Deltas in Depth scientific sessions		
Deltas in Depth 10. Economics and Finance of Adaptation		
DD 10.3 Evaluation of adaptation tools		
Chair	Paul Watkiss, University of Oxford, United Kingdom	
Presentations	•	MSc Pini Wijayanti, Wageningen UR, the Netherlands
	•	PhD Marcel Marchand, Deltares, the Netherlands
	•	MSc Maaike van Aalst, Deltares, the Netherlands
	•	Pauline Brémond, IRSTEA, France

Economic modelling for selection of flood protection measures in Jakarta: An optimization approach, MSc Pini Wijayanti, Wageningen UR, the Netherlands

Jakarta has floods from excessive river flows and from coastal flooding (Aerts et al 2009). A combination of structural and non-structural flood measures are required. Three is a limited budget to implement flood adaptation; so, economic consideration is required for all flood adaptation measures.

Wijayanti reviewed an analytical model to minimize the costs of flood adaptation. The model can be applied to multiple areas and includes a temporal dimension, so that different flood adaptation measures can be constructed and used under different time periods.

Further studies are needed to integrate ecological and hydrological analyses. The model was initially focused on infrastructure costs but socio-economic costs should also be included.

Design of assessment frameworks for delta adaptations – experiences from the Netherlands and the USA, PhD Marcel Marchand, Deltares, the Netherlands

Building resilience towards climate change requires a long term vision on how to adapt for climate change and socio-economic development. But little knowledge exists on how to design a framework that can handle uncertainly of long term adaptation strategies. Frameworks tend to be focused on shorter timeframe; and dealing with quite diverse situations. How do we design assessment frameworks that can grasp diversity, uncertainty, and long-term horizons?

Two examples of programs to develop assessment frameworks: (1) Rhine delta and (2) Hurricane Sandy in US; focused on water, floods, sea-level rise, salt intrusion etc.

1) Rhine delta. The Dutch government asked for an assessment framework to be devised that could be used to assess the Dutch delta program and could be used by different groups of people. The assessment framework must answer two main questions for program design: (i) does the project give the goals for safety and freshwater supply?, (ii) is the project flexible? The assessment framework uses different data characteristics to evaluate the program; these data characteristics must be scored within a criteria matrix. Scoring must be done over specific time horizons. Several criteria were set for the model: safety against flooding; freshwater supply; impacts on opportunities for other functions; implementation, and financial feasibility.

Lessons learned include: the model must be flexible; important to define spatial scales and reference situations; important to include a checklist of criteria, but to avoid using too many criteria otherwise the model becomes unwieldy.

2) 'Rebuild by design' (RbD) to rebuild areas in US impacted by Hurricane Sandy. This was a multi-stage design competition to develop innovative, implementable proposals to promote resilience.

An important question was, how do we evaluate the effectiveness of these models (developed in this competition) over time?

The objective of the completion was to stimulate and support the design teams to think about the beneficial aspects of their project, project evaluation and implementation. The design teams needed to identify a reference situation of the area under analysis, and identify stakeholders.

Some example criteria that were used in the models were: life cycle costs, flood protection, environmental value, social value, economic value.

Lessons learned were: it was helpful to force the design teams to think about project alternatives (this was challenging for both the Dutch and the US projects discussed here); it forced the teams to think, early on, about the most promising and feasible solutions; the framework must be flexible for use by different stakeholders.
Discussion: How did the frameworks help decision-makers deal with uncertainty? Different scenarios were used, though this was not done correctly in several instances. It is hard to pick climate and socio-economic scenarios that are accepted by different types of users.
There is a risk in the scoring process, so how do you evaluate what is 'promising' or not? Regional perspectives may show particular features that coincide with other perspectives. When local solutions are combined with results from other policy domains then they can work well.

Comparing economic tools for evaluation of adaptation pathways to support climate adaptation, MSc Maaike van Aalst, Deltares, the Netherlands

The economic evaluation of adaptation pathways is complex. It can be very difficult to decide how to invest for an unpredictable future, when to do this, and how much to invest. A water management strategy should be robust and flexible – this will lead to a sustainable strategy.
Marjolijn Haasnoot has designed a new policy approach of dynamic adaptive policy pathways with adaptation tipping points and pathway choices designed to deal with uncertainty.
Van Aalst presented a hypothetical approach for the Waas, at different river discharges and how to adapt to continue to allow shipping. The model used a process of ranking of pathways (A, B, C, D, etc.) through cost-effectiveness, for different uncertainties (climate, ecological side effects etc.), discount rates, time periods. In this example, policy models for managing river discharge that allows for shipping must not exceed a certain acceptance level (ie a tipping point) of river discharge. One can assess the different economic costs and benefits for different prescribed tipping points.
When one policy becomes unsustainable, you shift to a different pathway. You can assess the success and effectiveness of different pathways over long periods of time. Tipping points for different scenarios may occur at different times, and have different periods of uncertainty.
It is possible to examine the economic robustness of different pathways, and the transfer costs for switching from one pathway to another; (pathways that tend to be ones that are most favored for first responses tend to be the ones that are economically most effective initially?). Decision-makers tend to think in terms of 'what would be my best first decision based on the overall long term outcome?'
Discussion: It would be good to include a measure of 'regret' in the calculation; i.e a measure of what would have been the preferred pathway given certain changes in conditions. For example, would it have been better to follow pathway C rather than pathway A given some change in climate, and how does one measure the cost of not following that better pathway.

Interest of agent-based vs macroscopic approach to evaluate adaptation measures of private sectors to flooding, Pauline Brémond, IRSTEA, France

Asked why assess adaptation, how do we assess it, and what type of adaptation are we interested in? She discussed adaptation of economic activities to deal with flood risk before it occurs, and our responses to flooding after it occurs. What are the consequences of individual adaptation on damage; what is the distribution of costs and benefits for the adaptation?
Types of damage include (i) direct damage, which is measured either directly or by modeling; (ii) indirect damage measured by 'agent based modelling' (ABM).
Macro approaches are advantageous because they account for the economy as a whole, they reflect intersectoral linkages, produce aggregate values and data are available. But they do not account for links between direct damage and productivity, and they do not provide a measure of firm behavior.
ABM tends to address all the points macro approaches do not, but are not based on full data or well calibrated, and do not take account of the whole economy.
Discussion: Is there any work on validating the model? They will try to develop a local case study to validate the model.
AGM can be challenging; it is best not to try to model economy as a whole, but focus on specific sectors.

The main issue of uncertainty is the estimation of the costs and uncertainties. But this already starts with the volumes (being measured??). There is a large cloud of uncertainties that go well beyond the simple costs that are usually considered; and uncertainties increase over time.
We often pick our tools post facto simply to justify the choices we already made. We must remember that the tools can help us make the analysis, but they don't make the choices for us.