



## Use Of Risk Analysis Frameworks In Urban Flood Assessments

Arnbjerg-Nielsen, Karsten; Madsen, Henrik

*Publication date:*  
2011

*Document Version*  
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

*Citation (APA):*

Arnbjerg-Nielsen, K., & Madsen, H. (2011). *Use Of Risk Analysis Frameworks In Urban Flood Assessments*. Abstract from 5th International Conference on Flood Management, Tsukuba, Japan, .

---

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

## USE OF RISK ANALYSIS FRAMEWORKS IN URBAN FLOOD ASSESSMENTS

**Karsten Arnbjerg-Nielsen**<sup>1</sup>

Henrik Madsen<sup>2</sup>

*1 Dept. of Environmental Engineering, Technical University of Denmark, Denmark*

*2 DHI, Denmark*

In the period 1960 – 1990 rapid urban development took place all over Europe, and notably in Denmark urban sprawl occurred around many cities. Favorable economic conditions ensured that the urbanization continued, although at a lower rate, until recently. However, from 1990 to present an increase in extreme precipitation has been observed, corresponding to an increase of design levels of at least 30 %. Analysis of climate change model output has given clear evidence, that further increases in extreme precipitation must be expected in the future due to anthropogenic emissions of greenhouse gasses.

The design guidelines for urban sewer drainage capacity allow surcharge approximately 1 in 2 years. Studies in the 1980ies indicated that that is close to the optimum in socio-economic calculations. Recent developments in simulation software using detailed digital elevation models have confirmed these results. However, they have also highlighted a shortcoming of the design practice that jeopardized the entire design process: the floods occur the same places every time, meaning that the losses are not equally distributed. Other key players in society are now starting to react upon this knowledge, primarily insurance companies and mortgage providers, but also politicians and media are highly interested.

Presently two very different approaches are being followed in both research and practice. One is the introduction of risk analysis and risk management tools to provide professionals and politicians with better decision support tools. Some of the developments are risk frameworks that encompass economic and/or ethic evaluation of climate change adaptation options and improved risk management. This line of development is based on a societal-based evaluation of maximizing the outcome for society and accepting losses that are outweighed by benefits to society as a whole.

Another, very different approach is to apply more stakeholder driven approaches, much in the line of Integrated Water Resources Management. The key difference is that it is recognized that the costs and benefits of both existing and planned urban drainage solutions are shared between very different stakeholders and that current practices are leading to personal bankruptcy by those bearing the highest costs. Therefore solutions must be developed that are understandable and can be communicated between different stakeholders and be acceptable also to the ones who bears the costs.

Denmark has supported research in both approaches by supporting a wide strategic partnership with many stakeholders covering all aspects of urban design, planning and utilization as well as two research projects on developing tools for risk assessments and decision support with time-varying loads and preferences. Time will show which of these approaches will be most predominantly used in the future.

The presentation will outline the two research projects and the pros and cons of each approach as well as the preliminary findings of each of them. Both are being carried out in real-life applications combining researchers, practitioners, and NGOs.