## Deltas in Practice, policy-practice sessions

### Deltas in Practice Theme 1. Risk assessment

### DP 1.1 Future Weather: a new instrument for policymakers and risk analysts

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| Chair | Prof. dr. Wilco Hazeleger, KNMI, the Netherlands |
| Organised by | MSc Bernadet Overbeek, KNMI, the Netherlands |
| Presentations | • Dr. David Stainforth, London School of Economics, United Kingdom |
| | • Prof. dr. Bart van de Hurk, KNMI, the Netherlands |
| | • Prof. Sten Bergström, SMHI, Sweden |
| Co referents | • MSc Hans Waals, Regional Water Authority Hollandse Delta, the Netherlands |
| | • Pieter Bloemen, Staf Deltacommissaris, the Netherlands |
| Session topic | • Future Weather generates realistic time series of high-impact weather events, which can be used to explore their impacts on e.g. infrastructure and water management. |
| Objective of the session | • The presentations focus on Future Weather in the international context of climate services (like climate scenarios and probability distributions) and on its practical applicability. The implications of working with Future Weather for robustness tests, as well as the use of Future Weather to determine tipping points for adaptation paths are discussed. The aim of the session is to further elaborate on the applicability of Future Weather. |

### Main conclusions and lessons learnt from the presentations

David Stainforth points out the problem that, while global climate change predictions seem to be quite accurate, predictions on a local scale are highly unreliable, even though they are presented on maps with great detail. Besides, they do not provide a clear picture of real future weather conditions that is useful for local decision makers and communities. If local authorities base their adaptation strategies on these detailed predictions (often expressed as probabilities), they might take the wrong decision, resulting in over- or underinvestment. Stainforth argues that Future Weather, an approach that outlines plausible possibilities of future weather conditions, is much more useful than climate predictions or scenarios to determine impacts of climate change on a local scale.

Bart van den Hurk shows a Future Weather case on a real event in a watershed area in the north of the Netherlands. The modelsystem takes into account that two variables (coastal storm surge and precipitation/high inland water levels) do not occur independently, but are correlated. Which is logical really, since they are both related to wind patterns. Since disasters are often the result of two or more simultaneous events, it is important to develop models that take these compounding effects into account. Since compounding events are space and time scale dependent, such complex models must be tailored to local situations. The prediction of the impacts of future events is equally important as predicting future weather phenomena, the latter being far more important than climate statistics.

Sten Bergström illustrates the practical difficulties of implementing climate adaptation measures for a concrete project in Stockholm: the rebuilding of the sluices between Lake Mälaren and the Baltic Sea. There are many conflicting interests, such as water supply for Stockholm, water safety, agriculture, navigation, etc. Adding to the problem are urban development pressures on the waterfront. Climate change adds on to all these issues. Instead of being paralysed by uncertainties concerning probabilities, Stockholm uses scenarios to determine possible effects and necessary

measures, but these are highly contested.

Co referents' reaction

Hans Waals: Climate change uncertainties are a political issue. Water boards need to take measures now for the next decade. Plausible future weather situations are more important for deciding which measures to take.

Pieter Bloemen: The Dutch Delta Decision which has just passed parliament, proposes € 20 billion on water safety measures based on climate scenarios. He would like to know whether compound effects of two medium events are likely to be more dramatic than extremes of one event. The strategies proposed in the Delta Decision are flexible, so differences in approaches (future weather instead of climate predictions, compound event modelling instead of stochastic modelling) can most likely be accommodated.

Main conclusions of the discussion

Do 'plausible possibilities' tell us anything useful for making climate adaptation decisions? Stainforth argues that changes in the probability of the occurrence of events might be less important than plausible pictures of extreme future weather events.
There are seductive relations between science and politics, the latter demanding absolute certainties from the former. This runs counter to the plea for not focussing on probability-based predictions. The truth is that we have learned a lot, but the uncertainties have also increased. And the real problem is the uncertainties we don't know about. That means that even with built-in safety margins, we need to stay alert.

Another useful strategy may be to determine the tipping point, for example at what amount of sea level rise should we stop protecting a flood prone area? The danger is that this might negatively influence the value of property in the area. The best we can do is to invest in resilience and adaptive management. However, when the variability is too large, such as in the river system, the adaptive approach does not work well. The tipping point can not be forecasted by monitoring the system. In that case, a robust approach is more suitable.

Main result or conclusion of the session

There is definitely support for event thinking instead of probability thinking. And that is what the Future Weather concept implies: a plausible description of a recognisable event, projected to the future. The great advantage of this method – above using climate scenarios alone – is the high detail of weather information, both in time and in space, which is necessary for robustness tests of water and infrastructure systems at a local scale. Also the combination of circumstances can be studied, which is often the cause of high impact events.
Future Weather seems to be less useful for determining tipping points for adaptation, because the latter are based on probabilities; these cannot be given for a future weather event.

What was the most exciting insight(s) or outcome of the session? Please illustrate with quotes if possible

- Climate is for scientists, weather is for everybody
- Tipping points change when the focus is changed from climate to weather
- Economics are not predictable, as we have seen in recent years. Why demand certainty of predictions for climate change?
- Trust applies to people, not models or numbers. It matters who communicates on climate change and how. Trust arises in direct/informal contacts and in collaboration.

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| • Contrary to descriptions of trends, descriptions of events convey a much greater sense of urgency: it could happen tomorrow |
| • Changes in the geometry of the system, often difficult to reverse, influence events much more than boundary situations |
| • Present regulations sometimes prevent the implementation of adaptation measures |
| • You don't trust forecasts you cannot imagine. It is very important though, that extreme scenarios are seriously considered – Fukushima is an example where they did not. |