In: Kabat, P. & Vellinga, P. (eds.) Abstracts Scientific Programme Deltas in Depth.
International conference Rotterdam, the Netherlands, 29 September-1 October 2010

Flood risk developments and adaptation strategies in the Rhine-Meuse delta

Philip Bubeck[1], Aline te Linde[1], Jasper Dekkers[1] and Philip Ward[1]

[1]VU University, Amsterdam, the Netherlands

With almost 9 million inhabitants the Rhine-Meuse delta is a densely populated area. It is also very important from an economic perspective, as up to 65% of Dutch GDP is produced here. The delta faces flood risks from both its rivers and the sea. Even though a substantial part of today’s delta is already below sea level, the current risk of flooding mainly originates from its rivers, since river embankments have lower safety levels than coastal protection.

Estimating (future) flood risk, defined as probability x damage, requires insights in both flooding probabilities and potential consequences. Changes in both of these parameters are expected in the future, which will increase overall flood risk. Urbanization and industrialization are projected to intensify in the delta’s flood prone areas, thus enhancing potential damage. As a result of climate change, extreme peak discharges, and consequently flooding probabilities are also expected to increase. Against this background, a better understanding of the scale of these future flood risk increases is required. For the development of possible adaptation strategies it is important to comprehend the independent contributions of the main driving forces to the overall increase in risk. Since flood management strategies in the upstream parts of the basins can have a significant effect on flood risk in the delta itself, it is important to take the entire basin into account.

To estimate current and future flood risk we apply a uniform flood risk model for the rivers Meuse and Rhine and their delta. Our risk model combines information on flood probabilities and flood damage estimations, using two different climate change and socioeconomic scenarios. The change in the frequency of return periods corresponding to specific inundation scenarios are estimated by applying extreme value analyses to the output of hydrological models driven by climate scenarios data. Changes in land use as a result of socio-economic developments are derived from the ‘Land Use Scanner’ model. This GIS-based economics-oriented probabilistic model uses a logit-function to simulate demand for, and supply of, land in an iterative process. To estimate potential flood damages the information on land use (change) and inundation depths are combined by using depth-damage functions. By integrating both climate change and socio-economic scenarios we are able to discriminate the independent contribution of the two driving forces on overall flood risk. The model will also be used to evaluate the effectiveness of different adaptation strategies in terms of risk reduction.

The EU flood directive 2007/60/EC asks member states to consider the impacts of water-related or spatial policies and to evaluate risk management plans against the background of climate change (preamble 9 and14). The applied risk model allows assessing the impacts and long-term effectiveness of various flood management policies, ranging from spatial and non-structural to structural measures and thus contributes to the aims of the EU-flood directive. Furthermore, the derived insights are also indispensable to facilitate cooperation between upstream and downstream stakeholders and to inform the population at risk.