Even though the focus of this work is the CAM model and the integrated methodology, a HEC-RAS hydrologic-hydraulic model has been created, but the bibliographic research about the use of HEC-RAS in hydrologic-hydraulic modelling is missing and must be included in the introduction.

I recommend including the following paper:

- Is HEC-RAS 2D accurate enough for storm-event hazard assessment? Lessons learnt from a benchmarking study based on rain-on-grid modelling. Piefranco Costabile, Carmelina Costanzo, Domenico Ferraro, Pierfrancesco Barca

https://doi.org/10.1016/j.jhydrol.2021.126962

Methodology - Hydraulic Model

I understand that the main focus of the study is the land use change prediction methodology; anyway, the hydraulic model is a key part of this work, and there are few details about it.

The following subjects must be included in the paper:

- Which is the downstream boundary condition of the hydraulic model?
- A hyetograph of the designed storm used for the study must be included.
- Which is the precipitation-loss method used to calculate the runoff? And which are the parameters used for each land use type?
- It seems that the hydraulic model has not been calibrated nor validated. At page 5, it is said that two floods occurred. Are the model's results consistent with the actual inundation pattern and extent that occurred during those flood events?

The following subjects are suggested to be included in the paper:

- What spatial distribution method has been used for the rainfall storm over the basin?
- A table showing the land use – Manning coefficient association should be included;

Results and conclusions

This section is a little too brief and must be expanded, including some more quantities, analyses, and comments.

Some interesting points to be investigated are:

- The hydraulic results of the study are presented starting from 2026. This analysis can be more consistent carrying out a comparison between future land use scenarios and the present condition. What is the increment compared to the present flood extent and depth?
- Besides the flood extent and depth, other hydraulic quantities can be investigated, such as the impact of future land use changes on the volume and the duration of the hydrograph in specific control stations. Does the decrement of forested lands and a higher urbanization lead to faster floods? How much is the percentage increment of the hydrograph's volume? Does the 2051 hydrograph have a different shape compared to the 2026 (or present) hydrograph?