



# DELTA IN TIMES OF CLIMATE CHANGE II INTERNATIONAL CONFERENCE

OPPORTUNITIES FOR PEOPLE, SCIENCE, CITIES AND BUSINESS  
ROTTERDAM THE NETHERLANDS, 24–26 SEPTEMBER 2014

<b>Deltas in Depth scientific sessions</b>	
<b>Deltas in Depth Theme 2. Flood risk management</b>	
<b>DD 2.3 Improved decision support in flood risk management</b>	
<b>Chair</b>	Prof. Zbigniew Kundzewicz, Polish Academy of Sciences, Poland
<b>Presentations</b>	<ul style="list-style-type: none"><li>• Dr. Heidi Kreibich, German Research Centre for Geosciences, Germany</li><li>• MSc Marjolein Mens, Deltares, the Netherlands</li><li>• Peter Zwanenveld, CPB, the Netherlands</li><li>• Prof. Carlo Giupponi, Ca' Foscari University of Venice, Italy</li></ul>

This session on improved decision support in flood risk management discussed a variety of methods to support decisions: cost-benefit analysis, robustness analysis, integrated cost assessment and robust decision making.

Dr. Heidi Kreibich (GFZ, Germany) started off with a new view on how to assess costs of natural hazards. This integrated method has been developed in the European FP7 project *CONHAZ*. This research project was motivated by the fact that it is difficult to detect and project climate change and its effect on the increasing losses from natural hazards. In order to produce more meaningful projections it is necessary to improve assessment of costs of observed floods and costs related to adaptation, including estimates of avoided damage. Therefore, risk management should be a continuous effort and also follow a cyclic process. Dr. Kreibich proposed and explained a new framework for cost assessment that is closely connected to the risk management cycle (see figure).

Marjolein Mens (Deltares, the Netherlands) showed a comparison between different decision criteria in flood risk management. Using results from an application on the Meuse River valley (Netherlands) she demonstrated that depending on the criteria selected, strategies for flood risk reduction are likely to rank differently. Two of the criteria were benefit-cost-ratio and total societal cost. The first is commonly used throughout Europe, while the latter is favored in the Netherlands. Ms. Mens asked the audience to discuss why they think this is the case. Furthermore, she showed benefits of a robustness criterion, taking into account the potentially large losses of low-probability flood events. The robustness criterion helps scoring measures on how they contribute to the task of avoiding large, unacceptable flood losses.

Peter Zwanenveld (CPB, the Netherlands) presented a new method *Dique-Opt* for finding economical optimal safety standards, with an application on the IJssel Lake in the Netherlands. This method aims to find a protection standard for embankments based on the lowest total costs, and is based on work by Van Dantzig and Eijgenraam, two Dutch economists who are responsible for the economic reasoning behind the Delta Works (in the sixties) and the recently adopted new protection standards for the Netherlands. Mr Zwanenveld showed different results depending on assumptions on how the system is functioning (e.g. what if the Afsluitdijk fails during a storm). The results show that pumping is the cheapest option.

The final presentation was by Prof. Carlo Giupponi (University of Venice, Italy) on robust management of flood risk. He showed an application of the method Robust Decision Making (RDM)





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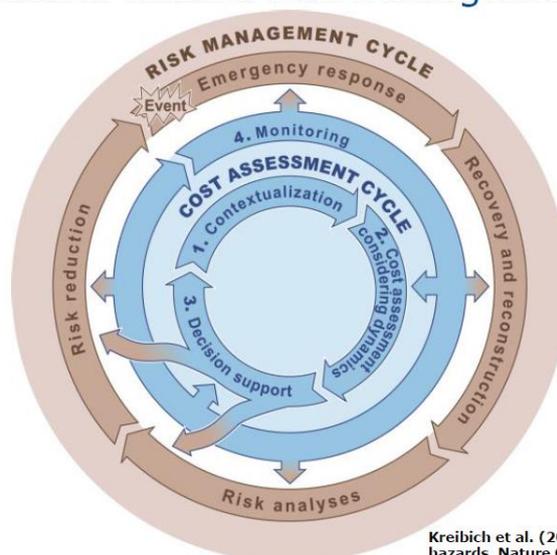
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developed by the RAND corporation (Robert Lempert et al) for a case in Bangladesh. The method aims to take into account the many uncertainties involved with long-term decision making in an uncertain world. The method starts with identifying the most relevant uncertainties, for example in calculating the change in flood risk. Next, many scenarios are run with a range of assumptions for the uncertain variables. Each scenario represents one possible future. The performance is measured as the percentage of runs that meet the decision target, for example flood risk below a predefined level. The challenge is to make a large amount of data of use for the decision making process. For that purpose, Prof. Giupponi demonstrated the use of data mining.

The session ended with a lively discussion on two topics. The first topic was applicability of methodologies - when to use which method? A variety of methods has been developed to support decision making, but they all take a lot of time to apply on a specific problem. While some people suggested applying several methods and discussing the differences, others felt that in practice there is often no sufficient time and no adequate funding to perform such broad, and demanding, analyses. This shows a clear need for guidance on when to use which method. Simpler (hence less accurate) methods that are less time-consuming may be preferable in some situations.

The second discussion topic was the possibility to prepare for unexpected events (sometimes called “Black Swans”). Some discussers found that awareness of unexpected events is more important than actually planning for them. Others took a more skeptical stance, doubting our ability to consider and to plan for things that have never happened before and hence are difficult to imagine, even possibly unthinkable.

## A vision for integrated cost assessment in natural hazard risk management



Kreibich et al. (2014) Costing natural hazards. *Nature Climate Change*, 4, 303–306

Figure with Ms Kreibich’s presentation

