

Session DD 9.1: Quantifying climate risks

Chairs	Prof.dr. Jeroen Aerts, VU University, the Netherlands and prof.dr. Reimund Schwarze, DIW Berlin, Germany
Keynote speaker	Dr. Robert Muir Wood, RMS, UK
Speakers	Jessica Ludy, University of California, Berkley, USA Laurens Bouwer, VU-IVM, the Netherlands H.F. Treur, Netherlands Insurers Association, the Netherlands Dr. Heidi Kreibich German Research Centre for Geosciences, Germany Wouter Botzen VU-IVM, the Netherlands Hans Waals, Waterboard Hollandse Delta, the Netherlands
Rapporteur	Dr. Monique Slegers, Knowledge for Climate, the Netherlands

Robert Muir Wood opens this session with a keynote speech about how to quantify the risks of extreme climate events and how to use tools to explore risk management options. Even though a hazard like hurricane Katrina could be expected with regards to previous occurrences in new Orleans, it is not possible to know what will happen in the future. A next catastrophe will be different! With regards to climate change extreme events are expected to occur more often. Using catastrophe models it is possible to consider the probability of climate extremes, to make damage and vulnerability assessments. The models can be used to explore climate change risks, adaptation scenario's and alternatives. With these models the pricing of risks can also be explored. It is important to know how much to invest each year to pay for future potential losses.

Laurens Bouwer looks into the dynamics of weather risks in the future. Projecting economic losses requires both insight in changes in the weather hazard as well as insight in the exposure and vulnerability to such hazard. With two cases he shows the dynamics of weather risks in the future. He applies different climate scenario's as well as socio-economic scenario's to show potential losses. Most studies show that the socio-economic changes have a higher effect on future risk than climate change. Climate change may amplify the effect of socio-economic change.

H.F. Treur discusses the question of what climate change will cost insurance companies. For this, the effects of heavy rainfall events on the related losses for insurers is researched. The study showed that there is a clear relation between insurers' losses and heavy rainfall. The intensity of the rainfall is more important than the total amount of rainfall. Climate change scenario's for the Netherlands indicate that the rainfall intensity will increase during heavy rains in the summer. This implies that insurers can expect more claims due to climate change. The study also showed regional differences regarding the number of claims and the damage amount per claim.

The Netherlands does not offer an insurance against flood damage. The government can compensate for losses in case of natural catastrophes. However it is uncertain if and how much the government will compensate after an event. A flood insurance could be a good measure to increase economic resilience according to Wouter Botzen. The question is whether households would be interested to buy such an insurance. Because the high costs in case of a hazard, it may not be possible for private insurers to offer an insurance. Therefore a public-private scheme is tested in which part of the damage is compensated by the government. The results indicate that opportunities exist for a (partly) private insurance market.

Jessica Ludy deals with the public perception of flood risk in the Sacramento San Joaquin Delta in California where a flood insurance exists. The United States National Flood Insurance Program (NFIP) intends to minimize flood risk by demanding flood insurance coverage for residents of areas situated in floodplains with a return period of floods up to 100 years. These residents also have to take measures to flood-proof their houses. Areas situated behind levees are not considered as floodplains and therefore no insurance is required. Most residents believe that they would not be allowed to live behind a levee if it were not safe. A survey in a newly developed area showed that residents: are not aware of the flood risk, have not been told that they are at risk and are unprepared for a flood. It is recommended that the land behind the levees should also be treated as

floodplains, and to base the insurance rate on the actual risk. It is important inform people of the risks to increase awareness.

Heidi Kreibich shows that experience is a strong motivator for better preparedness. She presents a study of households and businesses along the Elbe river, Germany to investigate changes in flood preparedness a few years before and after flood events in 2002 and 2006. All interviewed subjects were affected by both floods. People in the affected area had little flood experience prior to the 2002 event. The study shows that flood awareness has increased significantly for both households and businesses since the 2002 event. Ninety percent of households had taken precautionary measures before the 2006 floods. However, almost a third of the businesses had not taken precautionary measures to reduce damage before the 2006 flood. Particularly for businesses regulatory programs and programs encouraging proactive behavior should be implemented.

The final presentation in this session is given by Hans Waals. He demonstrates how options for a new governmental arrangement are researched in a pilot study area: the Island of Dordrecht. The area is located between the rivers Meuse and Rhine nearby the North Sea. Large parts of the area lies behind the levees. In the light of climate change the safety situation has to be reevaluated. The new policy concept, the 'multi layer safety' (MLS) was issued in the Water Plan (2009). Even though the probability of flooding is low, the occurrence of floods has to be taken into account. Therefore it is important not only to focus on preventing the area from flooding (the first layer). The second and third layer of the policy are developed to mitigate the effects of flooding. The second layer aims at the urban and regional planning and the building codes. The third layer consists in safety plans for flooding, evacuation plans and regular exercises. The Waterboard Hollandse Delta, the municipality of Dordrecht and the regional safety authority Zuid-Holland-Zuid are each responsible for one layer of the policy. By joining forces more economic effective and social acceptable solutions can be found.