EcoShape
building with nature

Deltares
Enabling Delta Life

Ecosystem Engineers, Ecodikes, Rich Revetments, Harbouring opportunities

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[1]Deltares / Lector Building with Nature at Zeeland University of Applied Sciences

[2]IMARES / Lector Marine Ecosystems at Van Hall Larenstein University of Applied Sciences

Ecosystem Engineering in The Netherlands

Soft solutions → **Hybrid hard-soft mix** → **Hard solutions**

more space, more BwN,
more flexible, cost-effective (?)

→

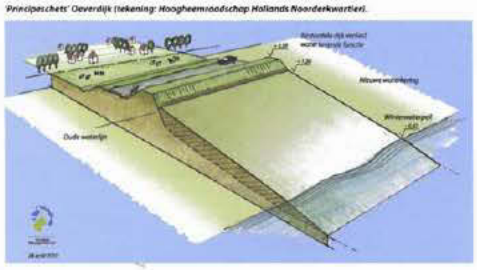
less space, more BfN,
less flexible, extra investment

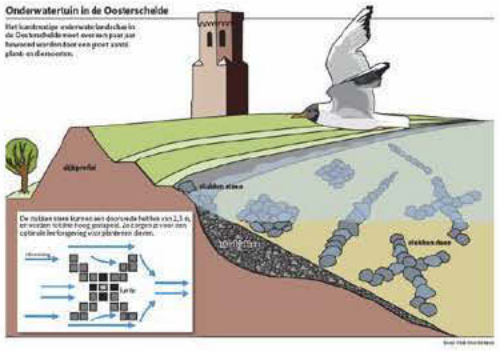
Wadden Sea - IJsselmeer

Oyster reefs Eastern Scheldt

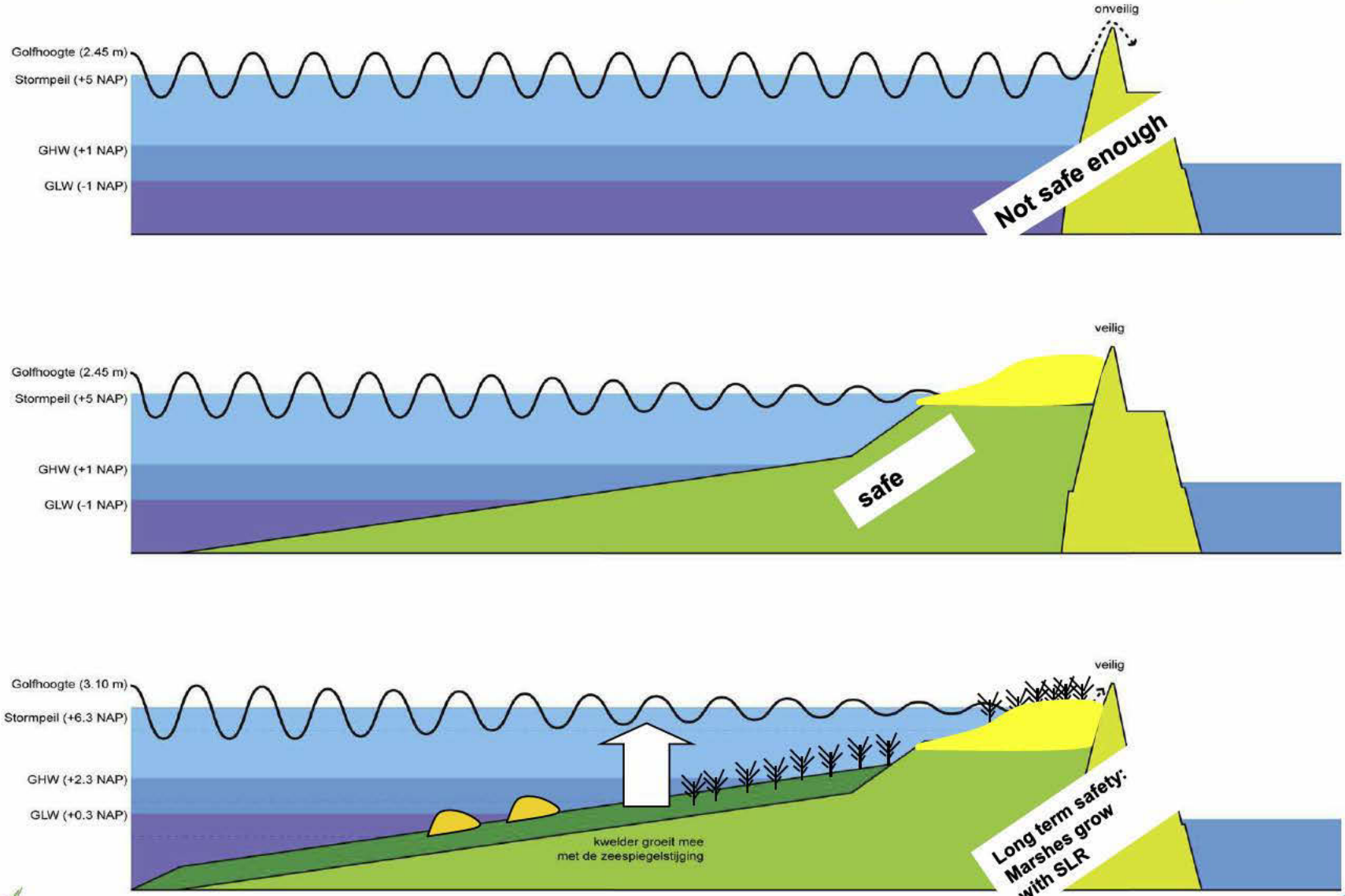
Rich 'Levees' Eastern Scheldt

RfR Noordwaard





Building with Nature : reefs, salt marshes, soft and hard



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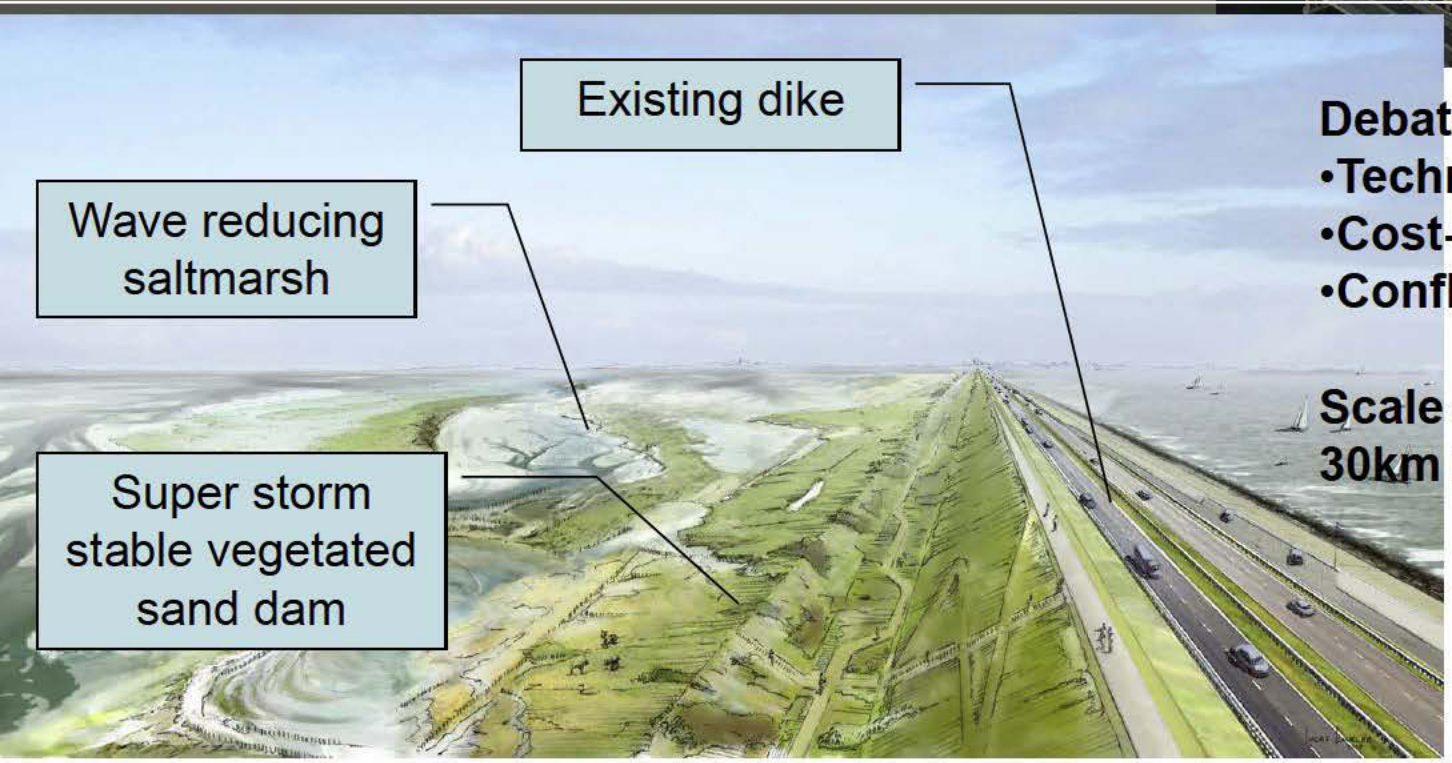
Wadden Sea Soft Safe Dike: saltmarsh/sand dam/dike



Debate:
- **Technical feasibility**
- **Cost-benefit**
- **Conflict with Natura 2000**

Scale 500m wide
30km long

Saltmarsh grows with sea level and maintains stability and safety
Flexible, low tech, low maintenance cost, longshore connectivity

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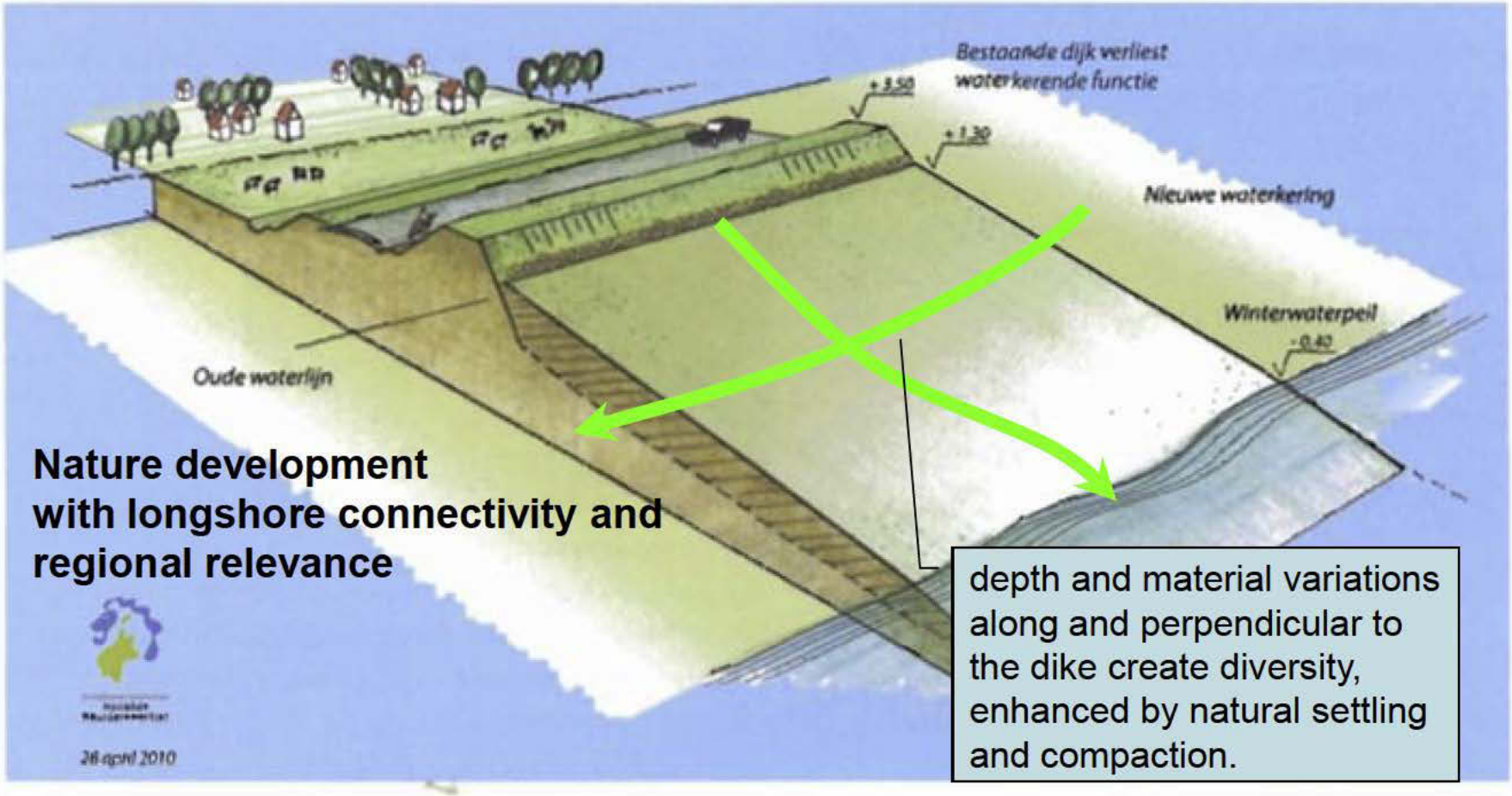
2010, HHNK, RWS-WD, Deltares, Haskoning: 'bankdike', soft safe green flexible dike along IJsselmeer

'Principeschets' Oeverdijk (tekening: Hoogheemraadschap Hollands Noorderkwartier).



50m wide, many km, large wave reduction, high nature value, along lake shore

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2010, Ecoshape: foreshore protection with reef. Large-scale oyster reef experiment (2x 200m x 20m)

Reduce erosion of intertidal areas in Eastern Scheldt estuary due to storm surge barrier.

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2009 RfR programme Noordwaard
Wavereducing hybrid dike 'fort Steurgat'

Clay dike
will be lower than
traditional design

100m wide

Wave reducing
willow-tree plantations
Low cost, low tech

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2007-2010 Rich Revetment pilots

1. IJmuiden
2. Haven van Rotterdam
3. Oosterschelde
4. Westerschelde

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Application: underwater forest harbors

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