

Dunes and Estuaries

Morphological management, a concept for a holistic management of estuaries

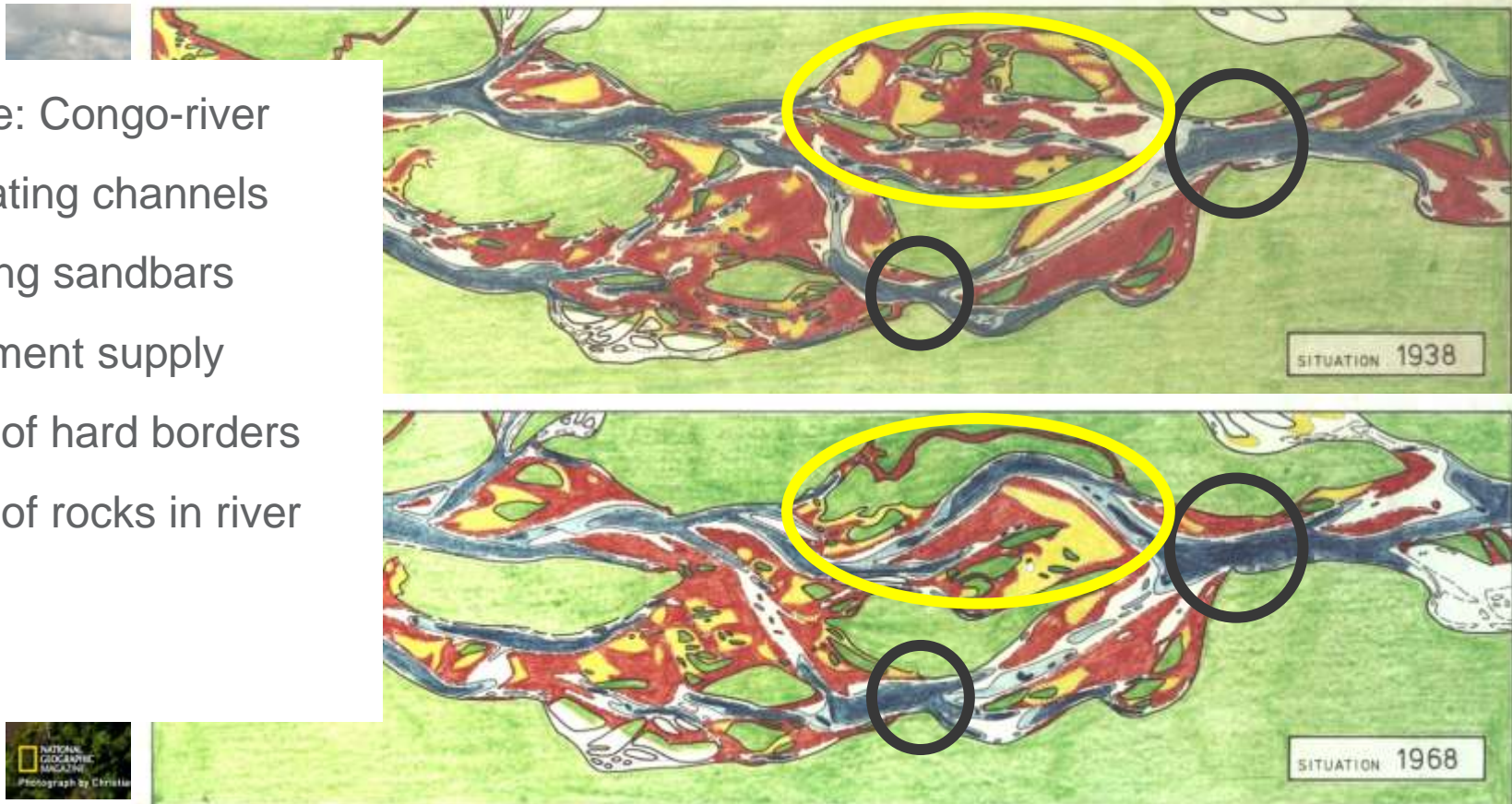
Ir. Yves Plancke *and Ir. Stefaan Ides*
Brugge, September 16th 2015

Morphology: intro

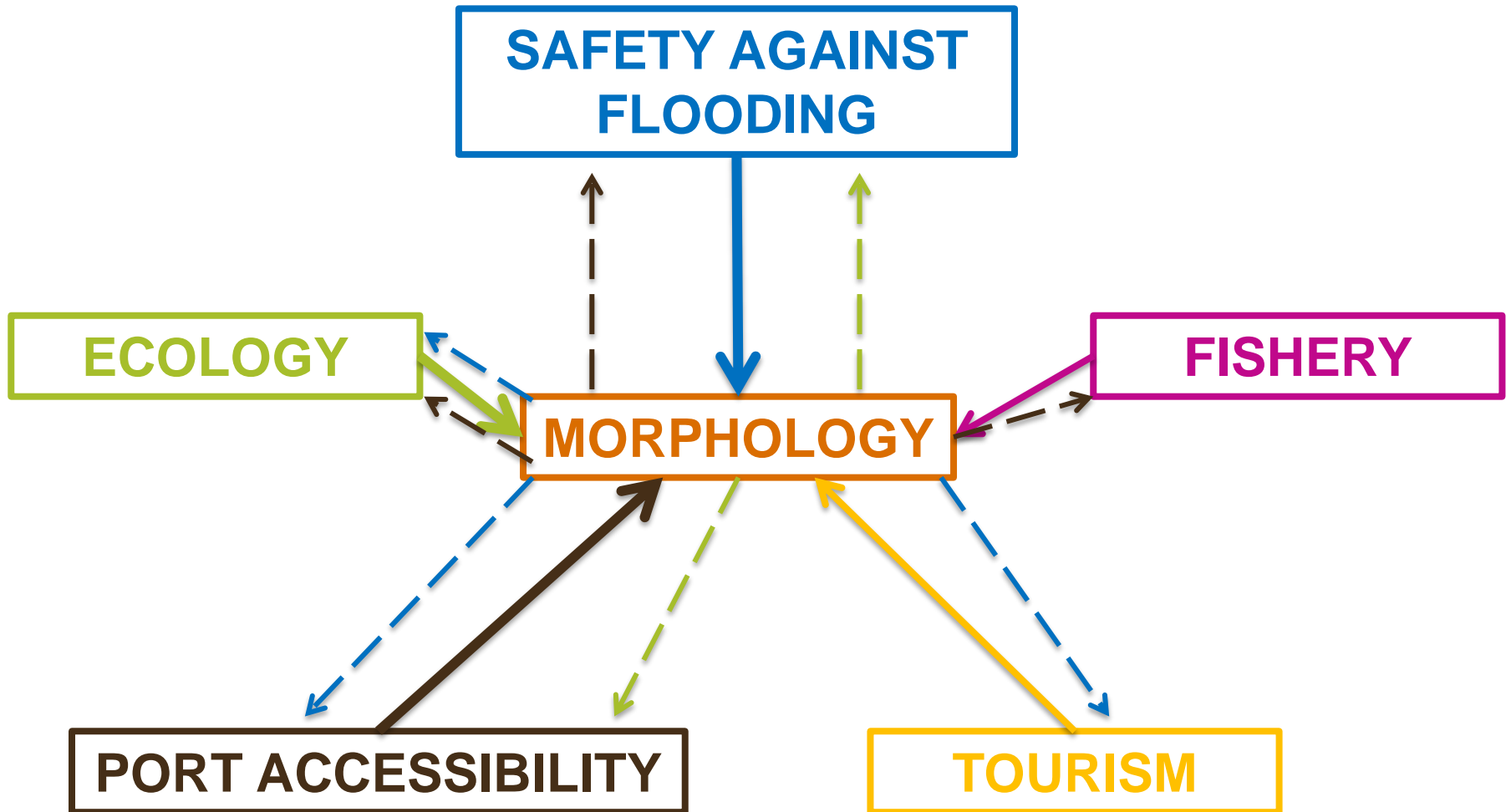
- Morphos (< Greek): form, i.e. depth and planform

Example: Congo-river

- Migrating channels
- Moving sandbars
- Sediment supply
- Role of hard borders
- Role of rocks in river
- ...

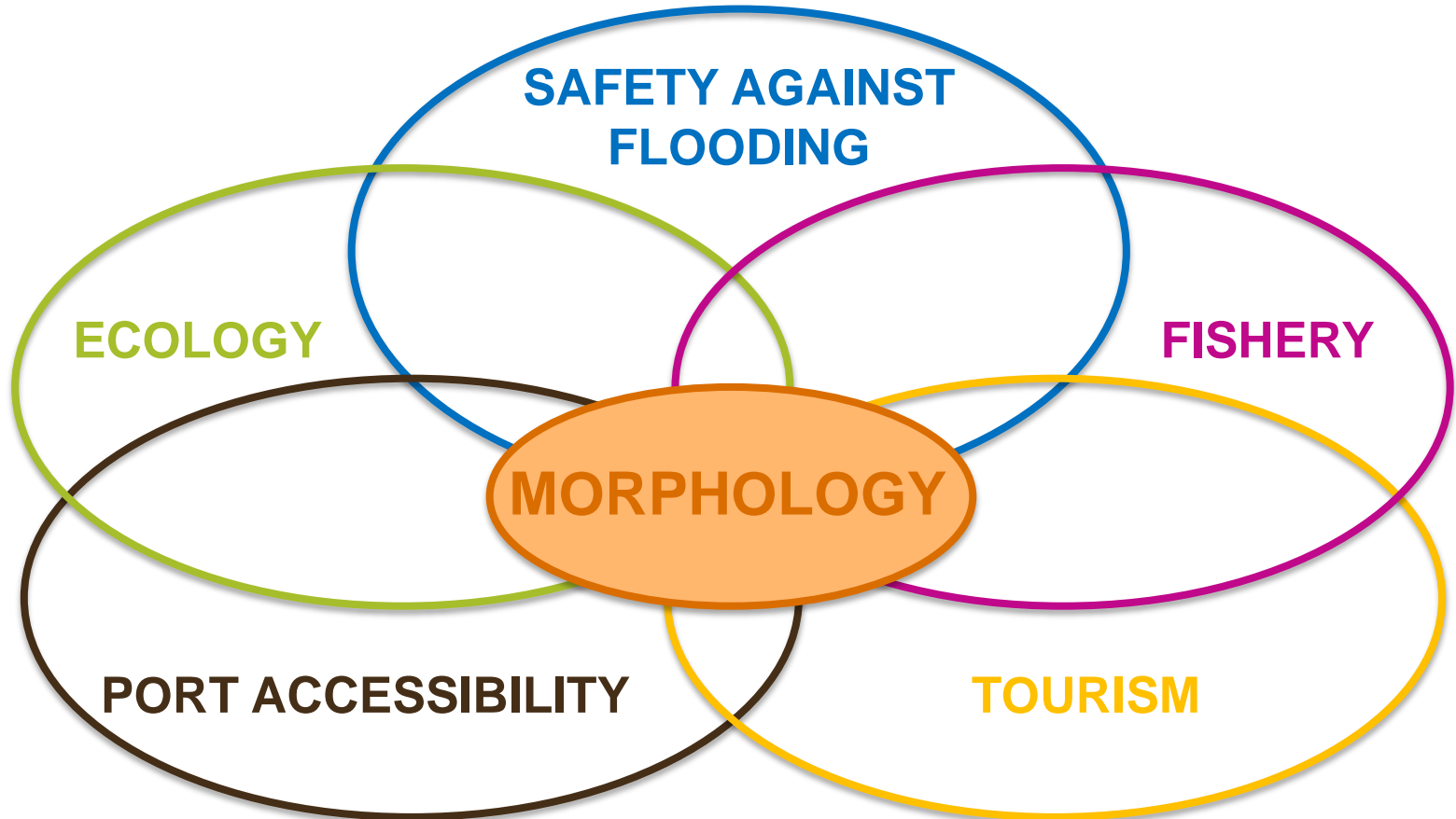


Role morphology (past)



Role morphology (future)

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Morphology is the foundation of all ecosystem services and functions !!!

Schelde-estuary

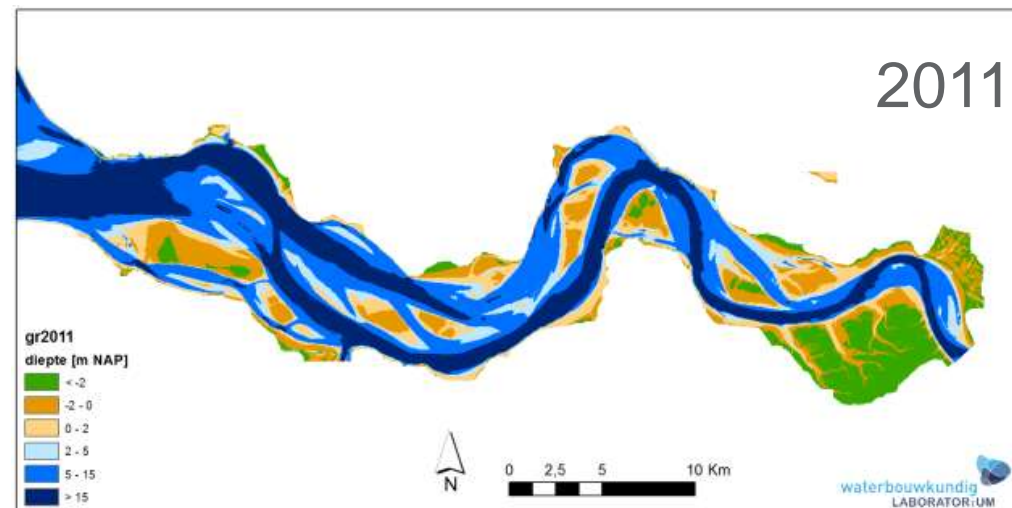
- Tides (range = 4 m)
- Salt water
- Sandy sediments



- Discharge ($120 \text{ m}^3/\text{s}$)
- Fresh water
- Muddy sediments

Morphology: Schelde

- LTV: “preservation of physical characteristics of the estuary is the cornerstone for management”
- Morphology is crucial for other functions
 - **Safety against flooding**
 - **Port accessibility**
 - **Ecology**

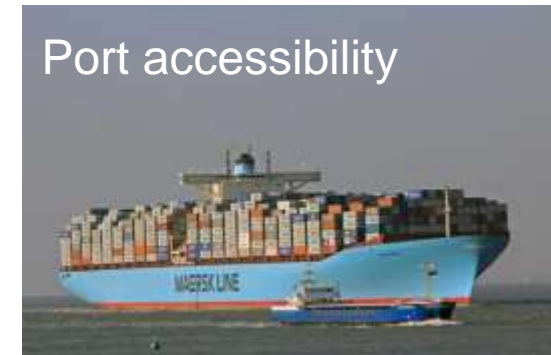


Future challenges I

Superstorms



Port accessibility

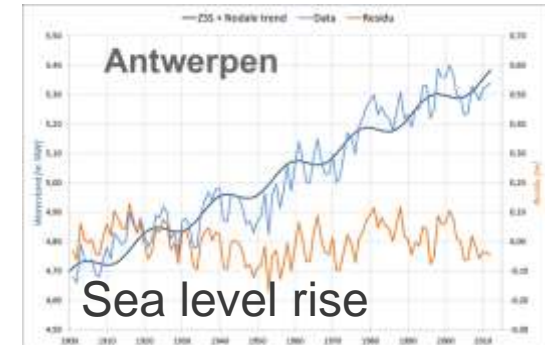


Nature



Regime shift mud ?

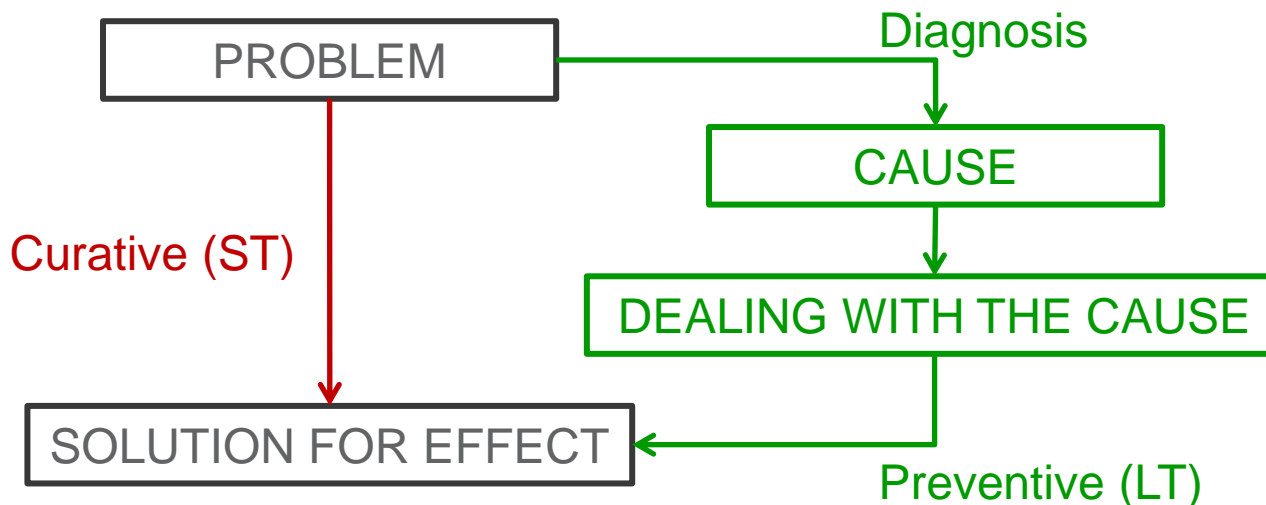
=> ecology



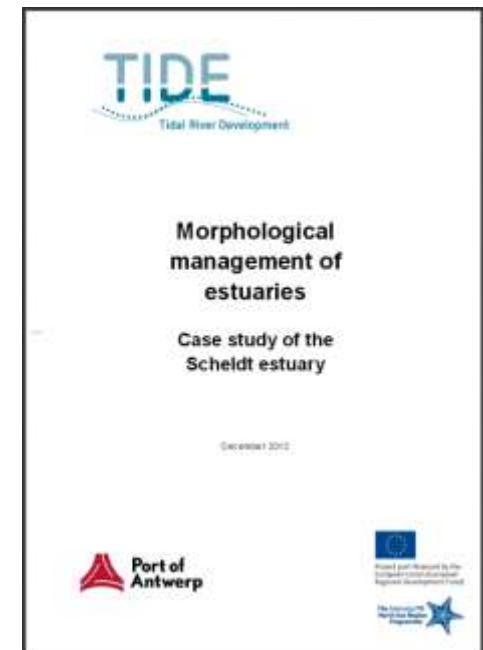
Solutions?

- Limitations of research tools ⇔ uncertainty
- Holistic approach based on system understanding
- Combining different ecosystem services and functions
=> striving for WIN-WIN-situations

=> MORPHOLOGICAL MANAGEMENT

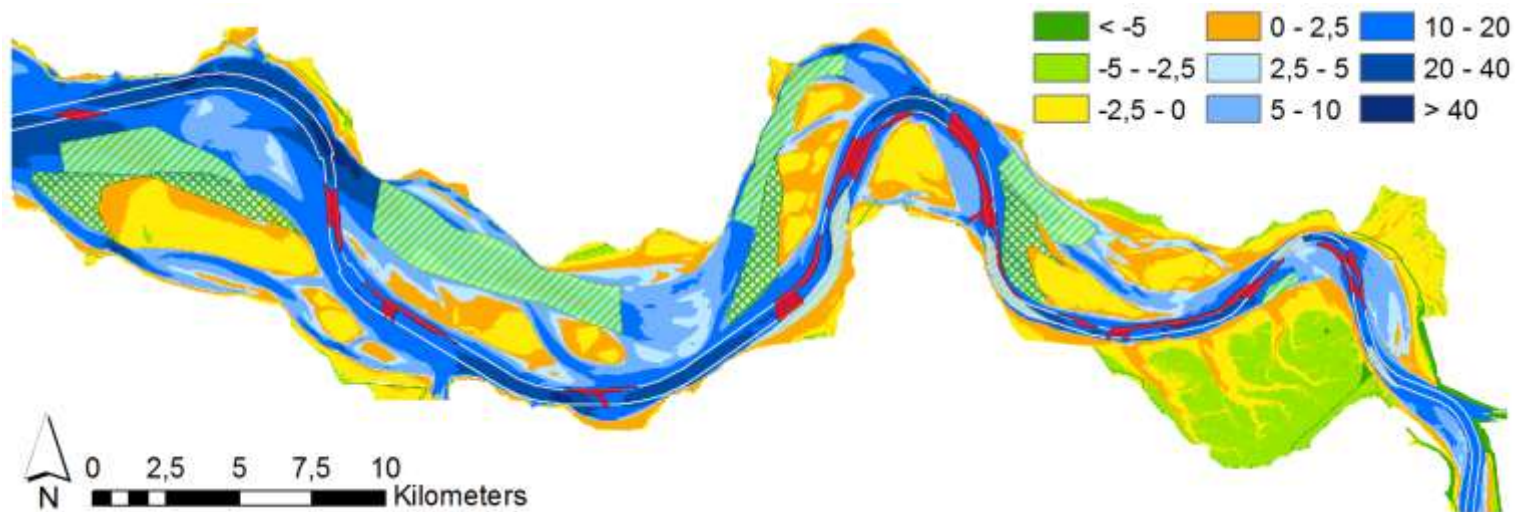


www.tide-toolbox.eu



CASE 1 – new disposal strategy Schelde-estuary

- Tide-independent draught up to 43' to port of Antwerp
- 7.7 Mm³ (capital) + ca. 12 Mm³/year (maintenance)
- Uncertainties on potential long term effects
- Three-stage rocket approach



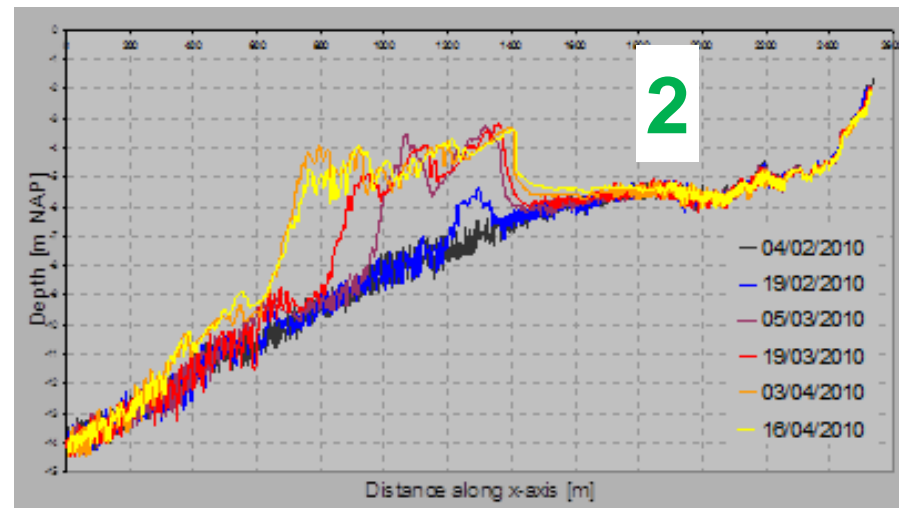
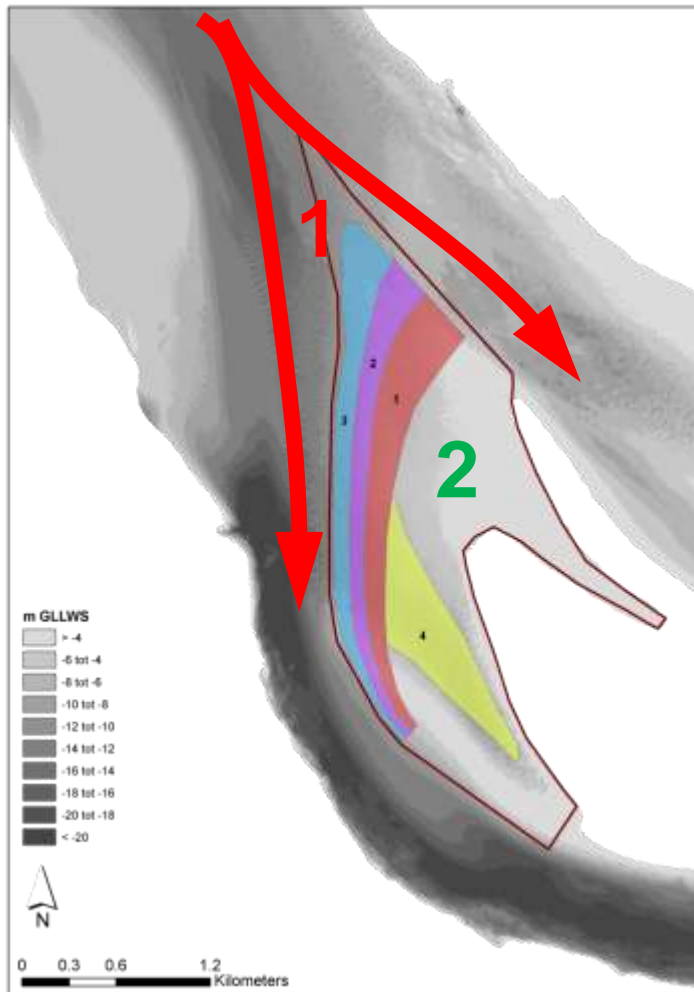
CASE 1 – new disposal strategy Schelde-estuary

- 3-step rocket approach:
 - **Stage 1:** EIA (Natura2000) most environmental friendly alternative: using dredged material to create new valuable areas for ecology (“**working for nature**”) => mitigate possible effects
 - **Stage 2:** Intensive **monitoring** (stability sediment, height of intertidal areas, grain size, ecology) and **evaluation**
 - **Stage 3:** **stopping** works (if necessary)



CASE 1 – new disposal strategy

- 1. Improving flow distribution:**
 - Multiple channel system
 - Self-eroding capacity sill
 - 2. Creation ecological valuable habitat (2012: + 81 ha)**
- => LT evolutions???

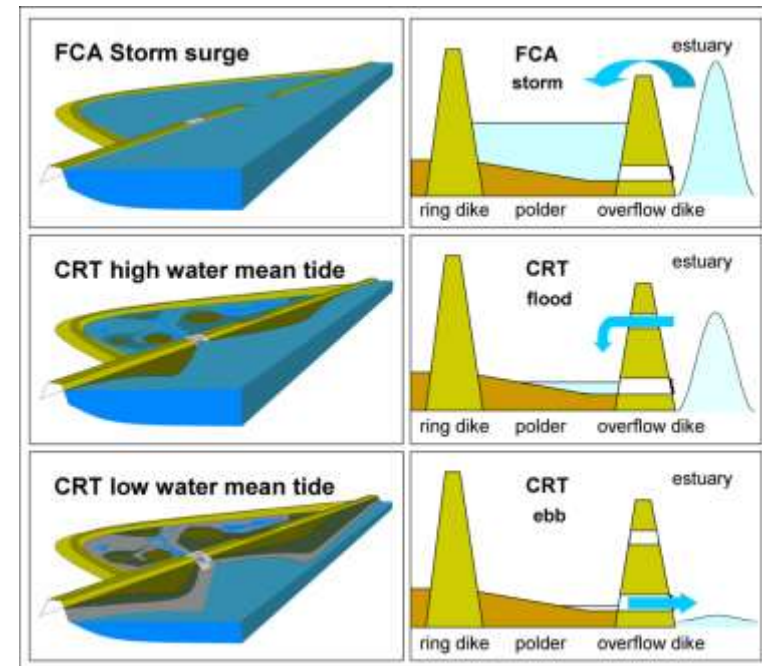


CASE 2 - construction of FCA + Controlled Reduced Tide



1. Extra storage capacity
2. New tidal flats/marshes

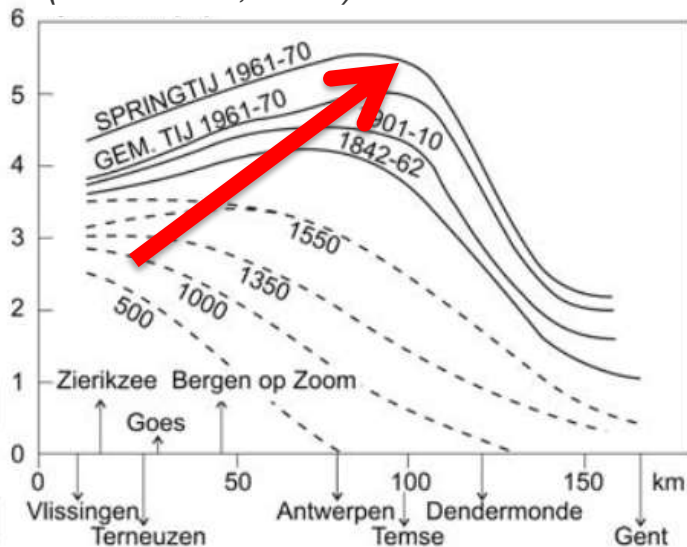
=> LT evolutions???



Future challenges LT

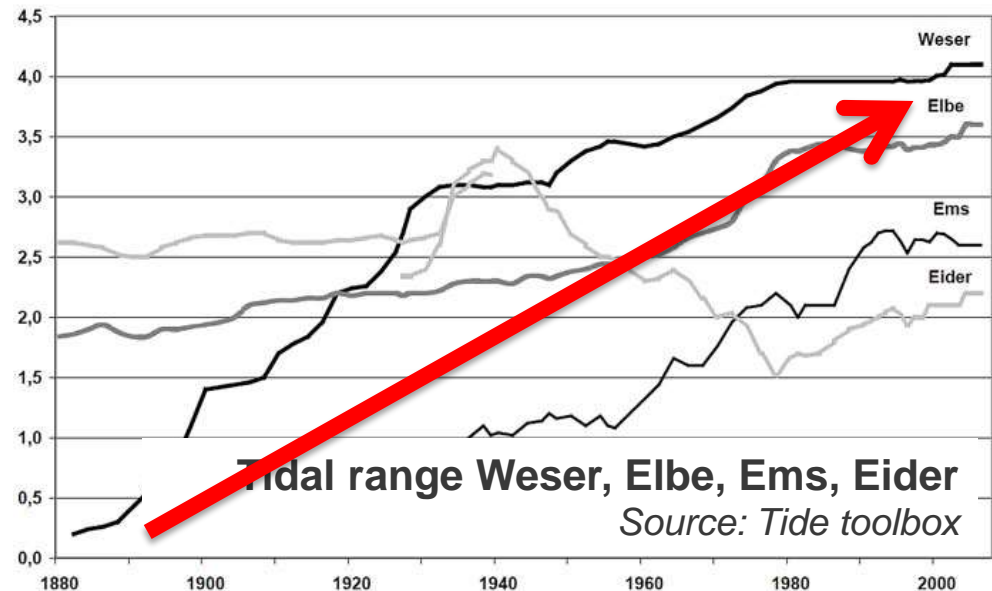
Tidal range Schelde

(Coen et al., 1988)



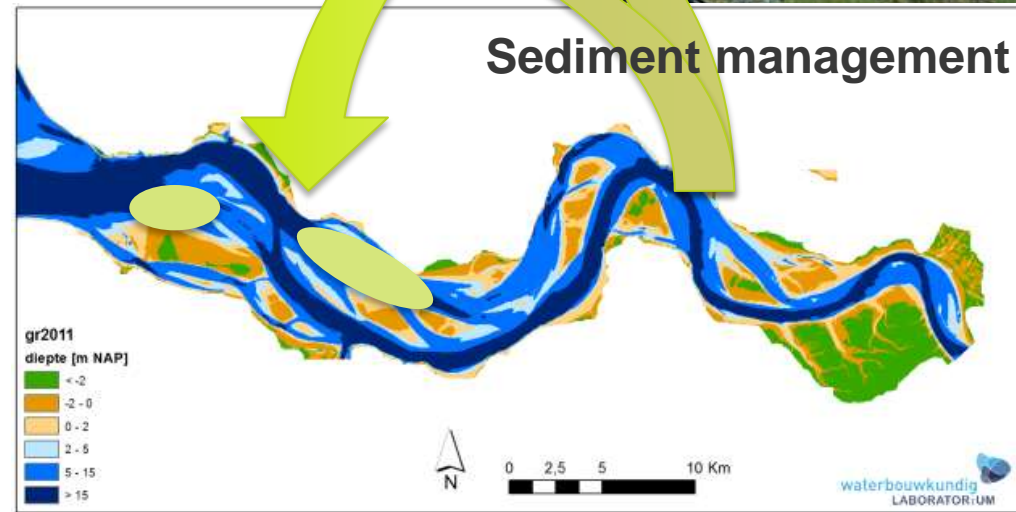
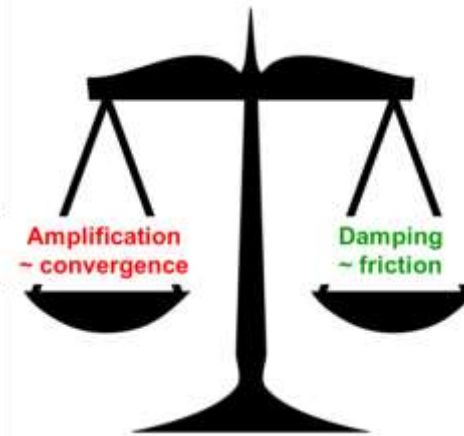
- Why have these evolutions taken place?
- Which role have human interventions played?

=> System understanding !!!



Tidal range Weser, Elbe, Ems, Eider
Source: Tide toolbox

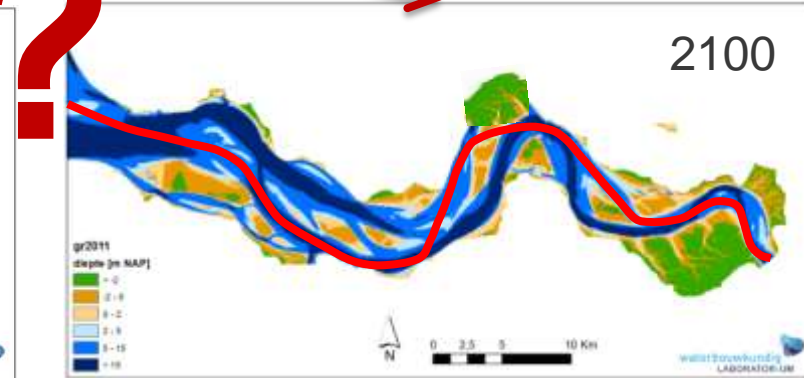
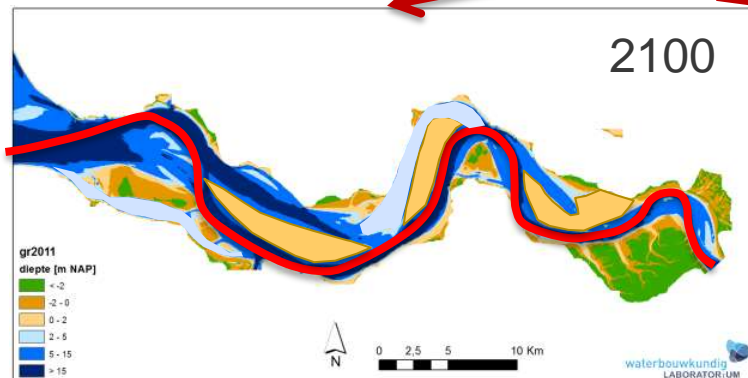
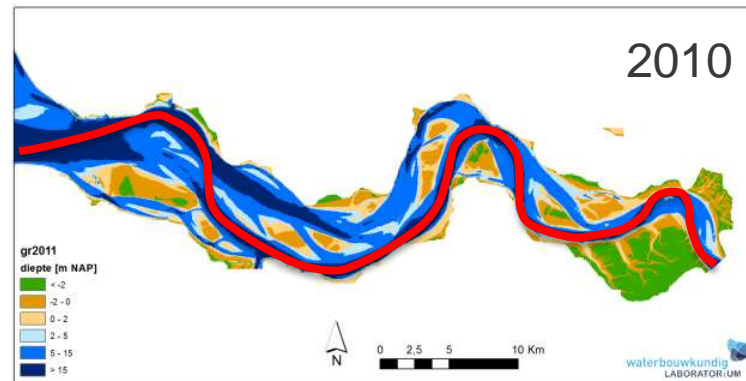
Possible solutions: sediment management



Schelde 2100 ???



**Importance holistic approach!
=> morphological management!**



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