

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC2  
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## **Comment on nhess-2021-51**

Anonymous Referee #2

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Referee comment on "A comparative flood damage and risk impact assessment of land use changes" by Karen Gabriels et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-51-RC2>, 2021

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### **GENERAL COMMENTS**

This is an important topic for the improvement of flood risk management through use of decision support tools, or in this case a framework to assess comparative flood risk. Such a framework could enhance the spatial planning of residential developments and siting of nature-based solutions, in this case, afforestation. Significantly, the paper uses actual data on flood extent from various floods and modelled flood depths with other modelling to assess flood damage. A scenario is presented where pixels are ranked for reducing flood risk via afforestation and reducing the impact of sealing.

### **SPECIFIC COMMENTS**

- **Flood damage estimates**

I have three main queries under flood damage estimates: residential damage is likely overestimated, the role of property-level flood risk adaptations (PLFRA), and the critical role of duration.

For the estimates of flood damage to residential buildings – the value of a home includes the land, the services to the land, e.g. sewer, water, electricity, and the property itself. Therefore, the cost of refits/rebuilding after a flood is some fraction of the value of the property. Estimates could be based on insurance pay-outs or other data.

For the analysis there are repeat floods in the same areas, yet the estimates of damage use the same formula – however, we might expect households, farmers, etc to implement PLFRA. Indeed, insurers may require such PLFRA. Some articles on PLFRA are:  
<https://wires.onlinelibrary.wiley.com/doi/full/10.1002/wat2.1404> and  
<https://www.witpress.com/elibrary/sse-volumes/5/3/995>

Duration is discussed earlier in the paper, but Figure 3 is just extent and Figure 6 is depth and damage estimates. Duration is critical in terms of damage costs to farmland and to residential properties – including to intangible costs. See here for estimates of the role of duration on farmland damage,  
<https://onlinelibrary.wiley.com/doi/epdf/10.1111/jfr3.12041>

#### ▪ **Thresholds and more realistic scenarios**

I understand how you estimated the afforestation and sealing scenarios, but I wondered if there is a threshold in either scenario? There must be threshold effects with increased sealing of the uplands and with undermining the benefits delivered by natural upstream areas, i.e. once they are opened for development the natural area will be under greater pressure for development. Surely these areas contribute a lot to the provision of flood regulation ecosystem services?

The takeaway that it is OK to build in the uplands near forest patches and afforestation is primarily around rivers seems somewhat counterintuitive and these unexpected results are not explicitly discussed and need to be. Are there other more realistic scenarios that could be generated, i.e. a scenario that pays attention to development and conservation planning in this catchment? This might include afforestation that also occurs in the upland and development that occurs in already residential areas or near these areas. Yet another scenario could try to estimate the mitigation fraction provided by upland conserved/forested areas by modelling the removal and/or partial removal of these areas.

As you note the costs of afforestation are high, another scenario could assess other NBS, i.e. the best places for floodplain floodwater storage. An advantage of such a scenario is that the storage of floodwaters would be temporary which might reduce associated costs.

#### ▪ **Afforestation mitigation**

The afforestation mitigation outcomes seem very high – are these % reductions similar to those found in other research?

## **TECHNICAL CORRECTIONS**

- **Map**

It would be useful for Readers who do not know the area to have the main towns located on the figures and to have an overall view of the area, i.e. an indication of where the rural areas, farmland, residential areas are.

- **References**

Many of the references seem older or perhaps it is the absence of more recent references that is an issue.

- **Word choice**

Around line 33 – elements – perhaps ‘assets’. This word is repeated several times.

Around line 124 – analogue – perhaps ‘an analogue to...’ or ‘analogously’ or ‘similar to’ – again this word is repeated several times.