# Climate adaptation and restoration in the Wadden Sea; how deep is your love?

Martin Baptist, 2 December 2021,
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# Climate adaptation and ecological restoration

- The Wadden Sea has examples of climate adaptation projects that combine adaptation with ecological restoration.
- Some Dutch projects even go beyond recovery to a previous state and apply *nature reinforcement* to create 'new' or 'improved' nature.

*interventions in abiotic and/or biotic functions, processes and structures with the aim of actively improving the value of nature**.

*Remark: improving the value of nature is subjective and arguable.

# Dutch climate adaptation and restoration projects

The international perspective is that the Dutch are doing quite astounding projects.

# Salt marsh construction Delfzijl

Construction of a salt marsh at a location where a natural marsh would not have developed by itself.

Wave buffer, bird breeding island, restoring salt marsh habitats, high stakeholder value

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Baptist, M.J., Dankers, P., Cleveringa, J., Sittoni, L., Willemsen, P.W.J.M., Van Puijenbroek, M.E.B., ... & Elschot, K. (2021). Salt marsh construction as a nature-based solution in an estuarine social-ecological system. *Nature-Based Solutions*, *1*, 100005.

# Clay ripening in Dollard salt marsh

Clay ripening basins built in a salt marsh to use the clay for local dike reinforcement.

Construction clay came from excavating a pond leaving a bird breeding island, basins filled with sludge from nature restoration project.

# Prins Hendrik Sand Defense,Texel

A flood-prove sand dune was constructed at a location where there was never a dune before.

placed in front of a weak dike replacing a hard revetment, course-grained sand to prevent erosion, intertidal bird foraging area.

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# What are the motives for nature reinforcement projects?

- **Nature facilitates people**
  - Nature delivers ecosystem services, and people make interventions to profit from these.
    *Building with Nature, Nature-based solutions.*
- **People facilitate nature**
  - Causes of degradation got out of hand so nature cannot resolve it on its own and people must help.
    *Assisted regeneration and reconstruction of populations (Gann et al*. 2019)



Gann et al. 2019. International principles and standards for the practice of ecological restoration. Restoration Ecology 27(S1): S1-S46

# The future Wadden Sea as a novel ecosystem

- Sea level rise and increasing temperatures will transform the Wadden Sea ecosystem to a 'novel ecosystem' (Hobbs et al. 2006).
- Depending on the severity of climate change, species are threatened.
- How far do we go in modifying the properties of the Wadden Sea as climate adaptation measures?

**How deep is your love?**



Hobbs, R. J., Arico, S., Aronson, J., Baron, J. S., Bridgewater, P., Cramer, V. A., ... & Zobel, M. (2006). Novel ecosystems: theoretical and management aspects of the new ecological world order. *Global ecology and biogeography*, *15*(1), 1-7.

# How deep is your love?

Suppose, the Wadden Sea is asking you:

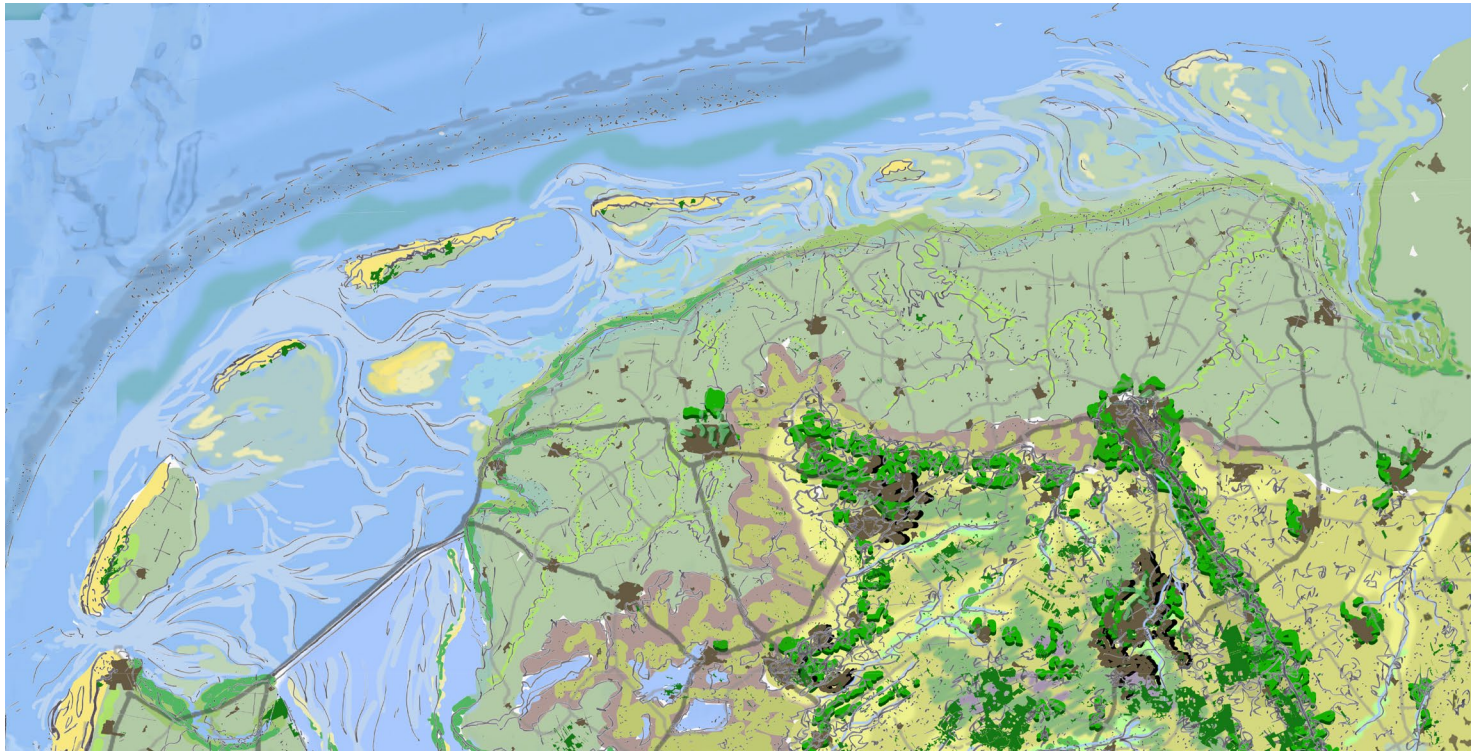
*How deep is your love?*
*How deep is your love, how deep is your love*
*I really mean to learn*
*'Cause we're living in a world of fools*
*Breaking us down when they all should let us be*
*We belong to you and me*

# Climate adaptation by species measures

- Re-introduction of *Sabellaria alveolata,* a reef-building tubeworm, which forms wave-breaking natural reefs that prevent tidal flat erosion.

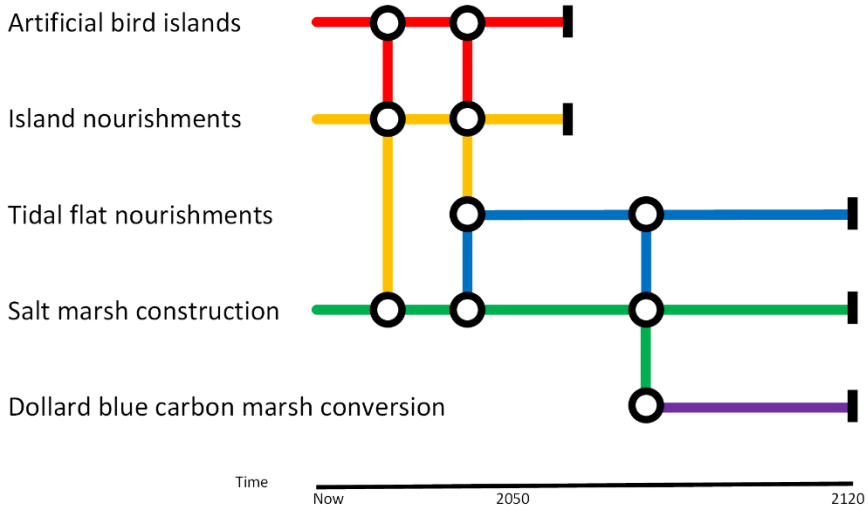
- Introduction of genetic varieties of species, such as cockles from the south of France that are more heatwave-resistant.
- Introduction of new species as bird food. For instance the replacement of Baltic tellin by *Loripes orbiculatus* or *Dosinia isocardia*, molluscs eaten by Red knots in west Africa.

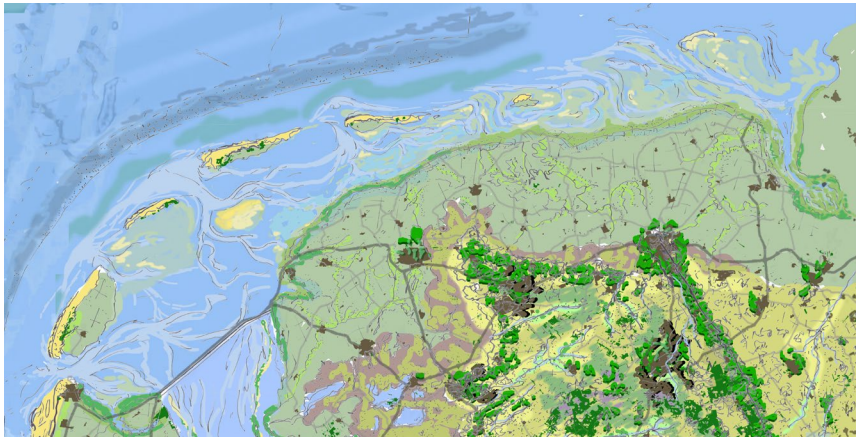
# Climate adaptation by biotope measures



The Dutch Wadden Sea in 2120 (Baptist et al., 2019)

# Recommendation:
# Develop climate adaptation pathways



The Dutch Wadden Sea in 2120 (Baptist et al., 2019)