**Natural Hazards
and Earth System
Sciences**

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Discussions

## *Interactive comment on* "An advanced method for flood risk analysis in river deltas, applied to societal flood fatality risks in the Netherlands" *by* K. M. de Bruijn et al.

**Anonymous Referee #2**

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My suggestion: Not publish or Very major changes which will result in a completely revised paper

Overall: The paper describes a method to calculate societal group risk. The method is presented as new, however the method is just another way of probabilistic analyses. The new part is the assumption that systems are related to eachother. The method is not placed in a context of policy making (do you take interaction between dike ring areas into account) en more important about the added value and the role of uncertainties. Although it is stated that the method is used a reflection is needed on the consequences and uncertainties before conclusions and recommendations can

be made. This should be added to the paper. Also a wider context is needed about societal risk and an reflection to the results of VNK. The paper does not hold much information about the estimation of the probability of flooding and the fragility curves (this seems to be a black box, also the fragility curve can change after a dike improvement.

The author also states that the method is used for candidate safety standard in NL. Please elaborate on this. Also improve the references because most of them are related to research of the institute of the author.

Detailed comments: - L1p1 Why river deltas? And no deltas in general? Better definitions are required.

- L2p2 Why is it complex when multiple causes of failure occur? Risk analyses can cope with this? What makes it complex? The complexity seems to be related to the specific system itself? The term 'complex' has to be explained.

- L26p1. Why is societal risk expressed in FN Curves? Other ways are available as well? The use of FN Curves is a choice. Please discuss several ways how to present societal risk.

- P1. The Netherlands has a long history on flood risk analyses and societal risk analyses. This paper has references (most related to the same institute) in a limited corner of available research, please extend this in a wider context.

- P1. The paper assumes an understanding of the Dutch system. Please explain the Dutch system. This is done later on, please change the structure of the paper.

- P2. The second requirement is related 'hydrodynamic interaction' however this only focusses on the water levels on rivers. A requirement to describe the probability of flooding (for different mechanism of failure) is missing. This seems to be the most important requirement which is missing. A second question, how is this related to FLORIS (VNK2) which is also published? And is there an upper limit how big a flood can be (in a realistic way)

- L26P2 Why the FN Curve 'Accurate' when is foreseen in the boundary conditions?

- L3p3 No method is find, what kind of activities are done for this conclusion? How does this related to the previous research of the author in which research after societal risk has been done?

- And why does this new method result in 'better' answers than the old method (and why is it better), taking uncertainties into account? I expect a reflection on this, as well as a comparison with previous research in NL and worldwide.

- P3. Literature is very narrow most related to institute of the author, please use a international scope

- P1642l13 Hydronamic interaction has to to redefined, this only describes consequences on water levels, what is needed is the consequences on the probability of flooding

- P1642l13 VNK is also probabilistic, what is new in the calculation of societal group risk? And why are the assumptions result in better outcome than VNK? What is the impact of the 'expert assumption' please reflect on this

- P1642l17 An event tree of all flood scenarios? How do you know al flood scenario? Is a scenario an event? And what is the role of the probability?

- P1642l24 weak points were assumed? But are they weak?

- P1642l24 the different probabilities of sections in a dike ring are discussed? But these can be taken into account in the VNK approach, are they? And if so why is it relevant?

- Chapter 2 focusses mainly on the consequences of a flood. The analyses of the probability of flooding is completely missing. A lot of literature is available about hydraulic loads and consequences of measures, this has to be related to the probability of flooding and interaction with breaches elsewhere. The focus of the author seems to be on the consequences, as the most critical value is expected to be the probability of

flooding.

- P1646L20. Why these difference in dike sections of 400 meter to multiple km's? What is the background of these sections? And why are these ok given previous statements of the role of dike sections?

- P1646L20. Candidate safety levels? Something seems to be missing, candidate for who? And how are these selected? The next sentence the safety levels are defined as input? Isn't this strange?

- P1647L5. How does the shift of the mean relate to the insights of VNK earlier mentioned? I cannot see this in the paper which is used as a reference.

- Formula 1. A and b are based on annual maxima, q on daily discharge. Is this correct?

- P1651: the use of the fragility curves is important, van de Mey is used. Please elaborate on this more, for example how this is related to VNK as mention in the paper? The work of van der Mey is not published? This cannot be checked, what are weaknesses?

- Chapter 4: Please show some more results, how many breaches occur in an event? Is this realistic compared to previous expectations? What is the probability of an event with 8000 casualties?

- References are missing (Klijn 2013)

- P1659 recommendation 1. When this is available please add to the paper

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 2, 1637, 2014.