



Large scale nourishment strategy in the Netherlands

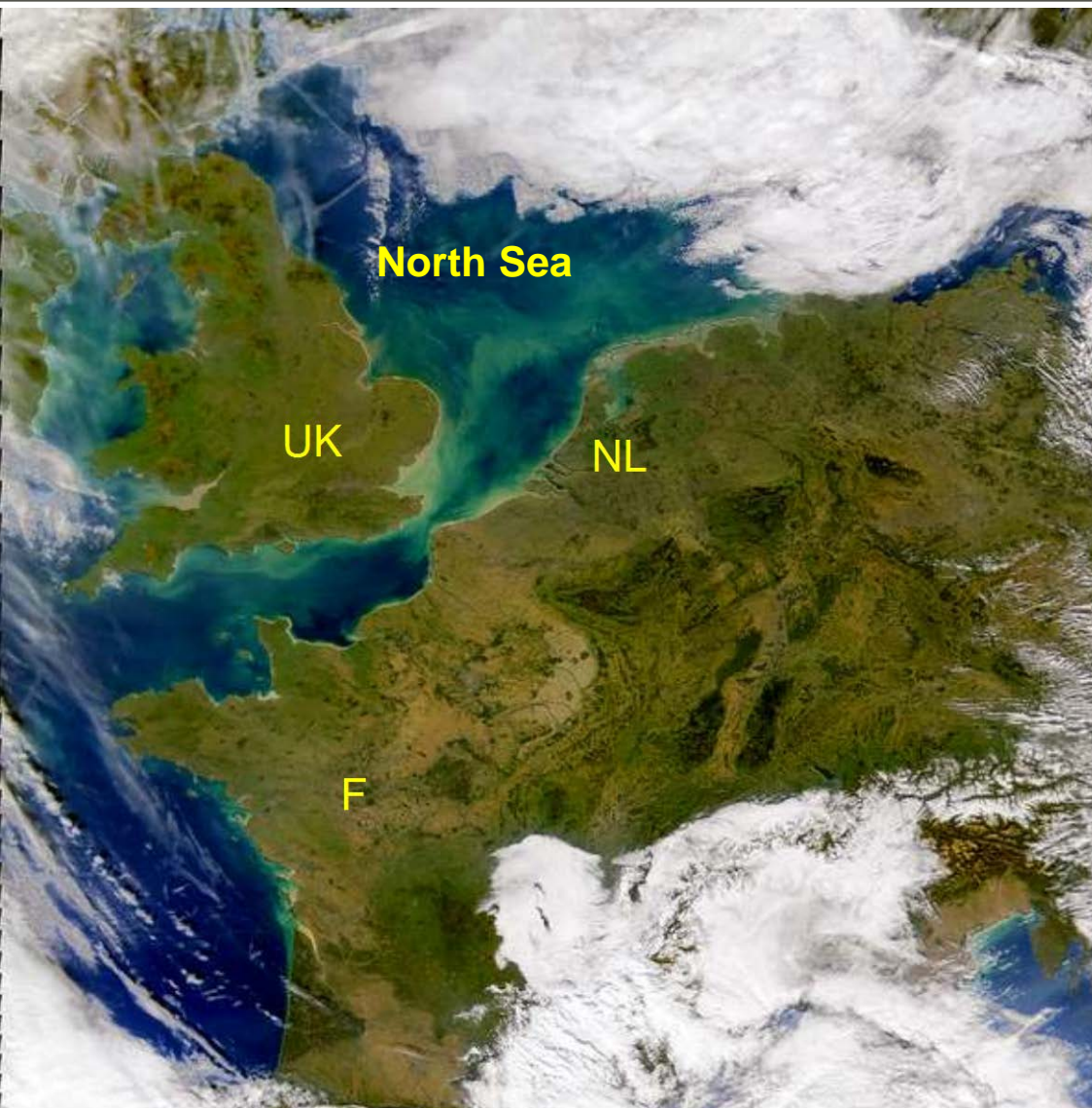
John de Ronde ^{1,2)} and Joost Stronkhorst ¹⁾

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²⁾ University of Delft

john.deronde@deltares.nl

Outline



- existing strategy
- systems approach
- approach to alternative strategy development

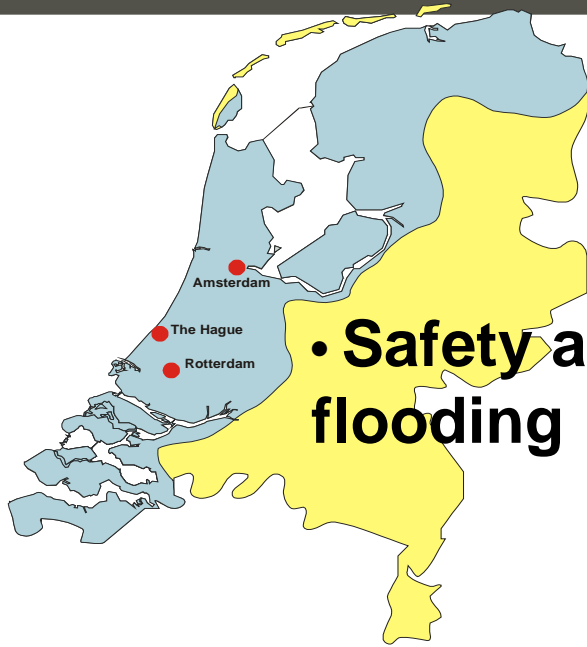
Sandy coast



Soft sea defence



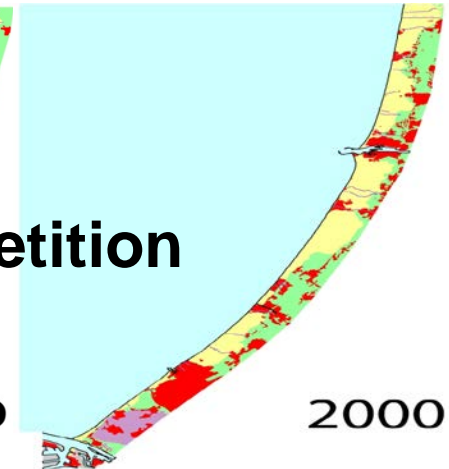
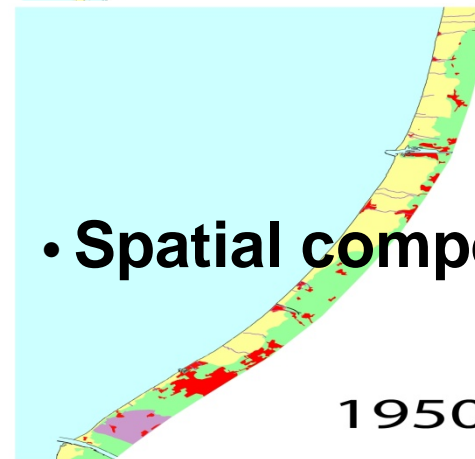
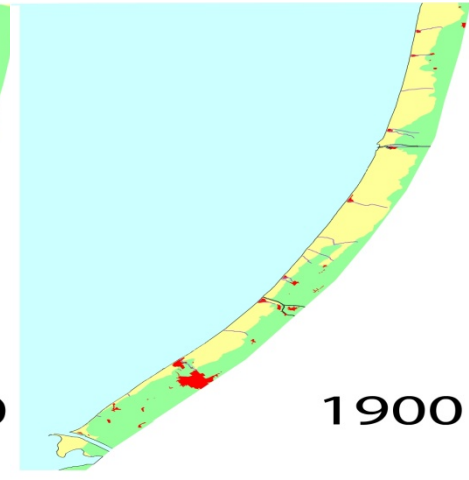
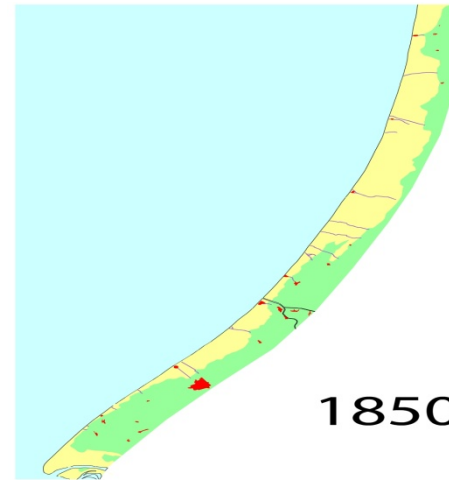
Main management issues



- **Safety against flooding**



- **Loss of functions**



- **Spatial competition**

Coastal policy objectives



sustainable
preservation of

- safety against flooding; and
- values and functions in the dune area

1st Coastal Policy Document, 1990

also see:

www.conscience-eu.net

A systems approach

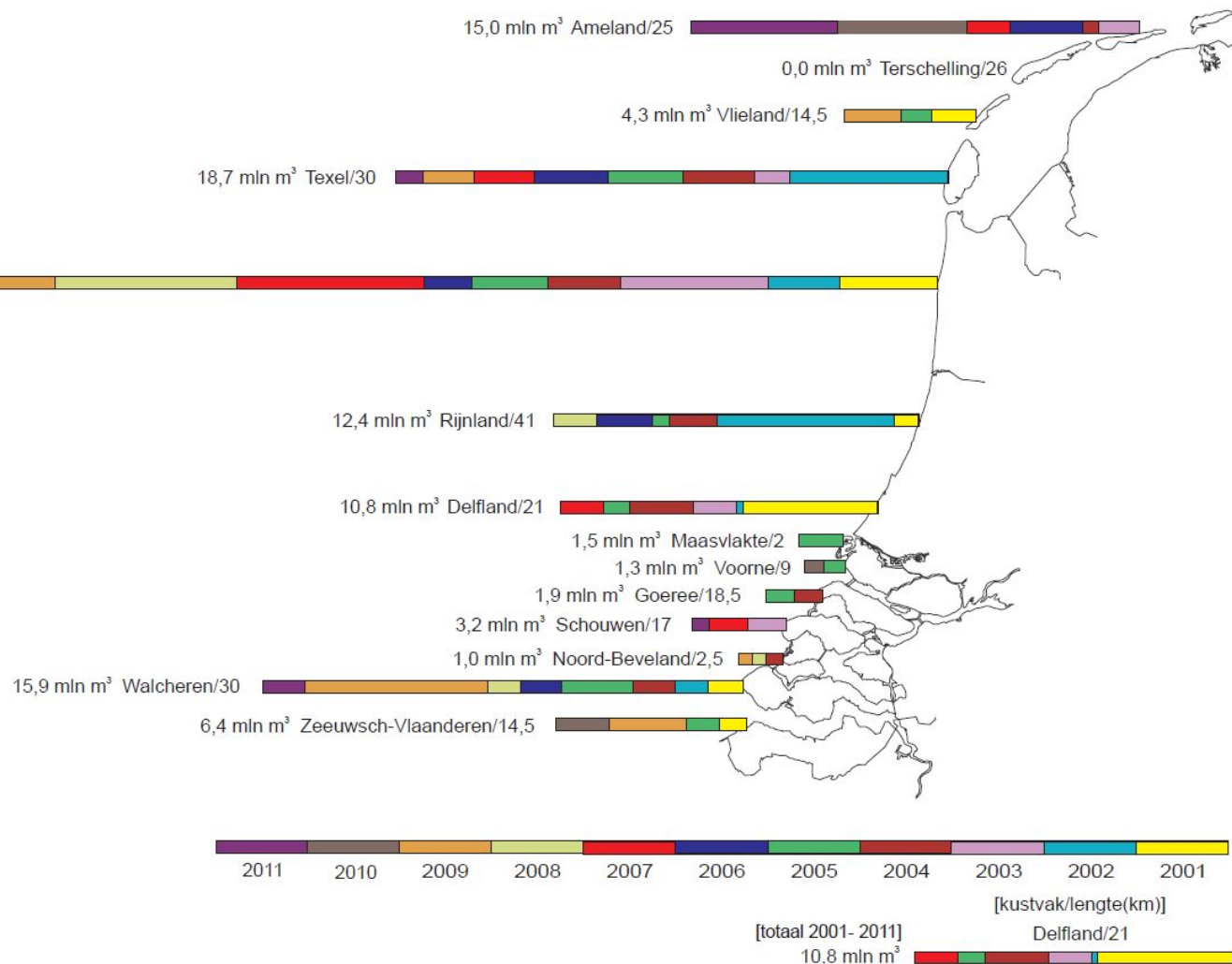
- sand is carrier of all functions
- grow with sea level
- maintain and improve coastal foundation
(from 6 to 12 to 20 M m³/year)
- make optimal use of natural processes
“building with nature”
- **sand nourishments**



Distribution of nourishments 2001-2011

1990 – 2000:
6 Mm³/year

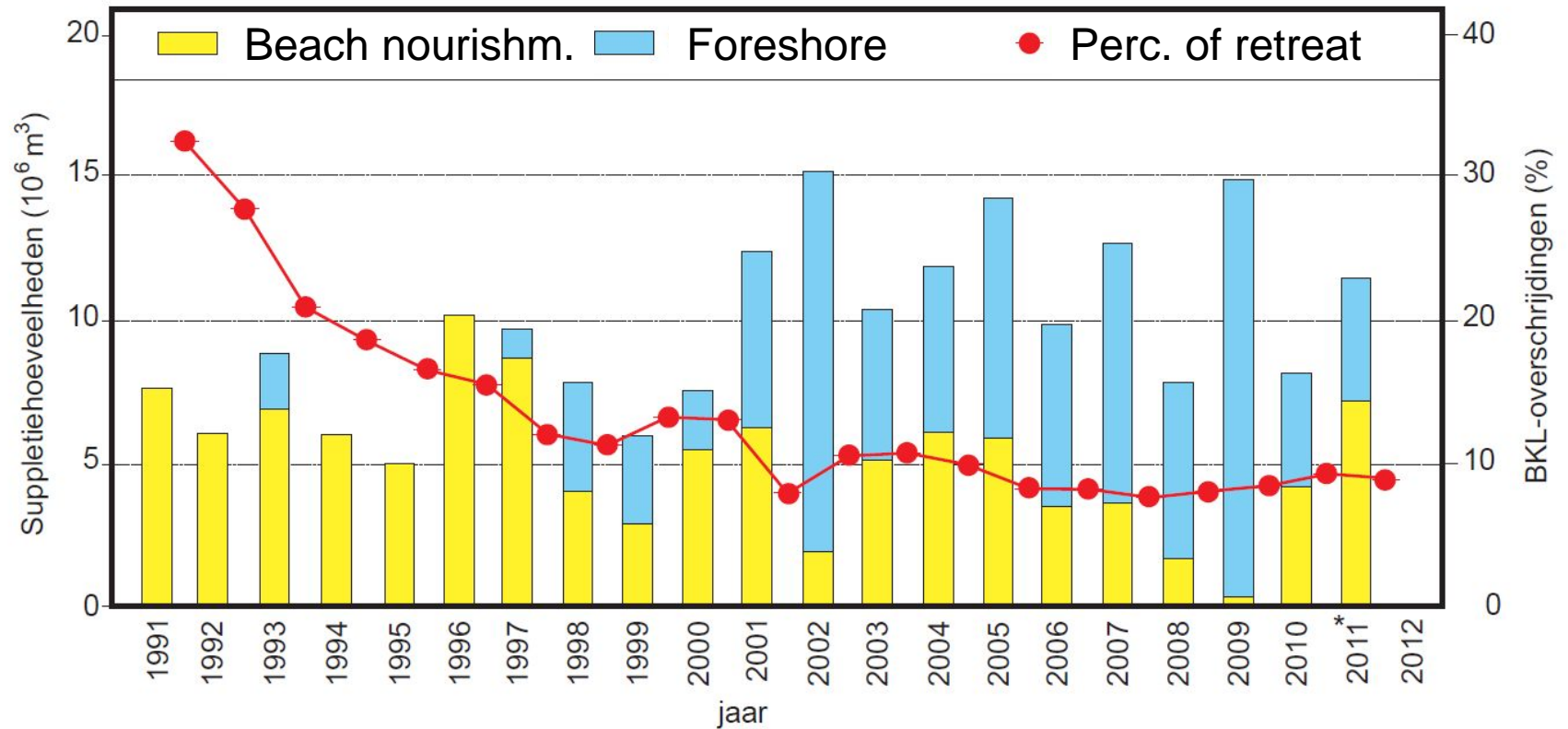
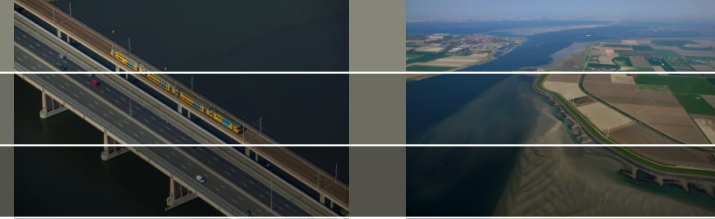
2001 - :
12 Mm³/year



Rijkswaterstaat
Ministerie van Verkeer en Waterstaat

Deltares

coast line position maintained

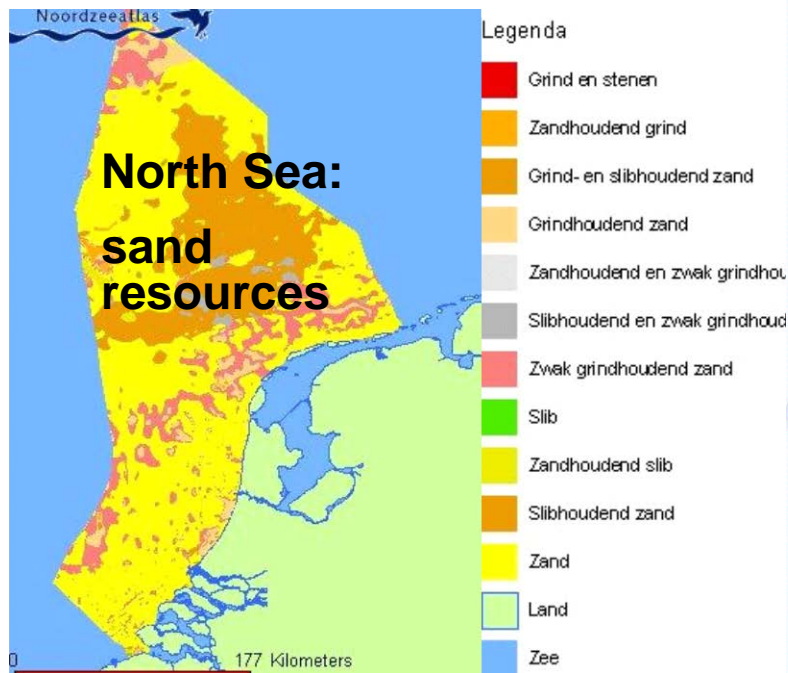


Rijkswaterstaat
Ministerie van Verkeer en Waterstaat

Deltares

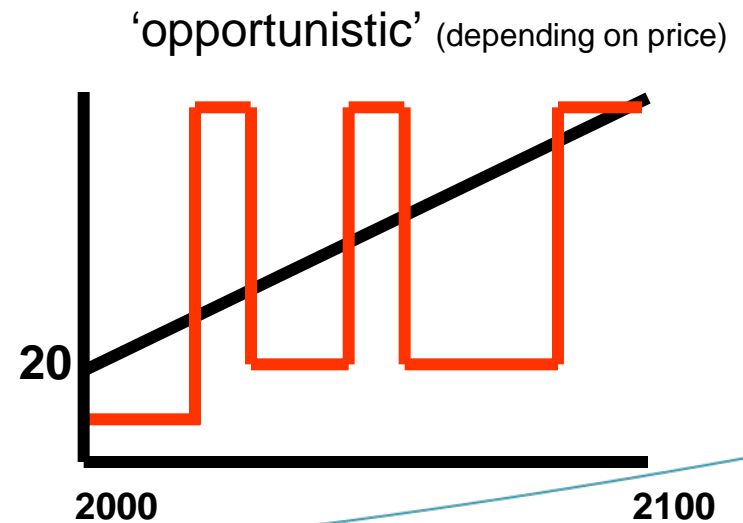
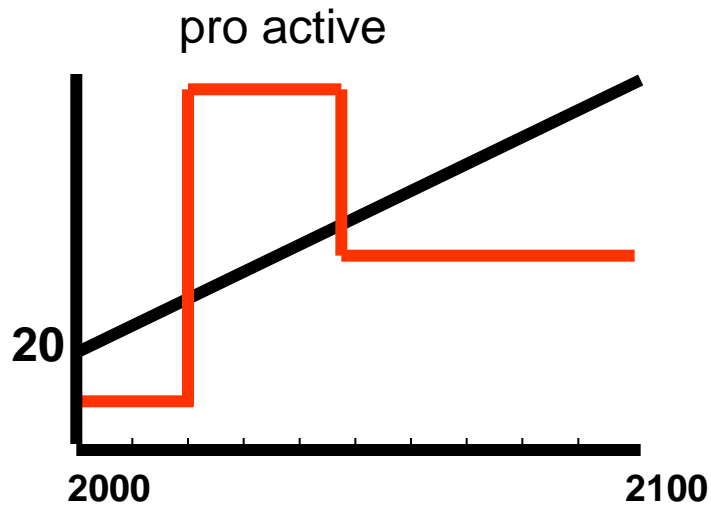
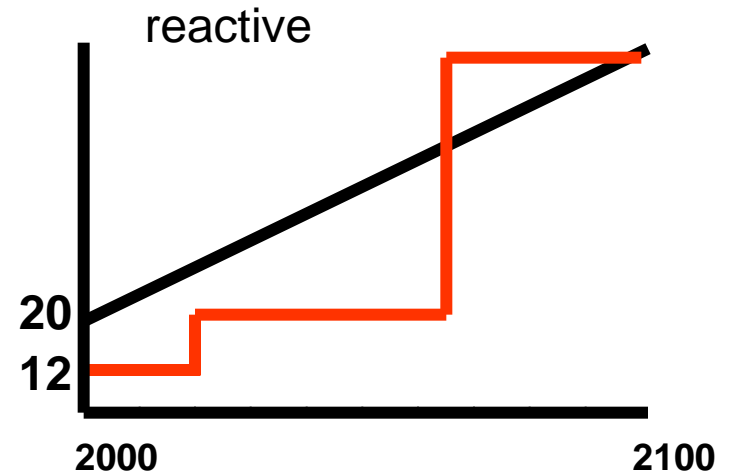
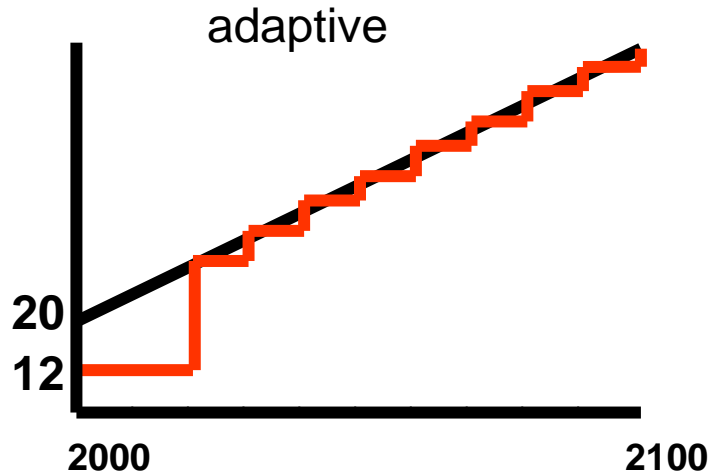
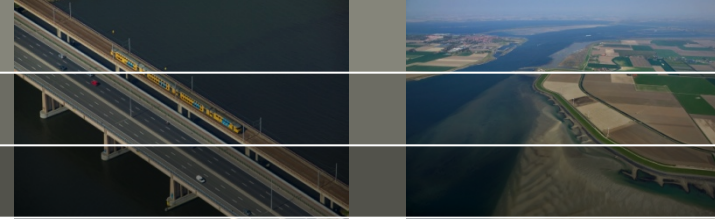
Main management challenge

- optimal distribution of nourishments
in space and in time

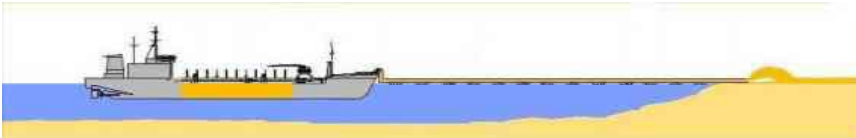
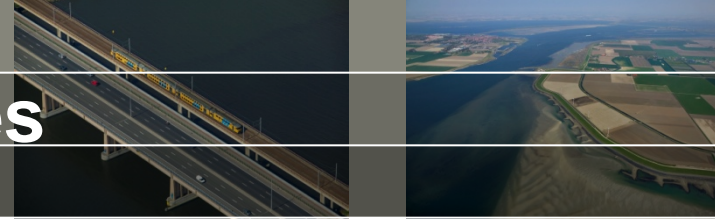


Nota Ruimte, 20

Different long term strategies



Different distribution strategies



beach – and shore face nourishments

200 – 400 m³/m

2-3 yearly



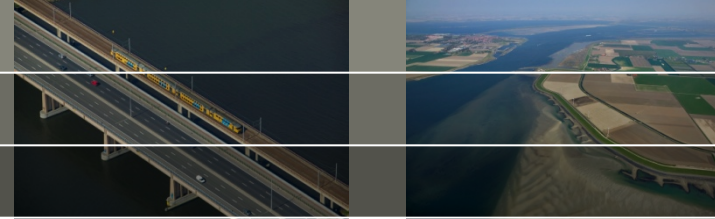
Sand Engine / giga nourishment

10,000 m³/m

once every 25 years

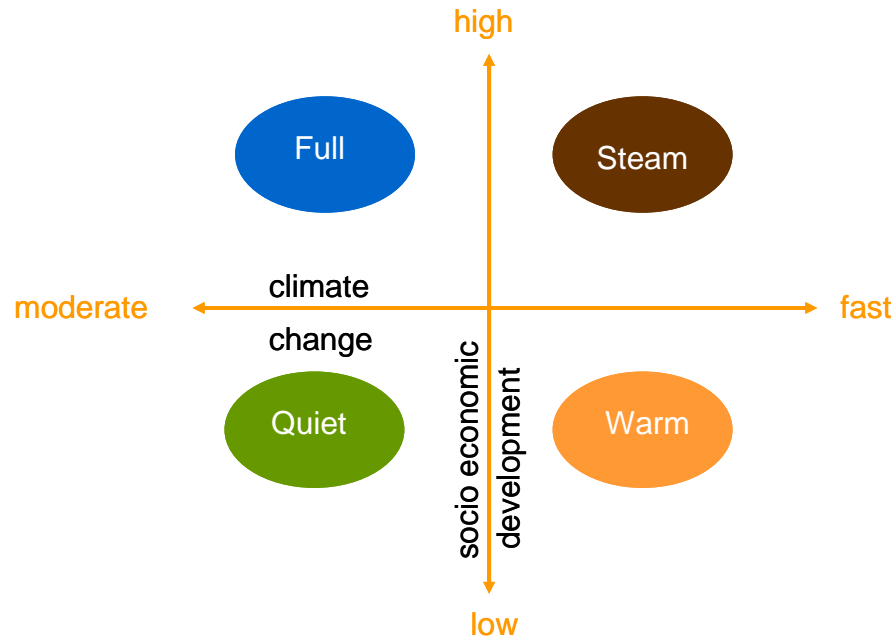


Different scenarios



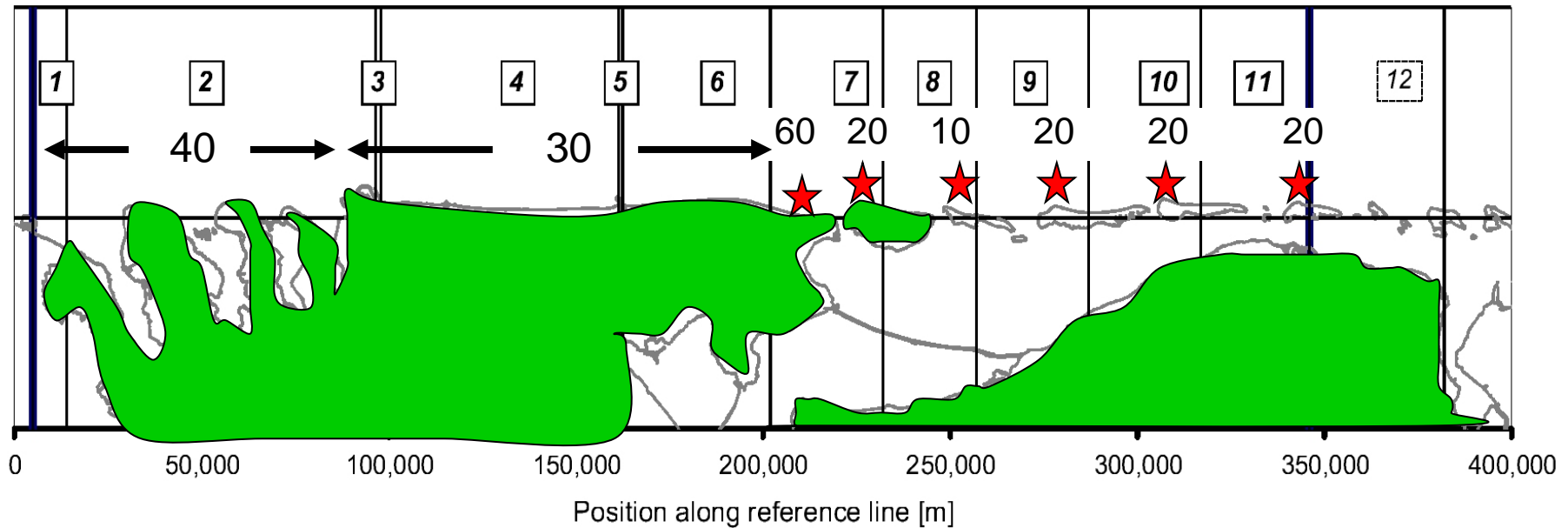
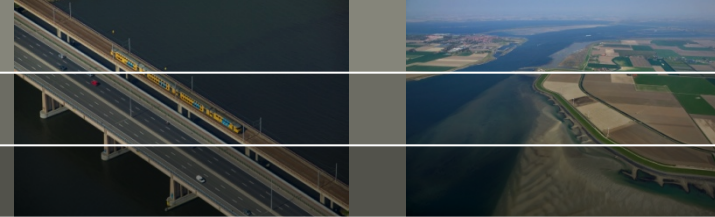
Where ?
When ?
How ?

How
much ?



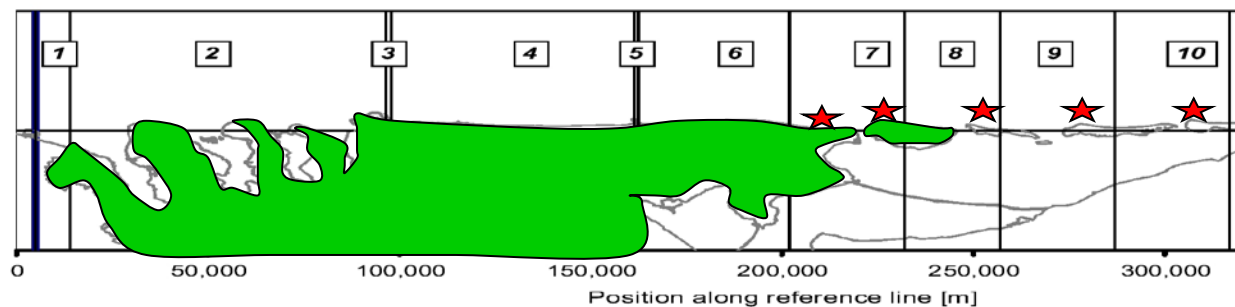
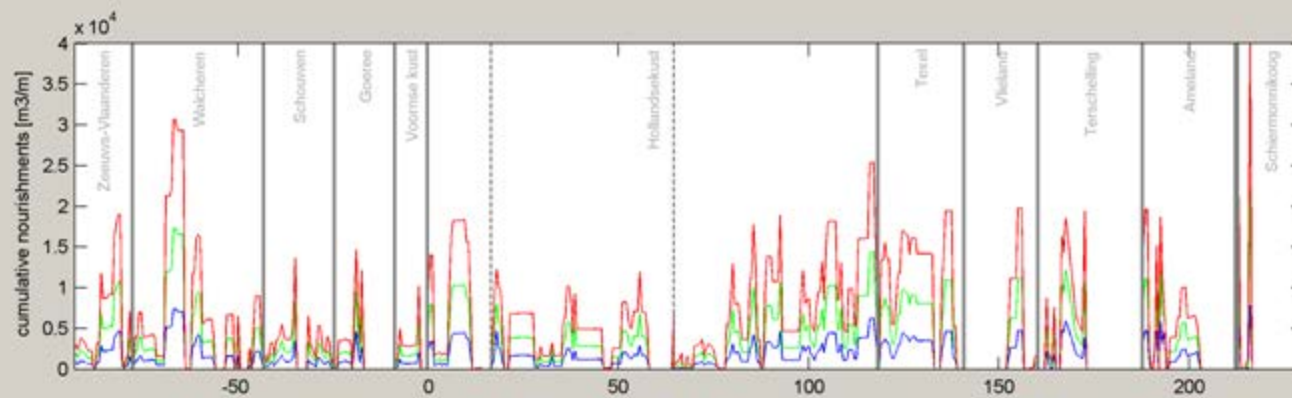
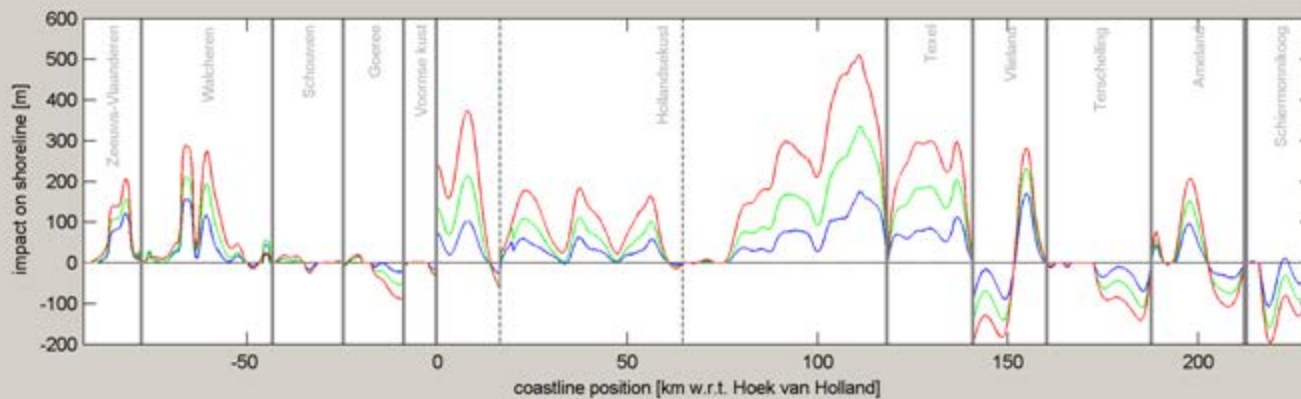
provide information on
(long term) dynamic character of the
physical system

Nourishment Variants

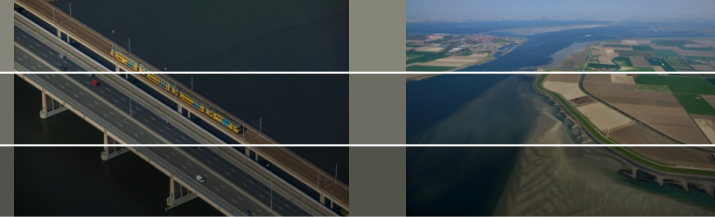


★ = meganourishment (e.g. sandengine)

Interactive design tool



7 Variants



1	Reference	:	Business as usual (12 Mm ³ /year)
2	Minimal –	:	
3	Minimal +	:	
4	Sustain –	:	
5	Sustain +	:	
6	Extra –	:	
7	Extra +	:	

Variant “Minimal”

M- = Only maintain shore where primary safety is at stake

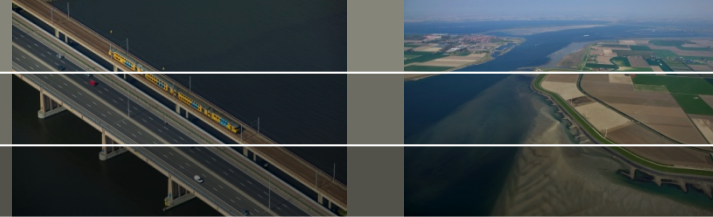
M+ = Plus safety at areas in front of sea defences +drinking water + recreation

Legenda

-  Safety
-  Safety + recreation
-  Safety in front of s d
-  Safety in front + recr
-  Drinking water
-  Drinking water + recr
-  Recreation
-  Rest

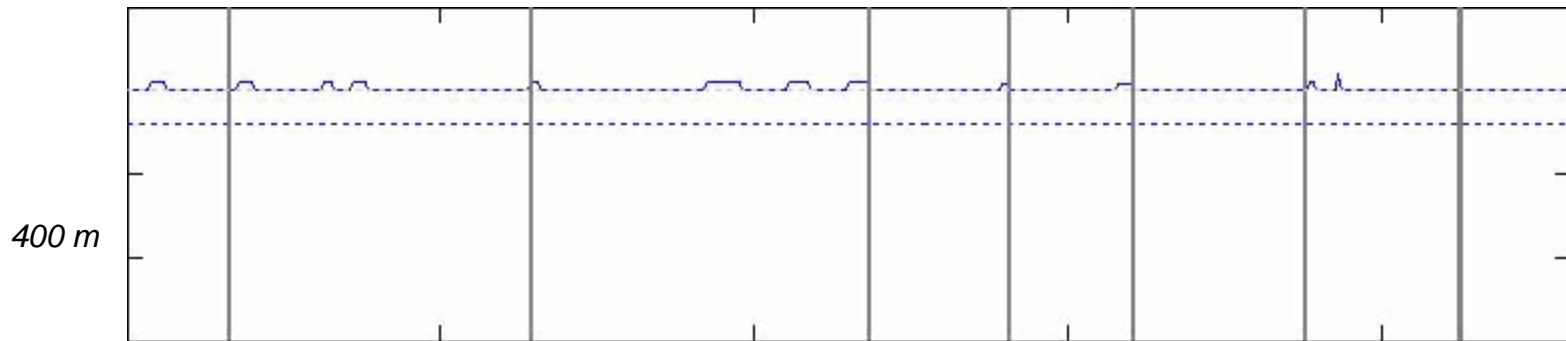


Coastal changes 2010-2100



Variant M-

landwaarts
0

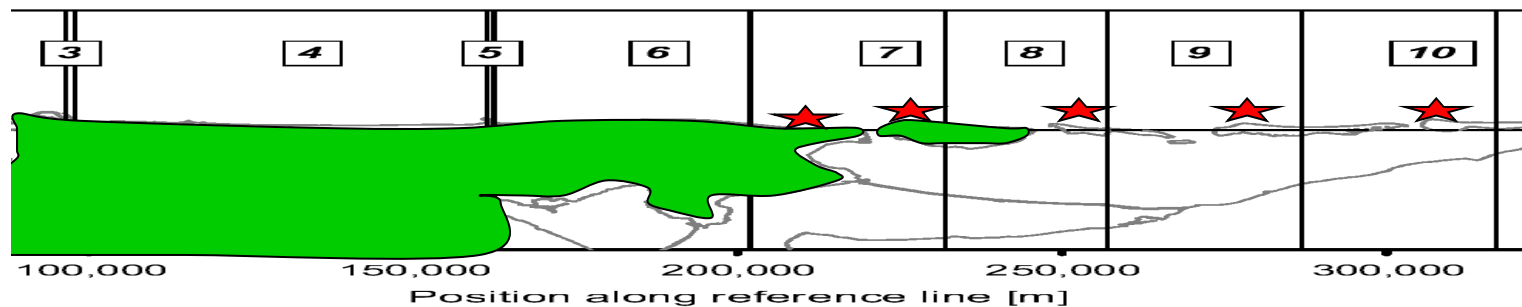


HvH Schev.

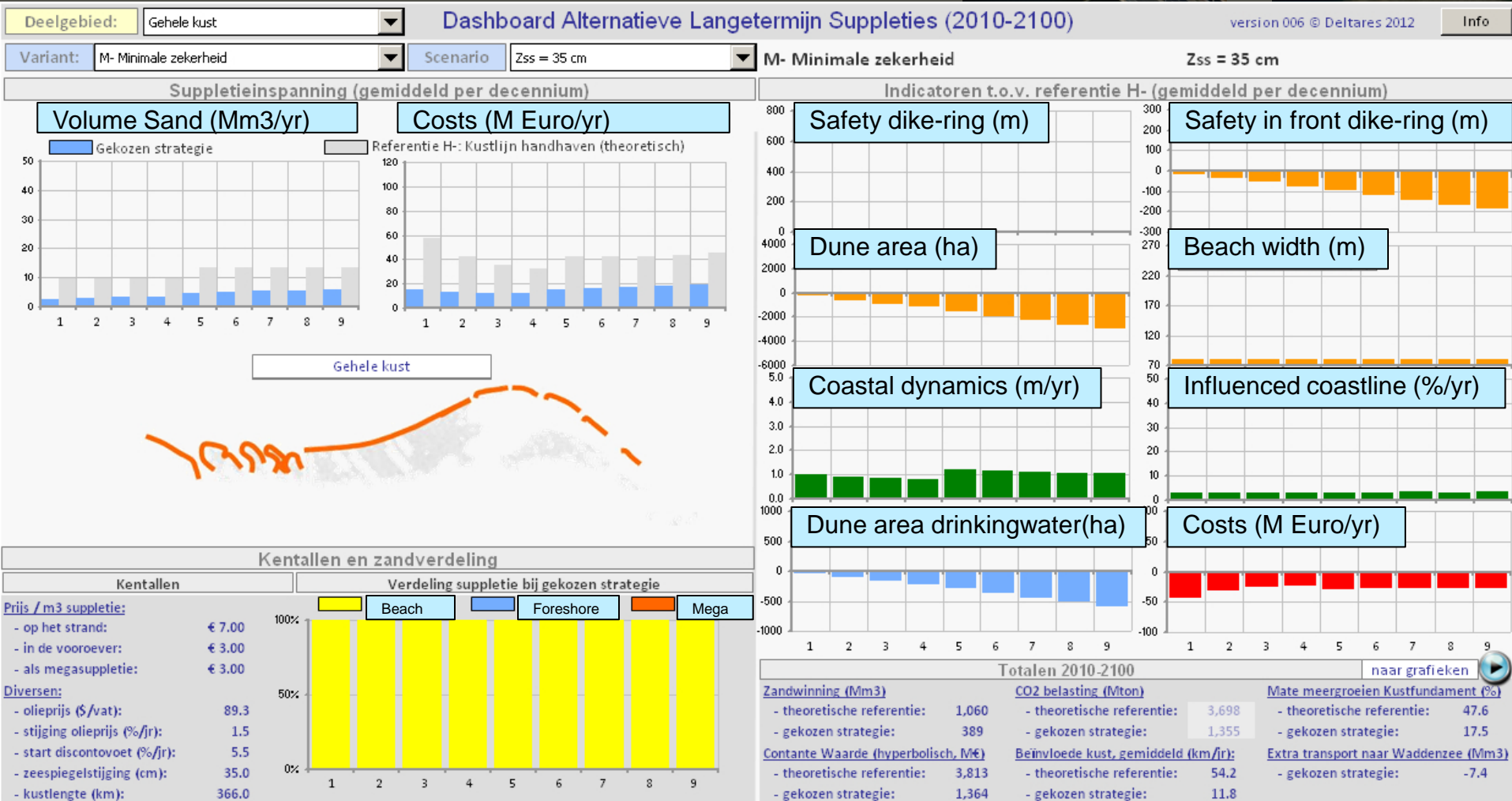
IJmuiden

Marsdiep

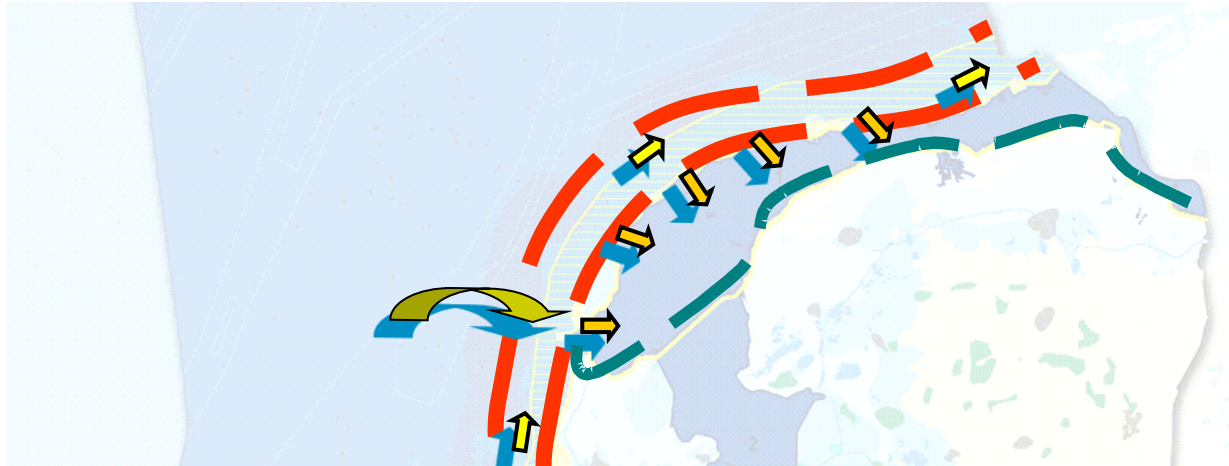
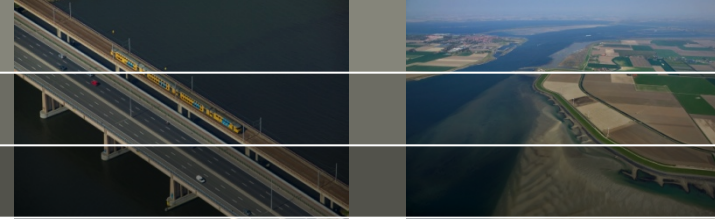
Schier.



Dashboard variant M- moderate SLR



Variant “Sustainable”



S - : maintaining the Coastal foundation



S + : maintaining the Coastal foundation + compensating losses caused by the Waddensea



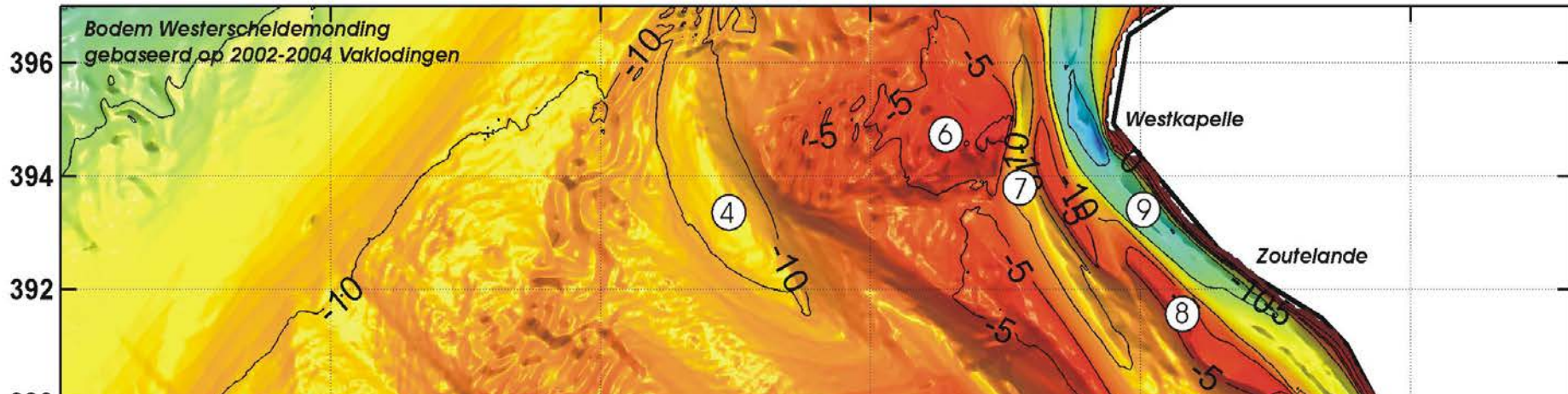
Variant “Extra Investment regional ambitions”

E- = S+ Plus

- Wadden: investment in system knowledge
- Holland coast: Extra buffer zones
- Delta coast: Extra gully-side nourishments



Variant “Extra Investment regional ambitions”



E- = S+ Plus

- Wadden: investment in system knowledge
- Holland coast: Extra buffer zones
- Delta coast: Extra gully-side nourishments

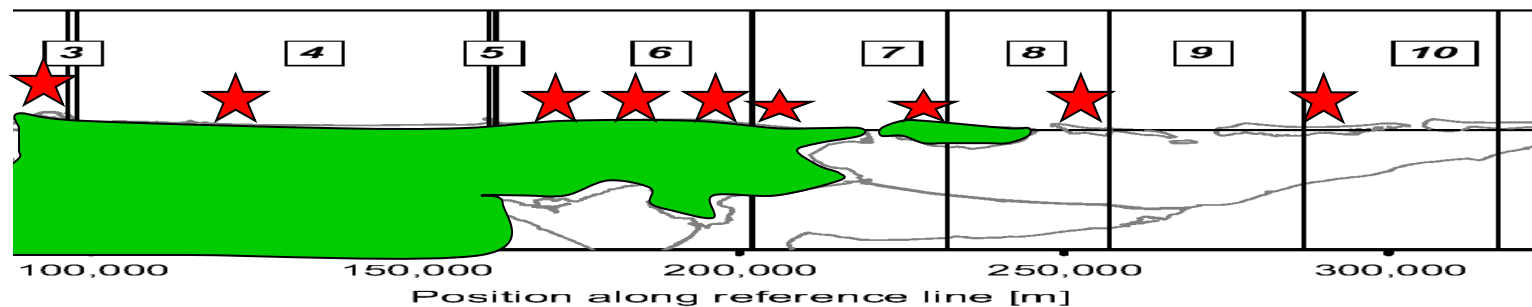
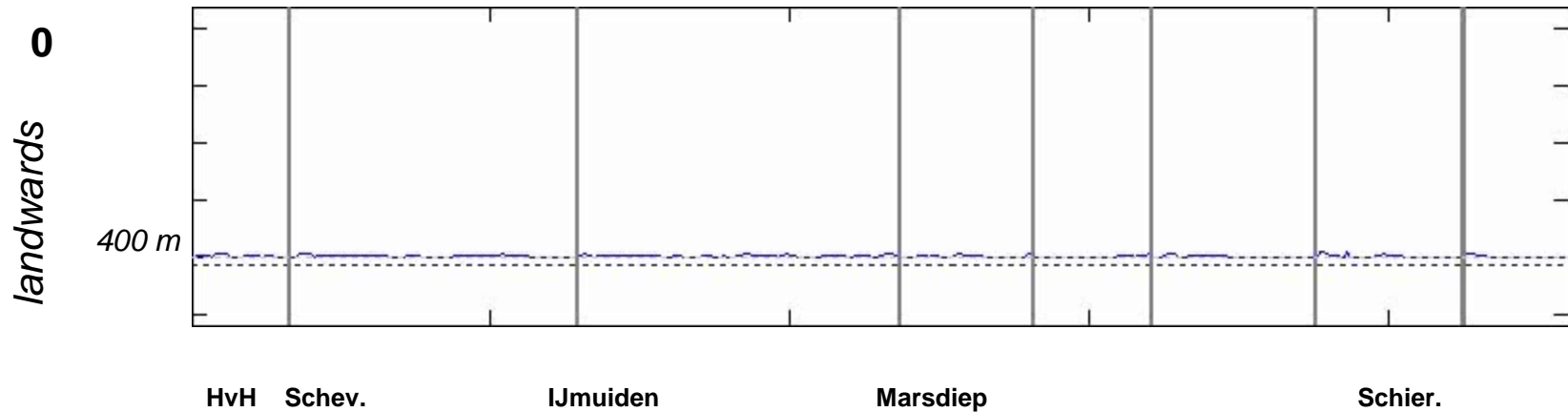
E+ = S+ Plus investments Wadden

- local, permanent coastal extension Holland coast
- local gully relocation in Delta area

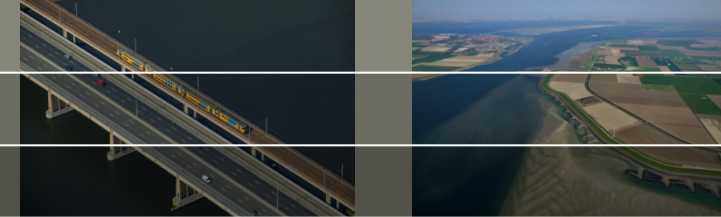


Coastal changes 2010-2100 in 30 seconds

Variant E -



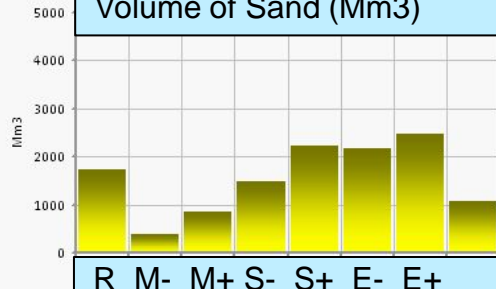
Scoring the variants



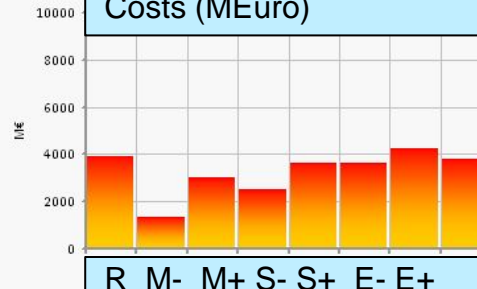
Totale waarden na 9 decennia bij

Zss = 35 cm Gebied= Gehele kust

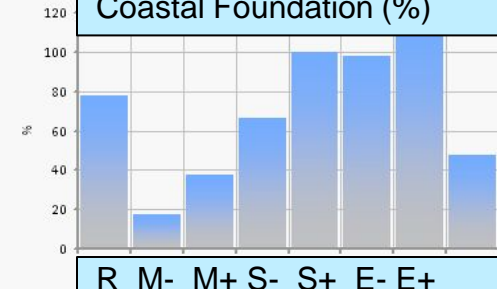
Volume of Sand (Mm3)



Costs (MEuro)

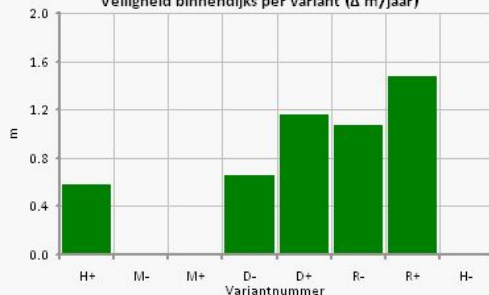


Coastal Foundation (%)

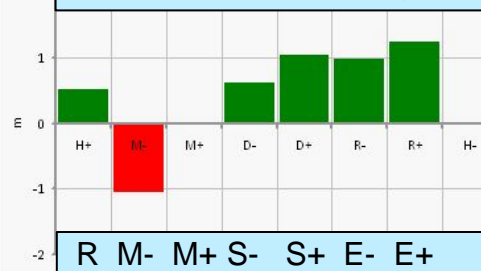


Gemiddelde waarden over 9 decennia

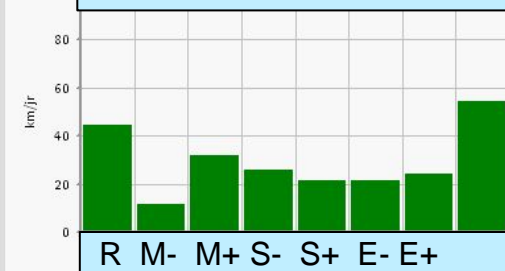
Veiligheid binnendijs per variant (Δ m/jaar)



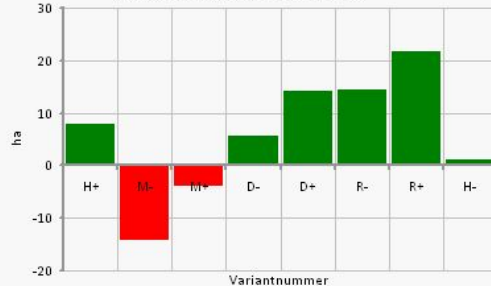
Safety outside Dike-ring



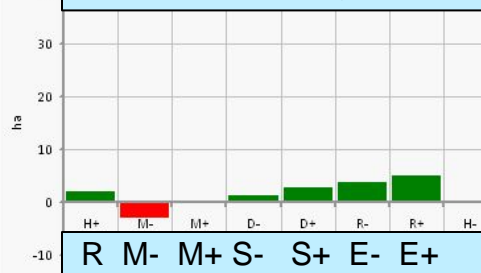
Influenced Coastline (km/yr)



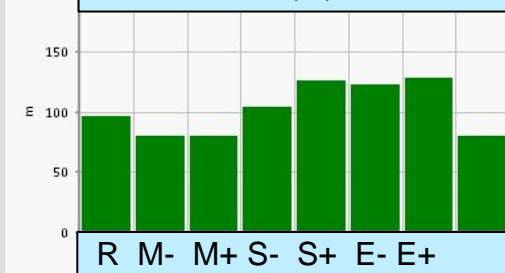
Aeraal duin per variant (Δ ha/jaar)



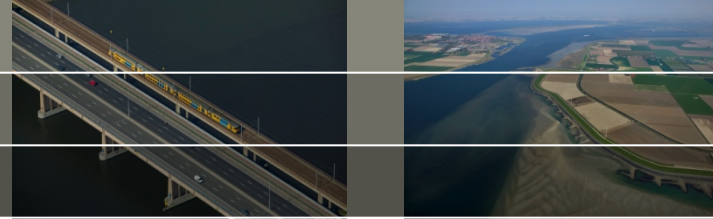
Dune area drinking w. (ha)



Beach Width (m)



Discussionpoints ALS study



- Minimal safety, Sustained Coast or Extra investments
- Priority on recreation, secondary safety , drinking water, nature ?
- Hold the line of the present coast or a new coast line?
- Conservation of the Waddensea ?
-

Alternative Long Term Strategy Development

Interactive approach

Who ?

client :
Deltaprogramme
Min. Infrastructure and Environment



involve stakeholders at all levels:

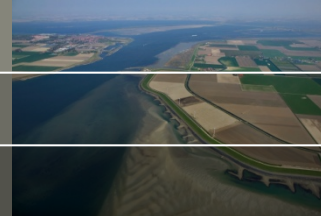
- national
- regional (provincial)
- local
- public and private

Conclusions

Juli 2012

- Nourishment strategy of NL is successful
- Upscaling necessary related to SLR
- Alternative strategies are being developed

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Re-evaluation

- upscaling in order to grow with increasing rates of sea level rise

