

In search for more robust flood protection concepts in the Dutch Wadden area

Jantsje M. van Loon-Steensma (Wageningen UR); Harry A. Schelfhout (Deltares); Pier Vellinga (Wageningen UR)

Contact: Jantsje.vanLoon@wur.nl



Delta Programme Wadden Area

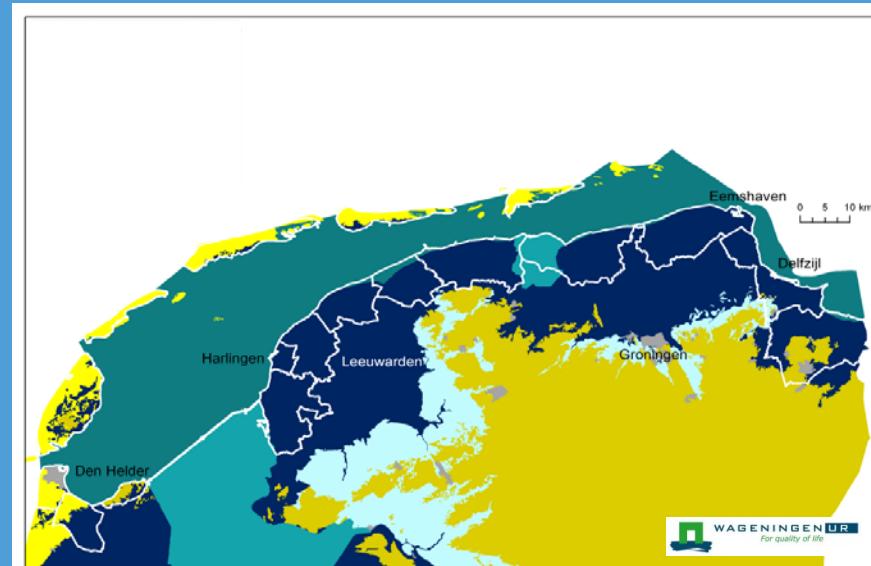
Advice Deltacommission 2008 → Recommendations on how to protect the Dutch coast and the low-lying hinterland against the consequences of climate change

Delta Programme → in search for measures

Objectives Delta Programme Wadden area:

To explore possibilities to ensure flood protection in the Wadden area in the long term taking into account both nature and landscape values

- Mainland
- Wadden barrier islands



Task to improve flood protection

Flood defences along Waddencoast: several stretches in Wadden area do not meet current standards



Innovative flood defences

Does the task to comply with (current and future) standards create chances for innovative flood defences?

2011: Explorative study on innovative flood defences

- Overview of innovative concepts
- Promising concepts for Wadden area
- (preliminary) Framework to assess promising concepts

2012: Pilot study Lauwersoog

2012/2013: Pilot study Dollard

Overview flood defence concepts

Traditional flood protection concepts

- Traditional coastal dikes
- Technical structures

Innovative flood protection concepts

- Basic concepts
- Robust concepts
- Parallel defences
- Hybrid solutions
- Eco-engineering
- Sand based concepts
- Technical structures

Traditional engineering design



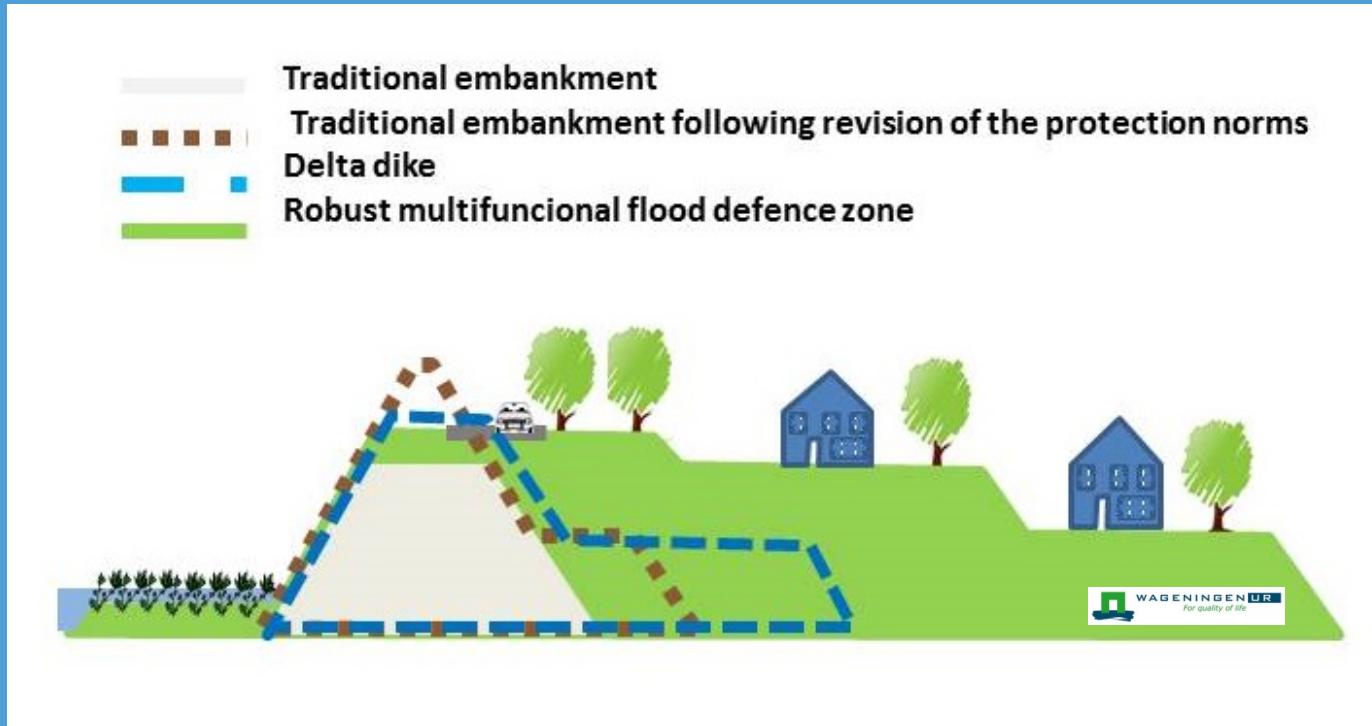
Technical structures



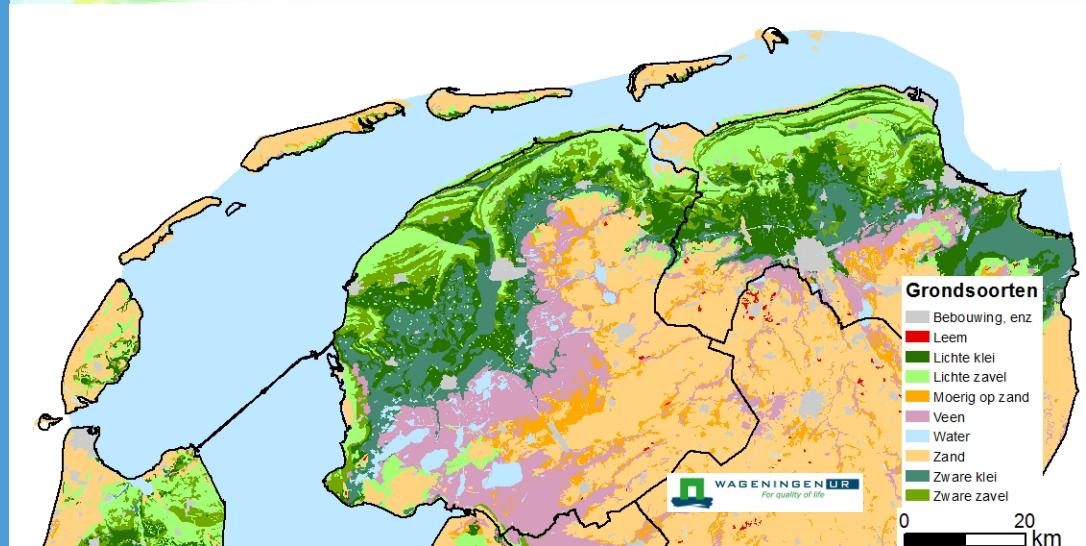
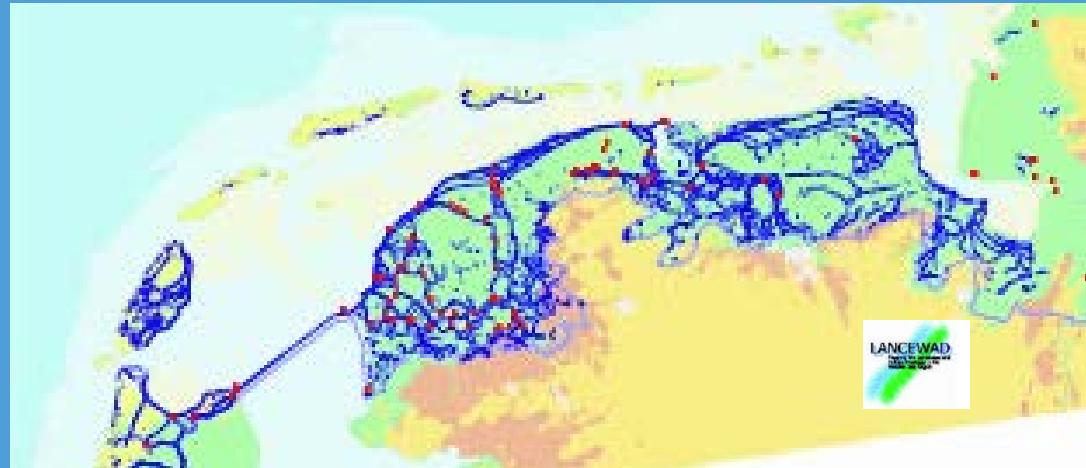
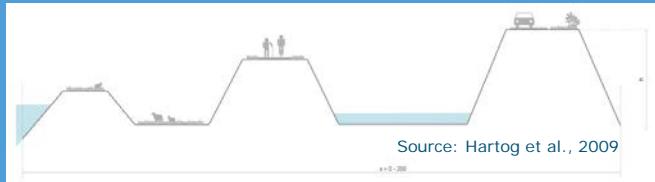
Basic concepts

- Overtopping resistant
- Overflow resistant

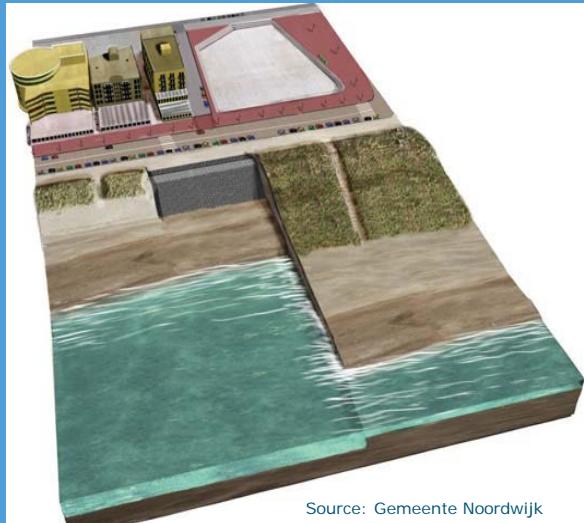
Robust Design



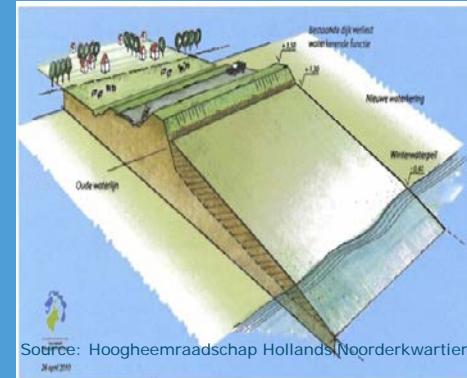
Parallel defences



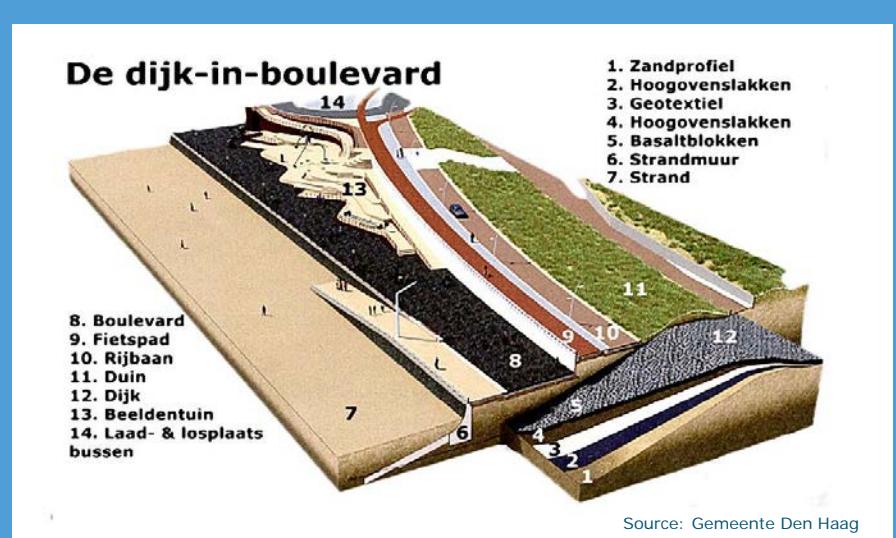
Hybrid solutions



Source: Gemeente Noordwijk

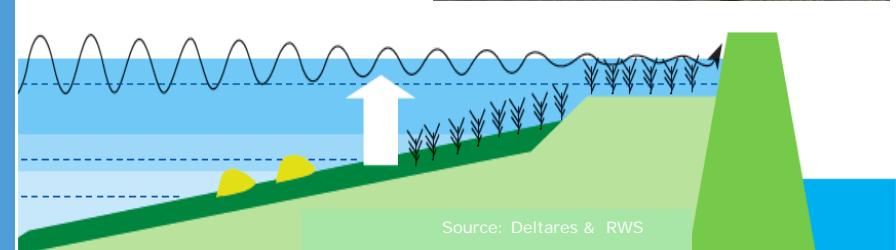
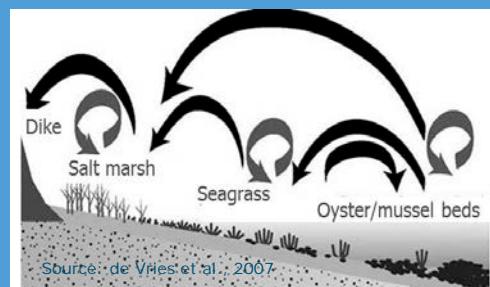
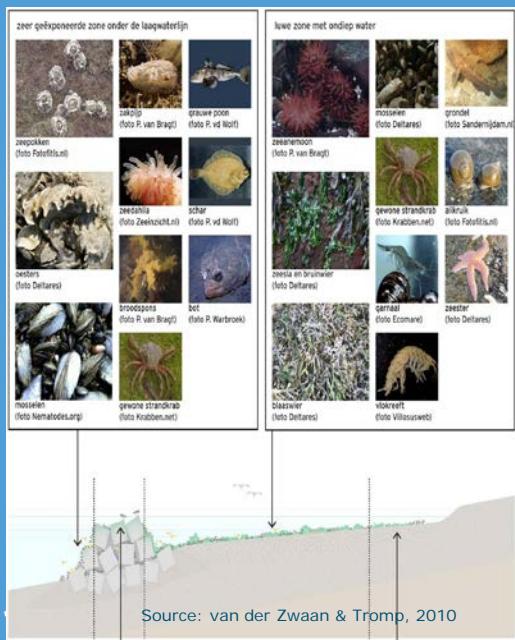
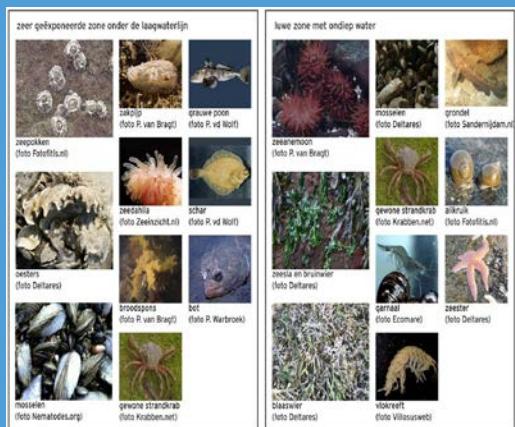
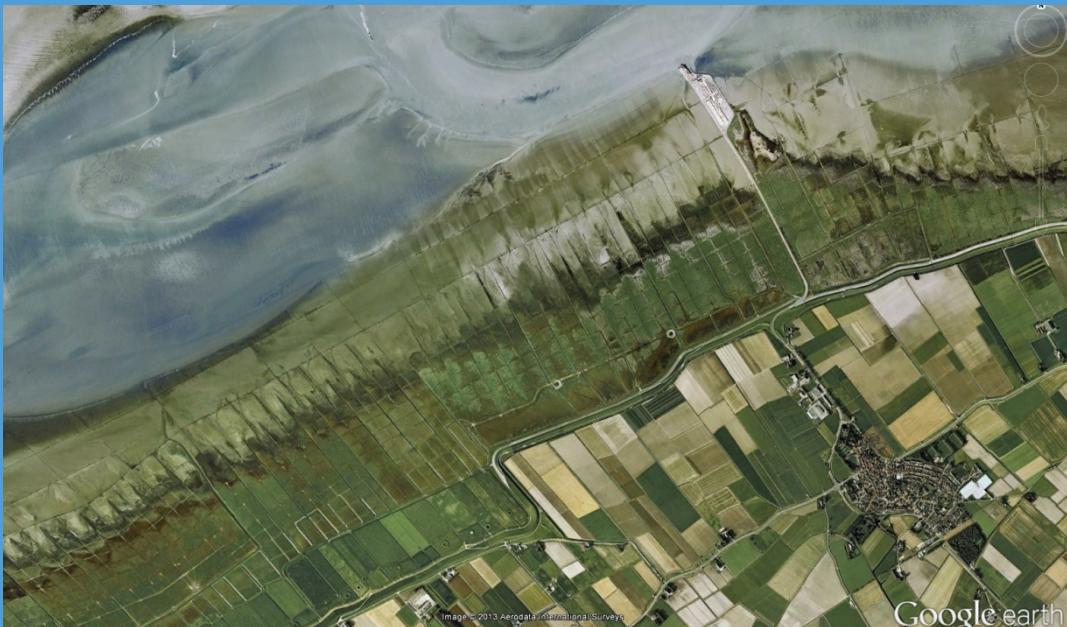


Source: Hoogheemraadschap Hollands Noorderkwartier



Source: Gemeente Den Haag

Eco-engineering

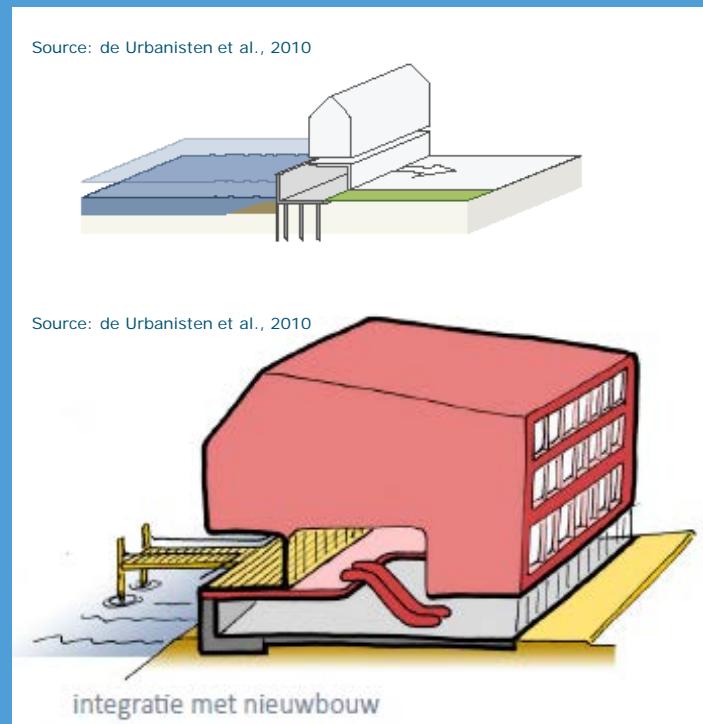
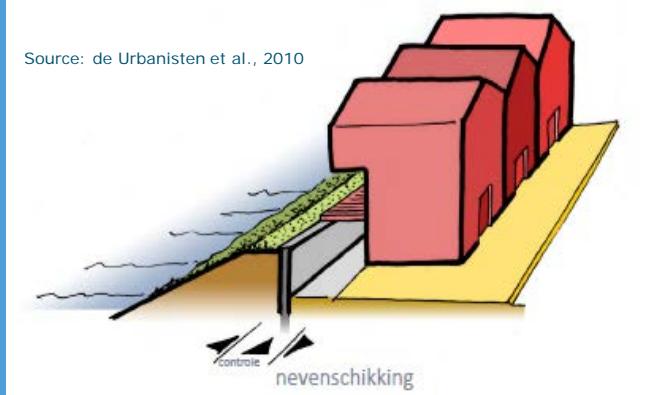


Sand based concepts

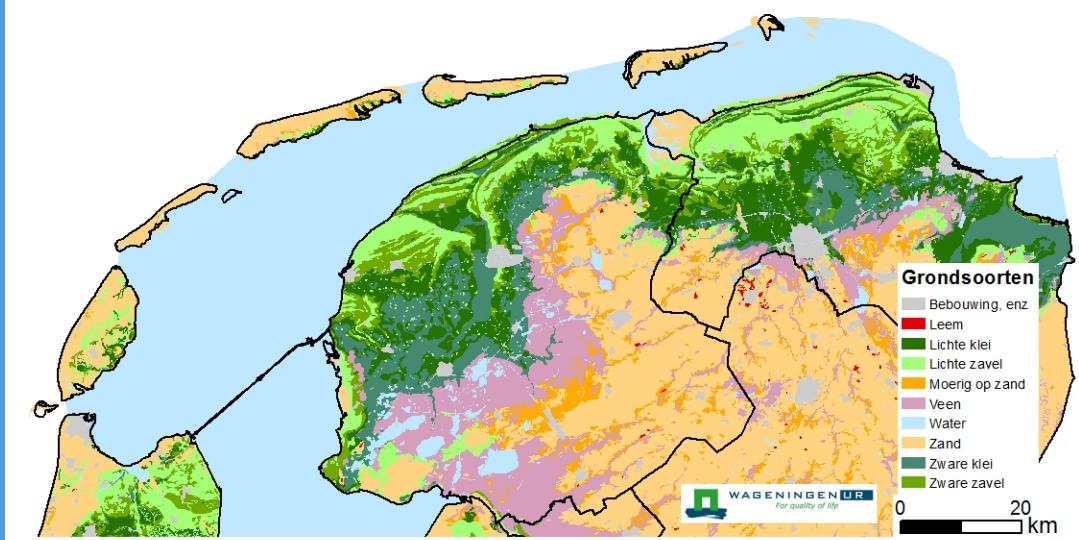
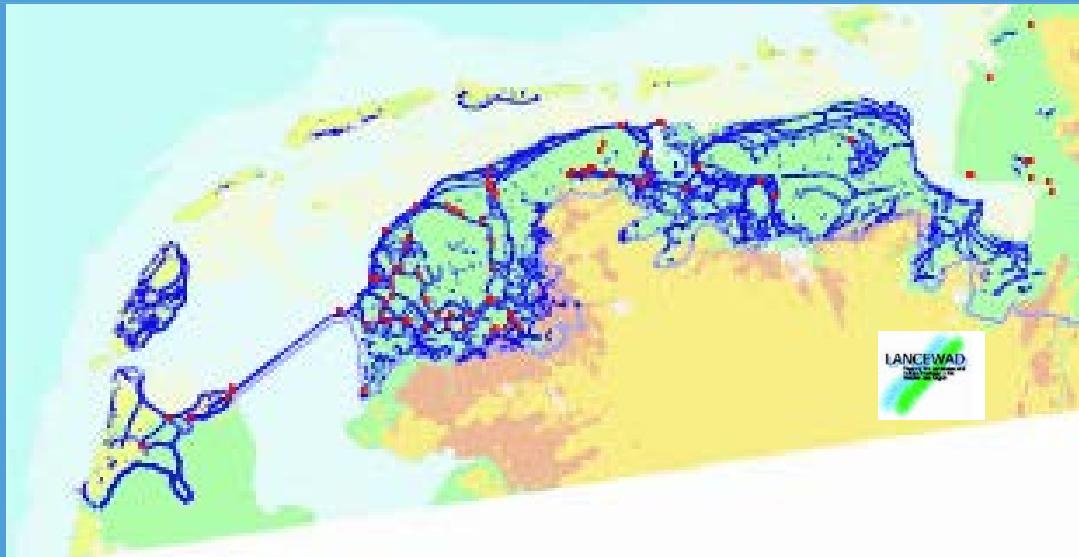
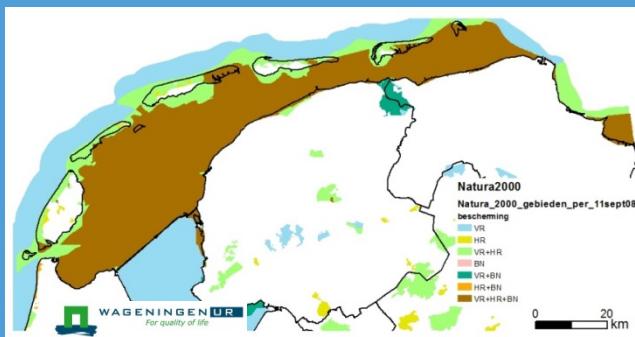
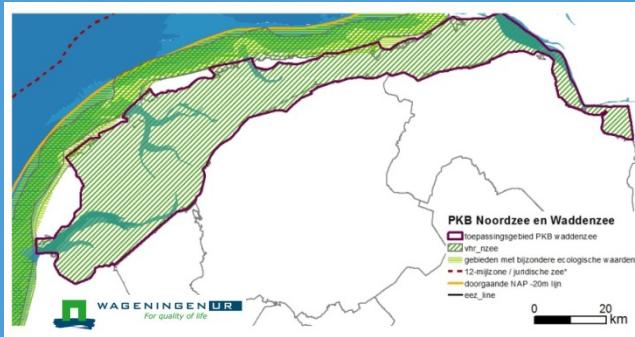


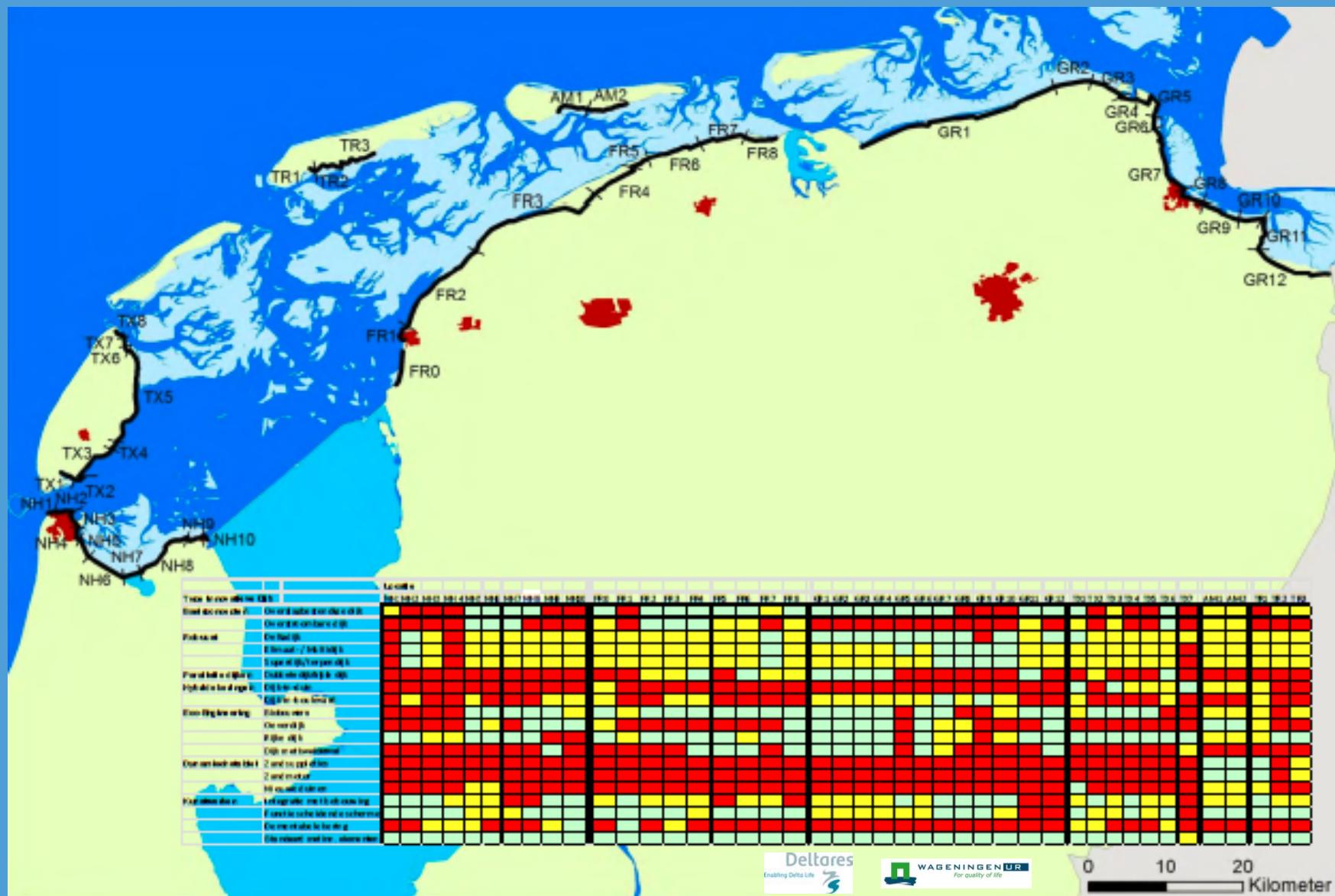
Source: www.dezandmotor.nl

Technical structures



Characteristics of the Wadden Area





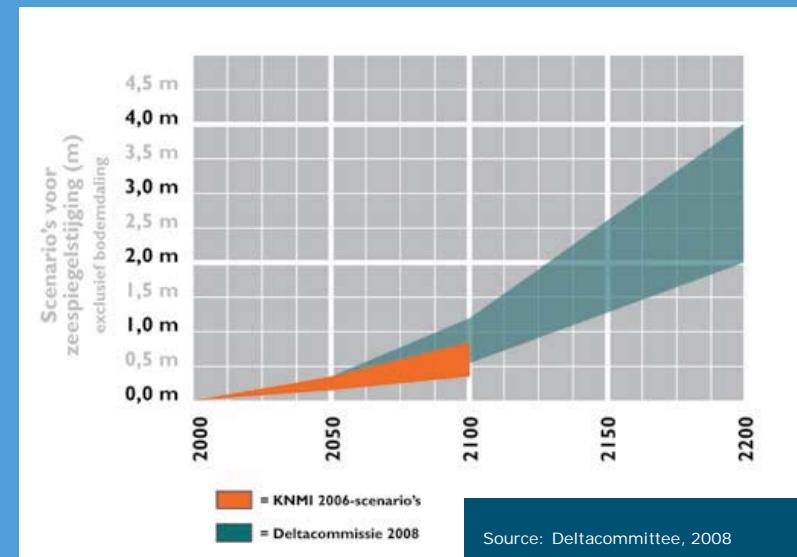
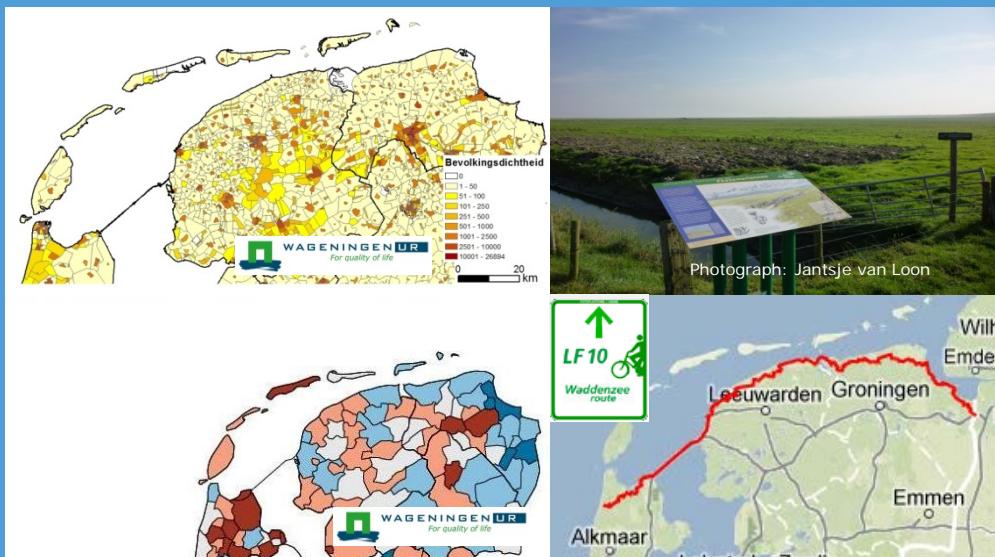
Promising concepts for Wadden area

- On most locations in Wadden area: adaptation of traditional flood defences to enhance local biodiversity and ecosystem functioning
- Urban areas: integrating buildings with flood defence
- Urban areas: robust concepts
- Areas with historic dike pattern: parallel concepts
- Areas with salt marshes: integration of salt marshes with the flood defence



Identifying suitable concept

- Location specific
- Tasks, ambitions, legal framework, benefits and costs
- For the long term: robust



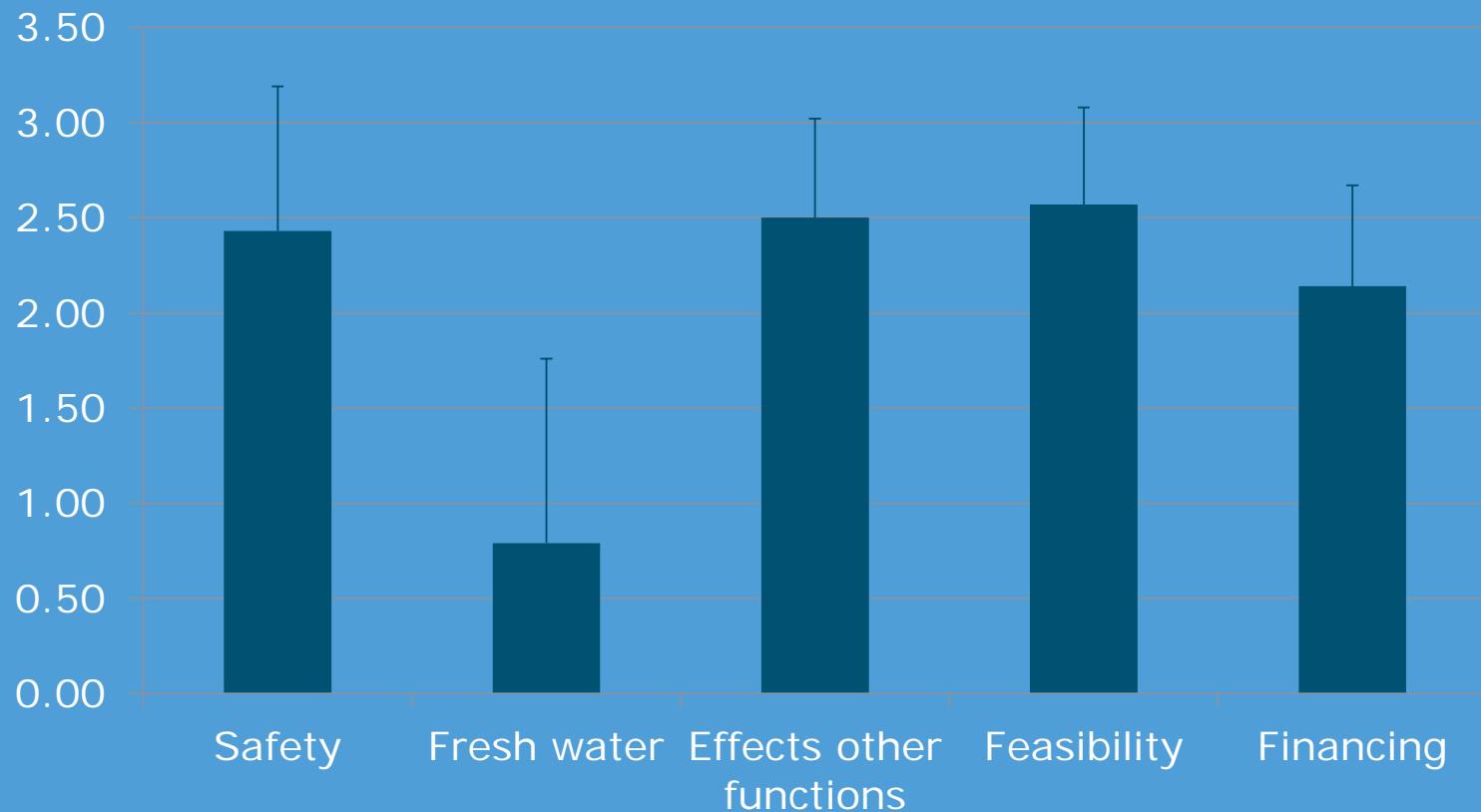
Pilot study Lauwersoog





WAGENINGEN UR
For quality of life

Ranking main criteria Delta program for pilotlocation Lauwersoog



Pilot study Dollard:



Source: Hunze & Aa's



Thank you for your attention

Loon-Stensma, J.M. van, Schelfhout, H.A.; et al. (2012). Verkenning Innovatieve Dijken in het Waddengebied; Een verkenning naar mogelijkheden voor innovatieve dijken in het Waddengebied. Wageningen: Alterra (Alterra-rapport 2294).

Loon-Stensma, J.M. van, Schelfhout, H.A. (2012). Pilotstudie Innovatieve dijken Lauwersoog; Ervaringen meerwaardebepaling innovatieve waterkeringen voor de pilotlocatie Lauwersoog. Wageningen: Alterra (Alterra rapport 2294).

Schelfhout, H.A., Eernink, N.M.L., Loon-Stensma, J.M. van (2012). Pilotstudie zeedijk Lauwersoog; Dijkconcepten, kruinhoogten en afwegingsmethode. Delft, Deltares (1206239-000).



Photograph: Jantsje van Loon

Contact: Jantsje.vanLoon@wur.nl

Harry.Schelfhout@deltares.nl