Deltas in Depth scientific sessions		
Deltas in Depth Theme 4. Coastal systems and wetlands		
DD 4.8 Coasts between conservation and realignment		
Chair	Prof.dr. Stijn Temmerman, University of Antwerp, Belgium	
Presentations	•	Joep Keijsers, Wageningen UR, the Netherlands
	•	Luciana S. Esteves, Bournemouth University, United Kingdom
	•	MSc Jantsje van Loon-Steensma, Wageningen UR, the Netherlands

Modelling climate-change effects on coastal dunes
Joep Keijsers (Wageningen UR) presents his efforts on modelling the evolution of coastal dunes in the Netherlands between 2000 and 2050. Dunes are the primary flood protection along large parts of the Dutch coast. Climate-change scenarios indicate a continuation of sea-level rise, higher temperatures and reduced summer precipitation. While we know that such trends have an impact on coastal dunes, their exact effects on dune dynamics and thus flood the flood safety level are uncertain.

After extending an existing model to a coastal setting, Keijsers and his colleagues found good agreement between modelled and observed trends in coastal dunes. An application to the 2000-2050 period with a 'no change' and a 'climate change' scenario show clear climate-change effects on the dunes. First, dune growth slows down relative to the current rates. Second, after an initial equilibrium, the dunes gradually retreat landward at a rate equal to the transgression. Both effects are largely due to sea-level rise. The immediacy of these effects is site specific: effects can be instantaneous on already narrow sites, whereas dunes on accreting sites may continue to grow for several decades. With such a site-specific understanding of dune evolution, dune management can be made more effective.

Managed realignment: a sustainable approach to restore coastal habitats and manage flood risk?
Luciana Esteves (Bournemouth University) questions the sustainability of managed realignment as a coastal management strategy. She argues that 'Managed realignment' is a popular yet nebulous terminology to describe the strategy of establishing a new flood defence line at some distance from the original line. Its aim is to improve long-term flood safety by creating space for water storage and flood regulation. At the same time, this additional space can be used to enhance ecological values, for example by creating habitat.

Many cases of managed realignment have been carried out in Western Europe and many are planned in the near future. Although the multiple benefits are attractive, relatively little is known of the long-term evolution of realigned sites: what type of habitat is going to develop? What are the effects on flood risk?

Esteves stresses the need for better research and monitoring programs, so we can improve our understanding of the long-term effects of managed realignment. With proper datasets, we can also provide evidence of the strategy's benefits, which is crucial for creating a balanced public perception of realignment. With better public perception and long-term knowledge, the sustainability of the realignment approach can be greatly improved.

Conservation and development of Wadden Sea salt marshes as a long-term adaptation strategy
Jantsje van Loon-Steensma (Wageningen UR) and colleagues point us to the potential of salt marshes for enhancing long-term flood protection. With climate change and long-term safety in mind, the Dutch Delta Committee recommended to raise the flood safety level in the Wadden area. As the Wadden are a protected nature area, a synthesis is sought between flood protection and ecological values.

Originally, salt marshes were not considered in the Dutch coastal safety plans. Only recently the potential of salt marshes for improving flood protection has been appreciated. On the basis of a modelling study, Van Loon and colleagues show that salt marshes are able to considerably dampen waves during storm events, even under extreme conditions. In addition, these marshes have prominent ecological and recreational values. Hence, salt marshes are a valuable addition to existing defence structures to promote both flood safety level and nature quality. Two case studies on the Dutch barrier islands demonstrate that natural expansion of these marshes is promoted by other erosion protection measures, such as stone dams. As a long-term adaptation strategy, Van Loon proposes several salt marsh designs, each with different wave-damping properties and ecological potential. Now it is clear why Dutch governments are now seriously evaluating salt-marsh development as an option in their flood-protection plans.