



Ecosystem Engineers, Ecodikes, Rich Revetments, Harbours opportunities

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Ecosystem Engineering in The Netherlands

Soft solutions

Hybrid hard-soft mix

Hard solutions

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

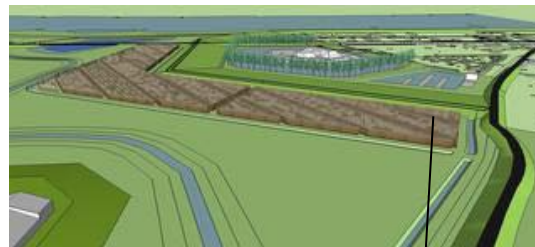
*less space, more BfN,
less flexible, extra investment*



Wadden Sea -
IJsselmeer



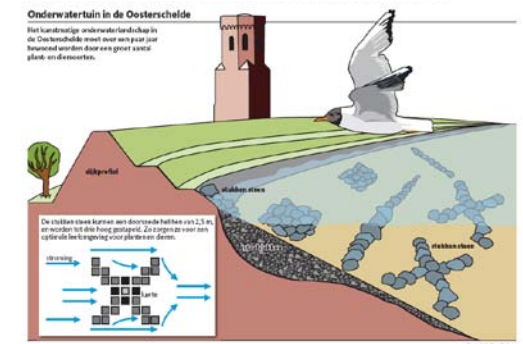
Oyster reefs
Eastern Scheldt



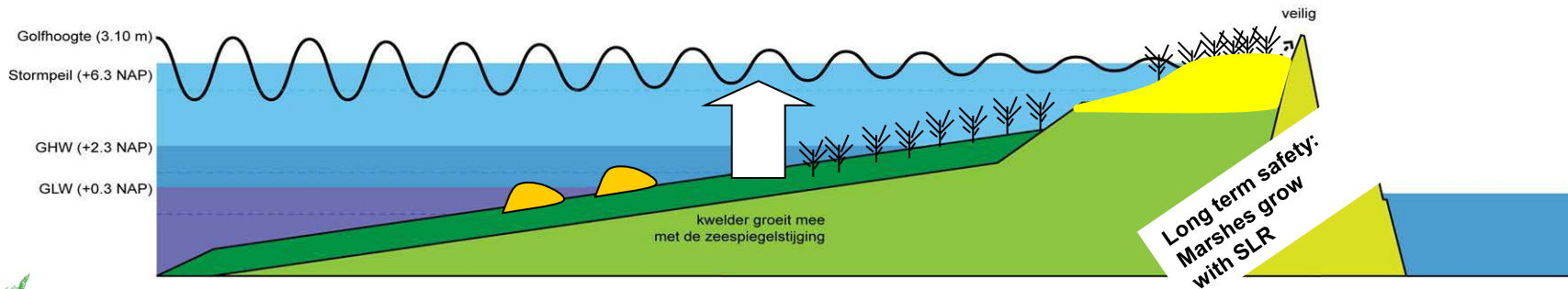
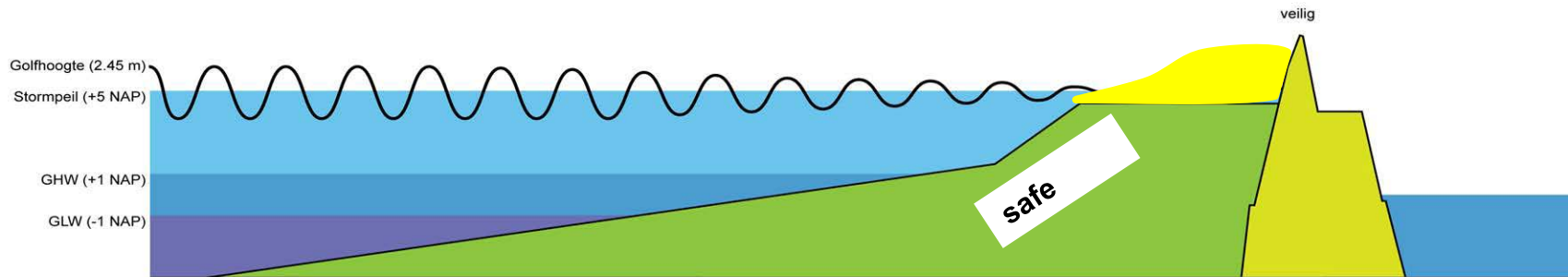
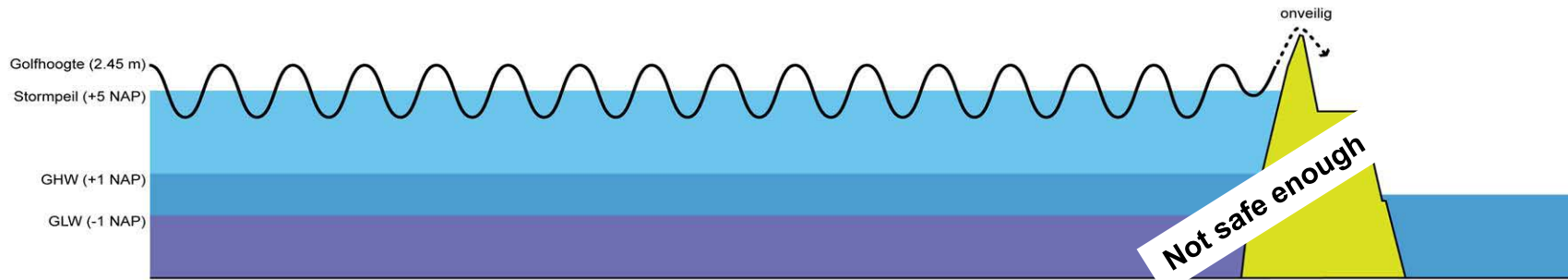
RfR Noordwaard



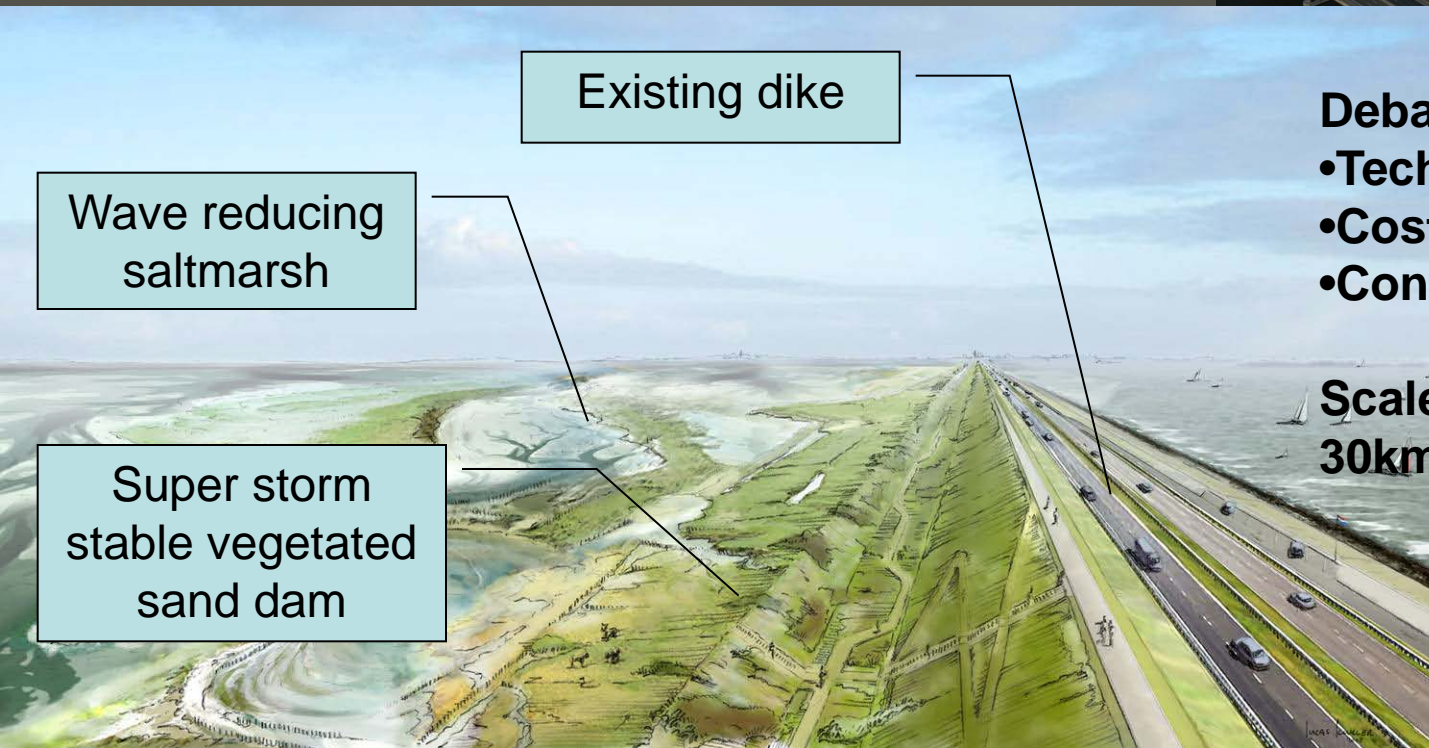
Rich 'Levees'
Eastern Scheldt



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



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

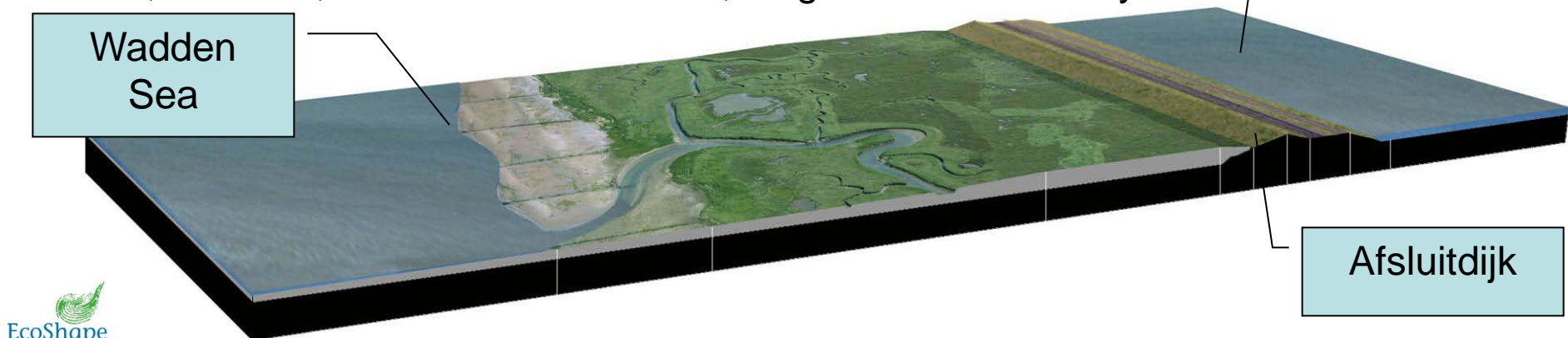


Debate:

- Technical feasibility
- Cost-benefit
- Conflict with Natura 2000

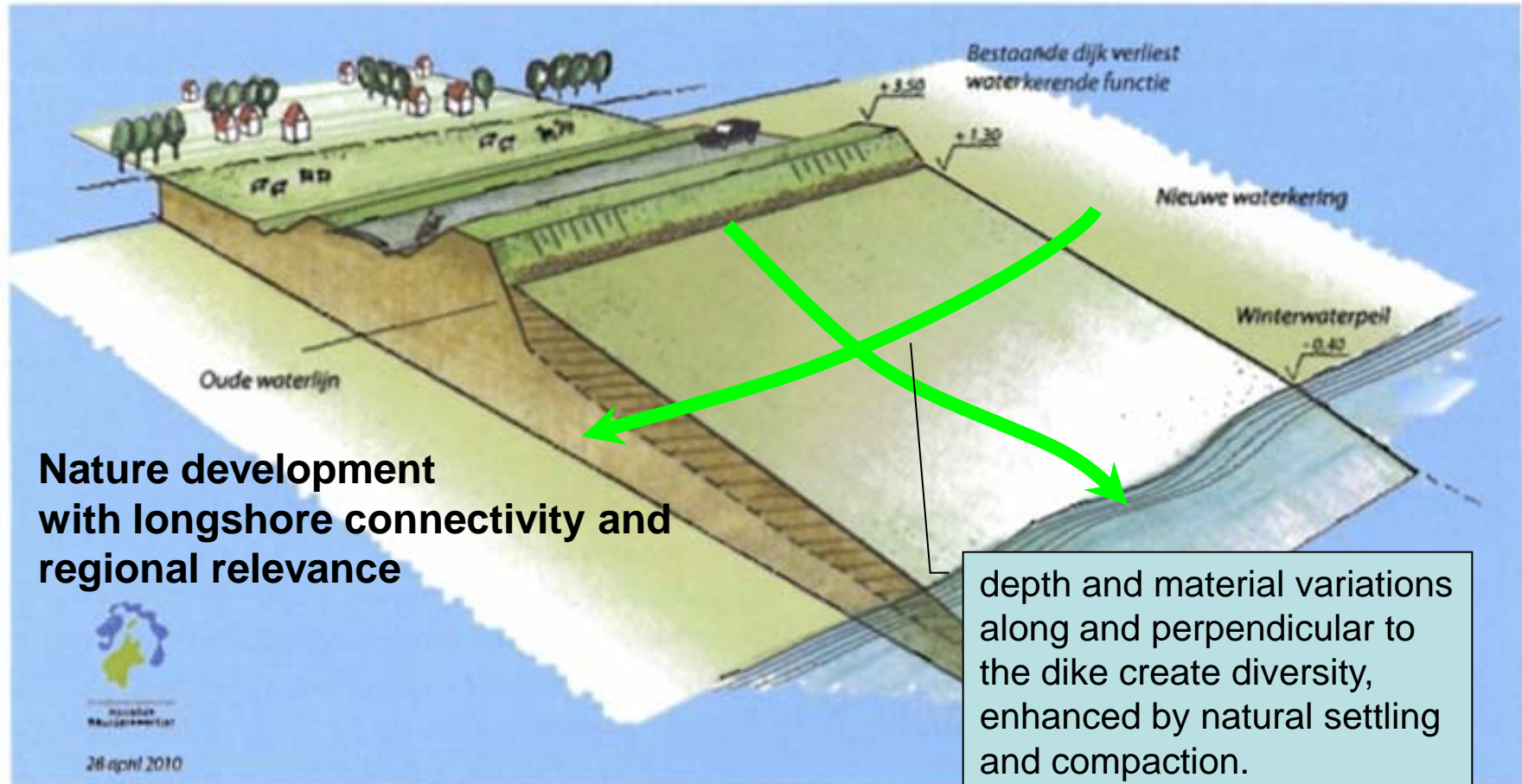
Scale 500m wide
30km long

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



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

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



**Nature development
with longshore connectivity and
regional relevance**

depth and material variations
along and perpendicular to
the dike create diversity,
enhanced by natural settling
and compaction.

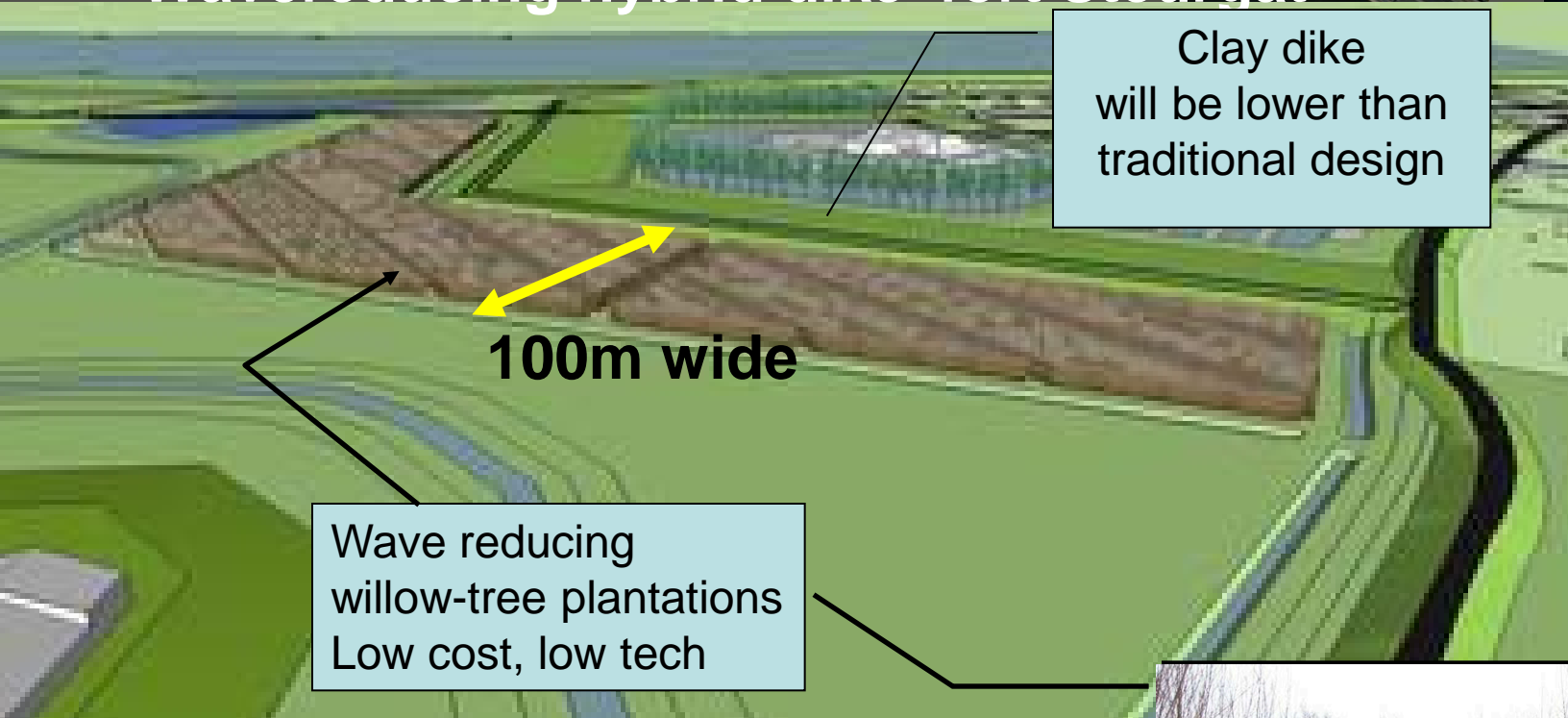
50m wide, many km, large wave reduction, high nature value, along lake shore

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.

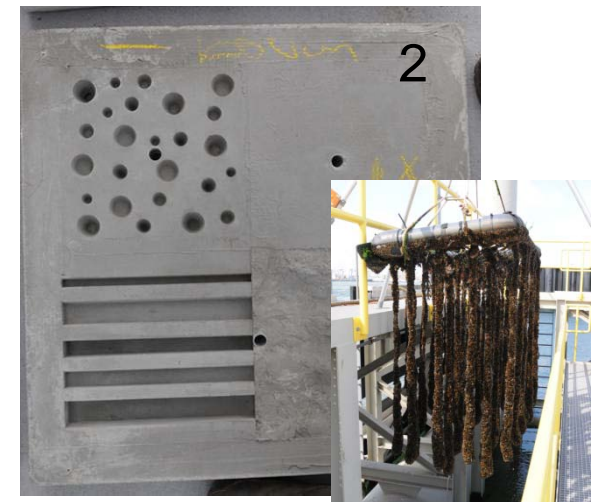


2009 RfR programme Noordwaard Wavereducing hybrid dike 'fort Steurgat'



2007-2010 Rich Revetment pilots

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



Application: underwater forest harbors

