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Reply on RC1

Karen Gabriels et al.

Author 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.,
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Thank you for your time and consideration in reviewing our manuscript. We agree that the discussion of our manuscript can further be extended. We further elaborate on how we propose to adjust our manuscript according to your remarks.

The derivation, calibration and validation of hydrological rainfall-runoff model is further detailed in a recently published paper:

Gabriels, K., Willems, P., & Van Orshoven, J. (2021). Performance evaluation of spatially distributed, CN-based rainfall-runoff model configurations for implementation in spatial land use optimization analyses. *Journal of Hydrology*, 602, 126872.
<https://doi.org/https://doi.org/10.1016/j.jhydrol.2021.126872>

This paper also includes an extensive discussion of the limitations of this model. We propose to provide a reference to this paper in our manuscript and to strengthen the discussion of our manuscript to include the implications of the most relevant modelling processes and assumptions, including the adjustments of the model to antecedent soil moisture conditions. The interpolations of water surfaces will impact the estimate of water depth and therefore also the flood risk assessments. However, this uncertainty relates to both the reference situation, before land use change, and after land use changes have been implemented. The uncertainty related to the water depth does therefore pose less of an issue in the relative assessment of both situations, as proposed in this framework. We will clarify and extend on this in the discussion of our manuscript.

The reduction in impacts for the land use change scenarios are difficult to validate, as validation data are lacking. To provide some indication on the accuracy of the flood risk assessment, we provided a comparison with the flood risk model LATIS (Beullens et al., 2017):

Beullens, J., Broidioi, S., De Sutter, R., De Maeyer, P., Verwaest, T., & Mostaert, F. (2017). *Ontwikkeling LATIS 4 Deelrapport bis: Actualisatie basiskaarten en schadewaarden. Versie 3.0. WL Rapporten, 13_159_7*. Universiteit Gent, Antea Group, Waterbouwkundig Laboratorium: Antwerpen.

This model has been used in Flanders to provide a benchmark economic flood risk assessment. The discussion on the uncertainty related to the comparative risk assessment will be strengthened by adding additional information regarding the assumptions made in

the land use change scenarios. For instance, the assumption is made that a full-grown forest is implemented, which will lead to the overestimation of the impact of afforestation. In addition, the combination of a limited number of flood events with a limited number of return periods does also influence the impact assessment of the land use changes, with a larger number of events and return periods leading to a more accurate assessment.