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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Uncertainty in flood damage estimates and its potential effect on investment decisions" *by* D. J. Wagenaar et al.

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We thank William Lehman for his comprehensive and constructive comments and his comparison of our method with the methods used in the US. Clearly a lot of thought and effort was put into this review and many interesting points were made. We really appreciate this. Below a summary of our thoughts on these comments and what we specifically intend to do with them for this paper.

-Three separate topics:

The referee commented that our paper really covers three complex topics and is very broad for one paper. We are aware of this difficulty in the paper. We decided to keep the three topics together because we believe that the value of the topics combined is

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greater than the topics individually. The referee also seemed to appreciate this combined value and therefore advised us to ignore his comment about this. We appreciate this comment but intend to keep it as it is now (like the referee suggested).

-Lack of common language:

The referee commented on the lack of common language and in particular the use of the word “model” in our paper. We have used a broad definition of the word “model” that covers the three different definitions the referee found in our paper. For clarification purposes we will go again through the paper and try to replace the word “model” with more specific descriptions of what we mean (as given by the referee).

-No uncertainty around a given depth discussed:

The referee commented that we didn’t discuss the uncertainty of the damage around a given depth. We did not explicitly discuss that, but implicitly it is part of the analysis. The uncertainty around the curve in our paper was the range covered by the different damage functions in our library. We even used this as input for our uncertainty analysis.

-Uncertainty in vertical elevation:

The referee commented that we had no discussion about the definition of the zero point in the damage functions. We acknowledge that from an international perspective this is an important point and that there are differences in definitions between different methods. In the Dutch context this is a less important point because the ground level in the digital elevation model is usually relatively close to the ground floor level.

For this paper we used no damage functions with significant damage below the zero point. In the few functions used with damage below the zero point the zero point was shifted to the point that the first damage occurred on. The definition of the zero point is therefore the elevation in digital elevation model rather than the ground floor level. We will add this description to the paper to the section about the damage function library (page 619).

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-Use of number of jobs as indicator for maximum damage to a building structure:

The referee wondered why we used the number of jobs as indicator for the maximum damage to a building structure and questioned jobs as an indicator for building construction value. This paper used the geographical data of the Dutch flood damage estimation software HIS-SSM. In HIS-SSM the number of jobs is used to estimate the value of a commercial building. As the referee suggested this may not be very strongly correlated with the value of a specific commercial building. However, the average case is expected to correlate quite well. This could therefore have contributed to some of the uncertainty found for cases with very few affected objects but is not expected to make a difference for large scale floods. We will add a brief discussion about this issue to the paper. This discussion will be separated in two parts: One general part about different ways to define the maximum damage on page 614 around line 14 and one specific part about was done in this paper and the possible consequences for the results on page621 around line 21.

-Distribution of maximum damage of commercial structures:

The referee asked why not a simpler method was used for the distribution of the maximum damage of commercial buildings (such as a triangular distribution). When the number of jobs is used as indicator for the maximum damage the variation in the maximum damage per job is very skewed in a way that is difficult to capture with a standard distribution. Very good and detailed data about this skewed distribution was available for use in this paper and was therefore used. With a standard distribution the uncertainty in maximum damage per job would probably have been underestimated for very small scale floods. We therefore intend not to change this approach for this paper.

-No depth damage figures reported:

The referee wondered why no depth-damage figures are shown. There is no important reason not to show them. It is not possible to show all depth-damage functions used (due to the large number of functions). But we agree that it could be interesting to show

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the average depth damage function per category per methodology (4 extra figures). This figure will be referenced to from page 619 in the damage function library section.

-Variation in construction practices:

The referee made a point that there is a lot of variation in construction practices and that therefore differences between damage functions are justified. We are unsure whether this was a point of discussion because we agree with the referee. Damage functions are uncertain when applied in other conditions then they were created for and what conditions are different is difficult to determine. Our paper therefore assumes that no good local damage functions are available to the modeler (in practice this is usually the case). This point is made in the paper but will be further emphasized for clarity. The argument that we assume that no good local damage functions are available will be added to page 618 around line 6.

-Differences in optimal investment strategy determination:

The referee described the US approach to determine flood protection investment strategies and wondered whether our approach was right. Our approach closely follows earlier work that it referenced too (Kind, 2013). This approach is widely used in the Netherlands to determine the protection levels for different dikes. The purpose of this paper is not to compare different investment decision making methods themselves but rather to see how different flood damage estimates could potentially influence investment decision making. We will add some extra information about this approach to make it clearer to readers who are not familiar with the work of Kind (2013).

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 3, 607, 2015.