Deltas in Depth scientific sessions		
Deltas in Depth Theme 11. Decision support tools and risk assessment		
DD 11.5 Decision analysis and support		
Chair	Dr. Rob Swart, Wageningen UR, the Netherlands	
Presentations	•	Dr. Jan Kwakkel, Delft University of Technology, the Netherlands
	•	PhD Wenhui Zhang, AGT International, Germany
	•	PhD Saskia van Vuren, HKV Consultants & Delft University of Technology, the Netherlands
	•	MSc Arend Kolhoff, Netherlands Commission of Environmental Assessment, the Netherlands
	•	PhD Andres Payo, Environmental Change Institute/Oxford University, Oxford, United Kingdom

Comparing robust decision making and adaptation pathways for supporting climate adaptation

Robust decision making (RDM) was compared with adaptation pathways (DAPP). Both approaches were applied to the Waas case, which is inspired by a real area around the river Waal in the Netherlands. Both approaches were compared looking at their performance in terms of the outcomes casualties, flood damage and costs. Multi-objective robust optimization was used by Kwakkel et al. (2014) to generate outcomes with adaptation pathways. The RDM resulted in three possible policies and user preferences should determine the final plan. Main difference between RDM and DAPP is RDM analyzes many scenarios highlighting those under which problems occur. DAPP focuses on flexibility in selecting preferred option pathways whereas RDM enhances the understanding of vulnerabilities. Both methods are effective ways to support policy design and were considered complementary.

The public asks whether the models were validated. For outcome this was not possible as future designs were produced. Next, it was questioned how to combine the methods. Plans do not yet exist to apply the approaches jointly with stakeholders and simplifications are needed for this purpose.

Using data and technology for decision support and risk management

The underlying approach of the product ReadyMind was demonstrated. The bases for this product are the 5 p's: prevention, preparation, precaution, prediction, protection. These are needed to proactively prevent floods as this requires different types of expertise that are currently mostly isolated. Integrated water resource management (IWRM) solutions are needed to combine 'the internet of things', data modeling and analytics with operations and crisis management. The solution shows the flow from data to decision support tool in order to get the right information to the right user. An early warning application of the product was presented that included an innovative user interface approach that can provide real time, continuous predictions of, for instance, water level in 24 hours. The solution brings together expertise, a water resource management platform and collaboration with users. Examples demonstrated that the tool was, among others, used by 15 water agencies and 76 provinces.

The public wondered how people were built into the system as for instance early warning systems only work when people listen. The product has to be tailored to needs of stakeholders.

Decision making in times of water scarcity

Water deficits will become worse in the future in delta societies. More water is needed for various functions. There is a need for a methodology to support fresh water allocation. How well do measures reduce (drought/water scarcity) risks? And are they cost-effective? The presented approach uses the probability of drought related to their consequences. For the case study Gouda the salinity risk was determined. The impact of four measures was compared to the reference situation including investment costs. The costs are lower than the risk reduction benefits. Objective for the future is to apply this to the whole of the Netherlands and to a delta in California.

The public asks how risk based approaches compare to RDM. Probability and consequences should be the basis of adaptation pathways to include uncertainties. Jan Kwakkel adds that he also looked at the Gouda case. He compared consequences of potential future runoff and salt intrusion. Also models are used to determine future impacts.

Rob Swart asks how this approach can take into account multiple risks at different levels. Reducing drought risk can induce higher risks in other areas.

Towards implementation of the delta approach: Added value of strategic environmental assessment (SEA)

SEA aims at improving government planning and decision making: it integrates environmental considerations including climate change with economic and social considerations and facilitates debate on these issues. Key elements are dialogue, information, and decision-making. Three examples were shown where SEA was applied:

1. Example Giang in Vietnam: Here a national obligation existed to apply SEA to a Master plan that was linked to the climate change action plan. Public was not involved.
2. Ajara region, Georgie: Vulnerability to climate change was low in this region.
3. Tana Delta, Kenia: Vulnerable to climate change, discharge decreased about 50%, and conflicts between groups were important.

Conclusions indicate that SEA supported agenda setting, integrating climate change issues, taking a long term planning horizon, achieving climate change objectives, identifying alternative options, building stakeholder commitment and preventing conflicts.

In response, because of the large apparent benefits, Rob Swart asks why climate change is not integrated thoroughly in all SEAs everywhere. Not the lack of data, but lack of ownership can makes it less successful. The public asked whether climate change is well incorporated in SEA and EIA in the Netherlands? This was estimated to be about 33%. What if there is no scenario for certain areas? Most important is that the possibility of effects is included in planning instead of detailed scenarios.

Coastal state indicators interdependencies

Aim of the presented method is to develop tools that minimize interpretations and maximize use of facts. First, coastal state indicators were explained and shown. Indicators are hierarchical but also scale dependent and ecosystem service dependent. A raster was developed to compare model and system structure. The take home message was: modeler-stakeholder interactions should minimize different interpretations and trade-offs between different coastal services (with associated interdependent indicators, and maximize the use of facts, but the structural validity and boundary adequacy test of the methodology are still embryonic.

Discussion

The overall discussion was started by asking: If you think of the five presentations; what are the lessons you learned? Uncertainty is framed by knowledge on outcomes and probabilities. If we know both, a risk based approach is useful. But how effective are the presented approaches in a situation with little knowledge? Not all in the public are convinced or certain about which approach is best to help decision makers in which situations. Different frameworks and approaches are relevant for different questions. Sometimes risk is not the best way to address particular questions. In general, in terms of preferred approaches a change is observed from 'predict than act' to 'explore and adapt'. Are tipping points and probabilities really needed by decision makers? Often this is not asked for! It is proposed to address climate change adaptation by developing a road map that starts from the worst scenario and derives actions that are promising anyhow (no/low regret) or have them available when needed. And costs and benefits are not the only criteria to take into account: 'for a new bathroom, often also no cost benefit analysis is done'.