Building with Nature

working with nature beyond restoration
BUILDING WITH NATURE?

development of water-related infrastructure
- in **harmony** with the natural environment
- respecting the natural system’s **dynamics**
- utilising these **dynamics**
- creating **new opportunities** for nature
PROBLEM AREA: HOLLAND COAST
BwN-SOLUTION: SAND ENGINE DELFLAND

- **primary function:** to have sand onshore $\Rightarrow$ coastal safety
- **other functions:** recreation (beach, swimming, surfing), enlarged freshwater lense in dune area, stance for birds and sea mammals
- **natural dynamics:** wind, waves, tide, surges, vegetation
- **dynamics utilised:** nature distributes sand alongshore and cross-shore; vegetation fixes sand / forms dunes
- **nature opportunities:** pioneer vegetation on the sandy hook, temporary beach lagoons, juvenile dune formation $\Rightarrow$ dune growth
PROBLEM AREA: EASTERN SCHELDT
BwN-SOLUTION: OYSTER REEFS

• primary function: shoal (edge) stabilisation
• other functions: substrate for living oysters, wave attenuation > lower dikes
• natural dynamics: wind, waves, tide, benthic comm.
• dynamics utilised: formation of live oyster banks
• nature opportunities: feeding ground for birds, habitat for many species, spatial gradients ⇒ diversity
Oyster reef construction near Viane (Zeeland)
BwN-solutions

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<th>Soft solutions</th>
<th>Hard solutions</th>
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<td><strong>Tidal</strong></td>
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<td>Eastern Scheldt underwater garden</td>
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<td>'rich levee'</td>
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Focus areas:
- **Eastern Scheldt underwater garden**
- **ES: oyster reefs as shore protection**
- **Noordwaard: willow forest foreshore**
- **Delfland coast Sand Engine**
- **Galgeplaat shoal nourishment**
- **IJsselmeer foreshore nourishment**
- **Markermeer eco-levee**
drivers of change

- **government**: seeks to become more agile via better informed decision making
- **industry**: seeks to realise growth at the high end of the market
- **consultancies**: seek competitive advantage by offering new concepts
- **RTO’s**: seek added value via rapid transfer of relevant new knowledge
- **academia**: seeks fast valorisation of new knowledge and ideas
- **NGO’s**: seek reconciliation of economical development and ecological sustainability
The consortium includes:

**INDUSTRY**
- dredging firms
- consultancies
- offshore industry

**RESEARCH INST.**
- Deltares
- IMARES
- Alterra

**GOVERNMENT**
- I&E – DG Water
- I&E – Rijkswaterstaat
- Municip. Dordrecht

**ACADEMIA**
- TUD/UT/WUR
- NIOZ
- NIOO-CEME

**NGO’s**
- > 20 partners
- ~30 mio

The project was active from 2008 to 2012.
THE ‘GOLDEN TRIANGLE’

government

research sector

private sector

EcoShape
building with nature
our mission
to show that it’s possible,
developing infrastructure
and at the same time
creating opportunities for nature
approach

• connecting to ‘live’ cases
• filling knowledge gaps
• experimenting in pilot-applications
• interdisciplinary, integrative
• aiming at knowledge sharing
• aiming at practical use
<table>
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<tr>
<th>scientific research programme</th>
<th>case &amp; pilot programme</th>
<th>manual &amp; tools programme</th>
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<tbody>
<tr>
<td>19 PhD-students in (biogeo-) morphology ecology governance</td>
<td>4 ‘live’ cases each with 2 or more pilot experiments</td>
<td>application guideline portfolio of examples tools lessons learned</td>
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</table>
DOMAIN OF OPERATION

building

society

nature

EcoShape
building with nature
DOMAIN OF DISCIPLINES

technology

social sciences

natural sciences
interactive mode of operation
workshops, design ateliers, discussion sessions
PILOT EXPERIMENTS
SAND ENGINE

- construction: first half of 2011
- monitoring during construction: data \( \Rightarrow \) BwN
- monitoring after construction (6 à 7 M€):
  - effect-monitoring: Rijkswaterstaat
  - scientific monitoring: PZH + EFRO (?)
- analysis & interpretation: joint PhD progr. (?)

collaboration: PZH, RWS, contractors, NGOs
ECOLOGICAL BORROW PIT

- sand ridges in 2 borrow pits MV2
- monitoring with Rotterdam Harbour Authority
- first monitoring data: indicate rapid recovery of habitat and biodiversity

collaboration: RHA, contractors, RWS
EASTERN SCHELDT SHOALS

- monitoring Galgeplaat shoal nourishment (video, in situ) ⇒ slow ecosystem recovery
- small-scale oyster reef test: successful (morphologically and ecologically)
- larger-scale reefs: built (Viane, de Val)
- monitoring schemes: ongoing

collaboration: RWS Zeeland
FRISIAN COAST LAKE IJSSEL

• 3 nourishment sites identified
• work started at Workumerwaard site
• monitoring plan W’waard ready
• agreement It Fryske Gea (NGO)

collaboration: It Fryske Gea, Prov., Wetterskip, CNK (coalition of NGOs)
LAKE MARKEN

- ecosystem analysis ongoing (4 PhDs)
- soil balance > soil bank?

collaboration: RWS, TMIJ, NMIJ
SINGAPORE

• monitoring / analysis coastal water turbidity
• how much turbidity can the ecosystem have?
• bioarchitects for coastal protection

collaboration: SDWA, Nat. Un. Singapore, PUB
GUIDELINES AND TOOLS
FOCUS ON OUTCOME

WIKI-BASED MANUAL

dynamic
extendable
menu structure
paper version as a derivate
OpenEarth: data & model access

• application under GoogleEarth > georeference
• 4D (space + time)
• compliant with international standards
• fast and easy access
• data sources from all over the world
• measured data and model results
• wide range of spatio-temporal data (+ metadata)
• open source

collaboration: TUDelft Library, Deltares, NOAA
Delft Dashboard

- tool for quick set-up of Delft3D models
- initial and boundary cond. from OpenEarth
- fast and easy access
- open source

collaboration: Deltares + Delft3D User Community
Building with Nature: worth developing from an innovation project to a broad international movement?