



# 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 7. Port development and infrastructure</b>	
<b>DD 7.2 Extreme weather impacts on critical infrastructures: International lessons to improve analysis</b>	
<b>Chair</b>	Tiedo Vellinga, Port of Rotterdam / Delft University of Technology, the Netherlands
<b>Presentations</b>	<ul style="list-style-type: none"><li>● PhD Jane Mullett, Global Cities Research Institute, RMIT University, Australia</li><li>● L. Andrew Bollinger, Delft University of Technology, the Netherlands</li><li>● MSc Tara Geerdink, TNO, the Netherlands</li><li>● PhD Judith E.M. Klostermann, Wageningen UR, the Netherlands</li><li>● Bas Wols, KWR Watercycle Research Institute, the Netherlands</li></ul>

The session focuses on the impacts of extreme weather on critical infrastructures and the policy that can address those impacts.

Jane Mullet, Research Fellow and Research Manager of the Climate Change Adaptation Program, in the Global Cities Research Institute (GCRI) from RMIT Australia describes the institute case studies for assessing the climate change impacts on ports in Australia and the Pacific. The results of the assessment suggest that the climate impacts on ports vary spatially and include both extreme events and long term climate change. What is more, the impacts influence a wide range of port activities from the navigation to the supply chain. In particular, Jane Mullet refers to specific threats that the ports face. 'Sea level rise seems not to be a problem for the big ports. Big ports are clear about the sea rise and dealing with that. Smaller ports are struggling' she says. Ports can also be vulnerable to extreme events such as cyclones. For smaller ports 'climate change is a risk multiplier' to already existing problems. Big ports on the other hand, are dealing with extreme events, 'they are ok'. They incrementally increase the health and safety levels of security for their workforce in the case of extreme events. In addition to dealing with the direct impacts, Jane Mullet stresses the impacts on the supply chain due to extreme climatic events even in other parts of the world. As an example, she refers to the impacts that the massive flood in Thailand had for the port of Kembla. 'The port of Kembla has a significant throughput of cars from Thailand. Due to the flood in Thailand, the port lost months' worth of business'. For all the aforementioned reasons, the research group created an interactive online tool which provides a visual representation of an extreme event that port authorities and stakeholders can use to discuss and make decisions. The research group engaged port authorities to interactive workshops to test the tool.

Andrew Bollinger, phd candidate at the Faculty of Technology, Policy & Management at Delft University of Technology presents his study as part of the Infrastructure Networks Climate Adaptation and Hotspots (INCAH) research programme. He describes the development and results of a computational model for assessing measures to support the resilience of the Dutch electricity infrastructure system with respect to extreme weather events. His research focuses on two types of extreme weather events, floods and heat waves. Andrew Bollinger stresses the fact that the Dutch electricity infrastructure system is in fact the most reliable system in Europe with a 0.6 % of total interruptions. Nevertheless, the results of his study suggest that there is some vulnerability to both flood and heat waves with less vulnerability to heat waves than flood. The main impacts for the





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system are related to power interruptions due to the flooding of medium and low voltage substations and the cascading effects that those events can have for other infrastructures such as the traffic system. In order to reduce the vulnerability to those events, he suggests adaptation measures that include providing back-up power to traffic signals and assessing the flood protection of the substations. 'We don't know the protection heights of the substations' he says. Investing on small scale electricity generation will also be beneficial. 'With relative small investments we can have a large positive impact and achieve high resilience' he concludes.

Tara Geerdink from TNO presents also a project which was a part of the Infrastructure Networks Climate Adaptation and Hotspots (INCAH) research programme. The project aimed to connect climate change knowledge to policy and involved several stakeholders. 'There is a gap between scientists and policy makers' she says. The instruments she used to get scientist to share knowledge and insights with policy makers mainly involved role play games during interactive workshops. 'It is the process that makes this impact'. The programme involved three workshops during which the relevant parties discussed interdependencies and exchanged knowledge. 'During the process there was a lot of knowledge exchange' she says. According to Tara Geerdink, the key point for achieving the necessary connection between science and policy is to have enthusiastic people and committed stakeholders. The second important thing is to focus on case studies. 'Frustration is high, policy makers do not know what to do. It is important to have a plan of what to do in case of emergency. Which scientists to call and where to get the data and info'. What is more, 'language is very important' she adds. Often policy makers and scientists do not communicate effectively. Ideas and insights, cooperation and applicable results start with a connection. 'We are not there yet but we are one step further' she concludes.

Judith Klostermann from Alterra Wageningen University presents an assessment of the Eemshaven port area to flood and sea level rise risk. According to Judith Klostermann, in that region there are 25 companies out of the dyke. Climate change and especially the sea level rise might pose a threat to the facilities of those companies. Her study aimed to identify which companies are aware of their position relatively to the dyke. For that reason, she conducted interviews in 11 companies that are located in all different areas of the port (inside and outside of the dyke). 'We tried not to influence their answers' she says. 'We didn't tell them if they were outside of the dyke'. The results of the study showed that 6 companies were aware that they were outside of the dyke and 2 were assuming that they were inside. Judith Klostermann explains the reason behind the confusion. 'The location of the dyke has changed over the years and the local government has not informed the companies about their position relevant to the dyke'. The study results suggest that only three companies have flood strategies, although none of the companies is insured against flooding. The companies that do have a strategy and are aware of their position relevant to the dyke are concerned and act on their own. 'They take measures on their own but in general the adaptive capacity is low. The role of the government in terms of providing protection for the companies outside the dyke is also not clear to the companies' she says.

Bas Wols from KWR concludes the session. He starts his presentation by mentioning that water companies want to reduce failures of their piping systems in the future. Therefore, his study aimed to estimate the future pipe failure frequency under the effects of climate change. According to Bas Wols, temperature is the most influencing climate variable therefore the analysis focuses on the effect of temperature on pipe failure. The study applied a statistical analysis on failure registrations





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to investigate the effect of ambient air temperature while also accounting for the evolution of replacement and aging of the pipes over the years. The study results suggest that different materials are affected in a different way. Nevertheless, 'the effect of climate change is quite small in the Netherlands as a whole. The largest variations in pipe failure are related to ageing of the pipes' he says.

