

Uncertainties in flood damage assessments

In recent decades, a transition from protection to risk management can be observed in many European countries^[1].

Within a flood risk management approach, flood risk assessments are of key importance to support decision making. However, flood risk assessments that try to quantify direct monetary damage due to flooding, are surrounded by considerable uncertainty^[2]. On top of that, flood risk is not a static parameter, but varies through time because of, for instance, socio-economic developments and climate change, which are also uncertain. Quantifying and communicating such present and future uncertainties is imperative in order to make well informed decisions^[3]. It also strongly influences the public confidence in such models^[4].

In order to assess the uncertainty in flood damage assessments and attribute it to different sources, all possible sources of uncertainty need to be addressed. Up to now, mainly uncertainty in the hydro-

logical component (i.e. river discharge, inundation depth) has been addressed^[5], but the relation to flood damage has received considerable less attention.

This relation is usually represented by so-called stage-damage curves, which are curves that indicate the fraction of total damage that occurs at a given water depth. A study on the underlying empirical data (post-flood surveys) shows there's substantial variation and thus uncertainty in this relation^[6]. Preliminary results of research done within the Climate Changes Spatial Planning programme shows that uncertainty in the stage damage curves (and associated maximum damages) is by far the largest contributor to uncertainty in flood damage estimates, outweighing hydrological factors.

In order to improve the quality of flood damage assessments research on the relation between hydrological factors and resulting damage deserves prioritization. The magnitude of future uncertainties due to climate change and socio economic developments on flood damage estimates and how it relates to present uncertainties remains to be investigated in the project. However, there are indications that they have a similar sized effect on flood damage estimates. When looking at the 20th century, socio economic developments were responsible for a tripling of potential flood damage and depending on the scenario for the 20th century it may have double again at end of the 21st century (see Figure).



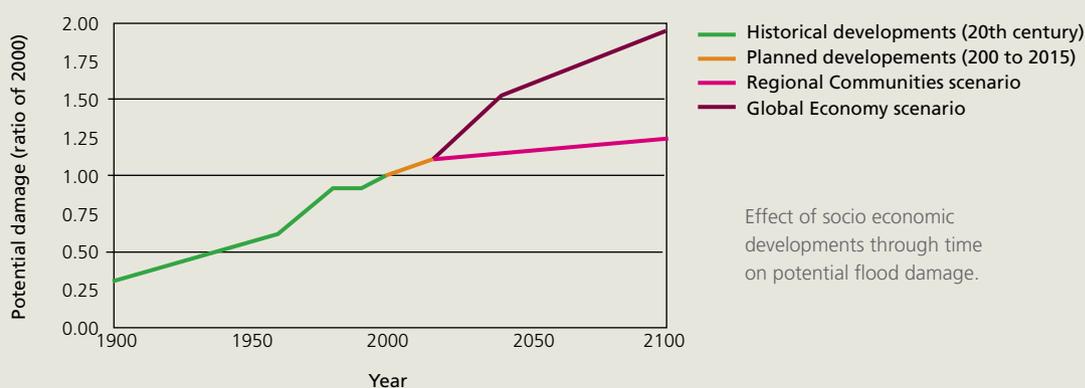
HANS DE MOEL
PhD researcher at the Institute for Environmental Studies of the VU University, Amsterdam, is specialised in flood risks, the impact of socio-economic developments and climate change, and its associated uncertainty.
+31 20 59 83992 / hans.de.moel@ivm.vu.nl

PROJECT: IC03 National adaptation strategies

PARTNERS: VU University Amsterdam / Alterra / Netherlands Environmental Assessment Agency (PBL)

REFERENCES

- 1] de Moel, H., van Alphen, J., and Aerts, J. C. J. H. (2009). "Flood maps in Europe - methods, availability and use." *Natural Hazards and Earth System Sciences*, 9(2), 289-301.
- 2] Apel, H., Thielen, A. H., Merz, B., and Bloschl, G. (2004). "Flood risk assessment and associated uncertainty." *Natural Hazards and Earth System Sciences*, 4(2), 295-308.
- 3] Ascough, J. C., Maier, H. R., Ravalico, J. K., and Strudley, M. W. (2008). "Future research challenges for incorporation of uncertainty in environmental and ecological decision-making." *Ecological Modelling*, 219(3-4), 383-399.
- 4] Brugnach, M., Tagg, A., Keil, F., and de Lange, W. J. (2007). "Uncertainty matters: Computer models at the science-policy interface." *Water Resources Management*, 21(7), 1075-1090.
- 5] Apel, H., Thielen, A. H., Merz, B., and Bloschl, G. (2006). "A probabilistic modelling system for assessing flood risks." *Natural Hazards*, 38(1-2), 79-100.
- 6] Merz, B., Kreibich, H., Thielen, A., and Schmidtke, R. (2004). "Estimation uncertainty of direct monetary flood damage to buildings." *Natural Hazards and Earth System Sciences*, 4(1), 153-163



Effect of socio economic developments through time on potential flood damage.