How the tides changed in the Schelde-estuary under influence of natural changes and human interference

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ECSA local meeting - Antwerpen, July 8th 2016

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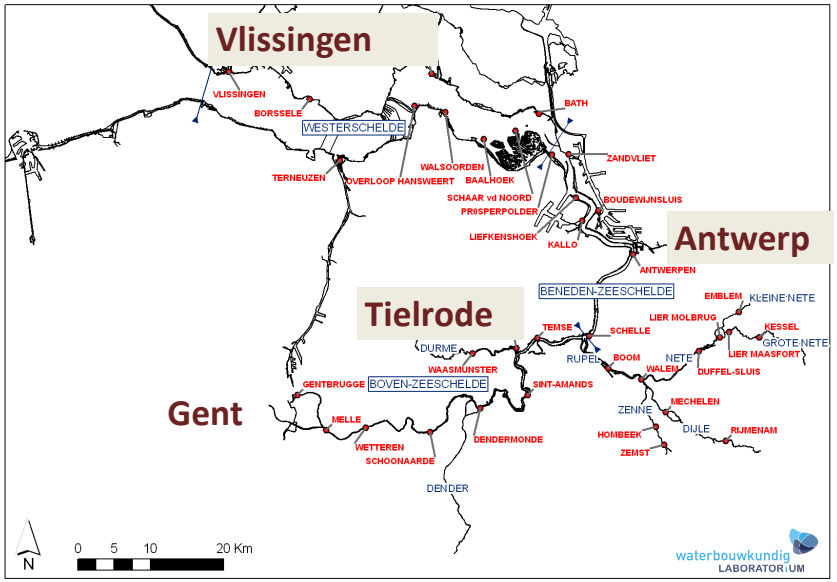
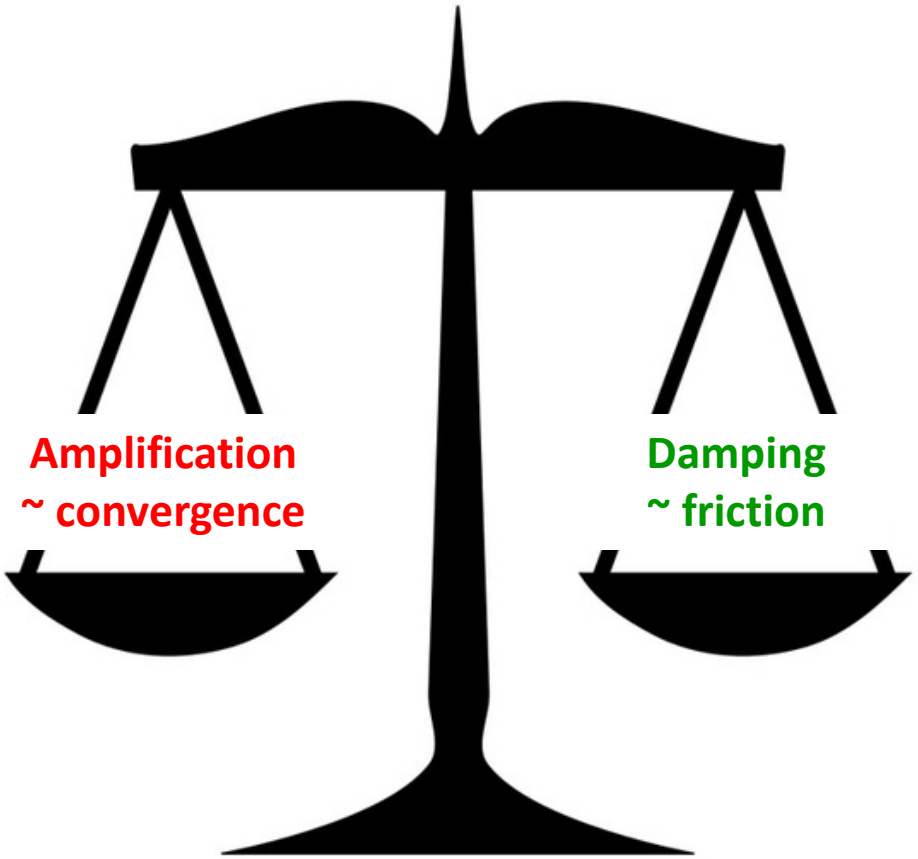
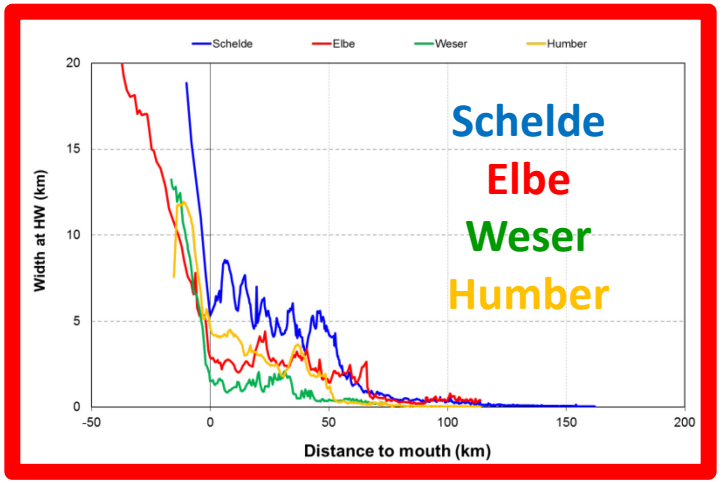
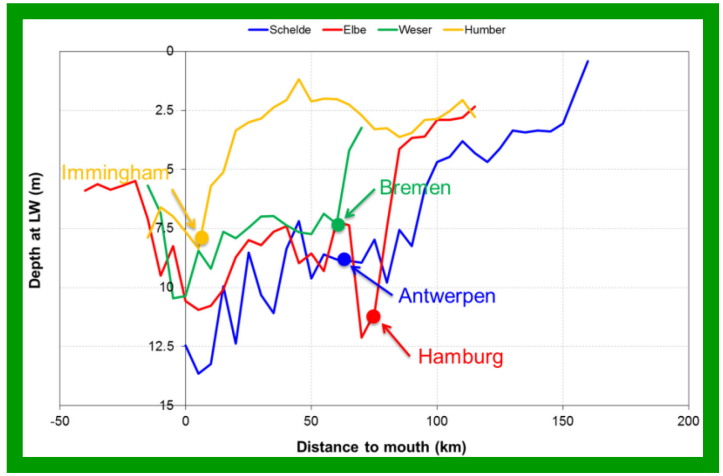
… in the Schelde-estuary



Tidal propgation: processes







Source: Vandenbruwaene et al., 2013

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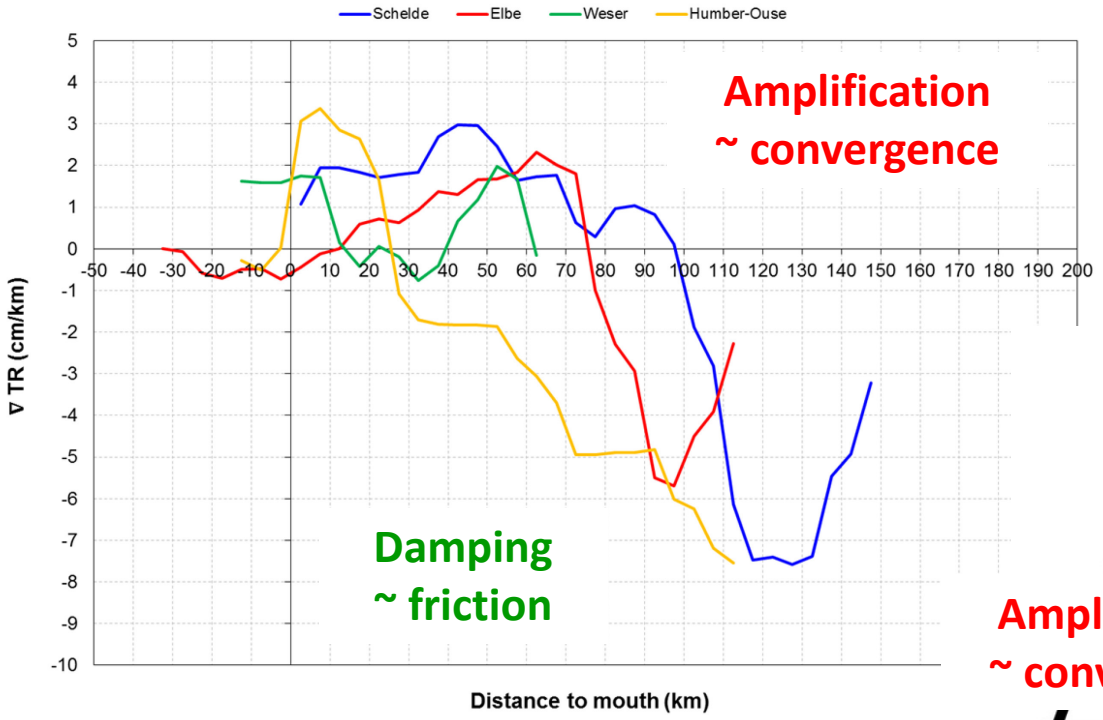
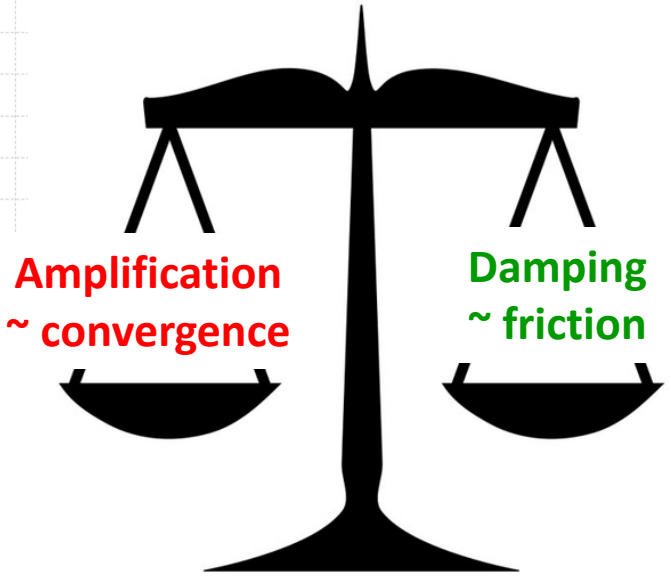
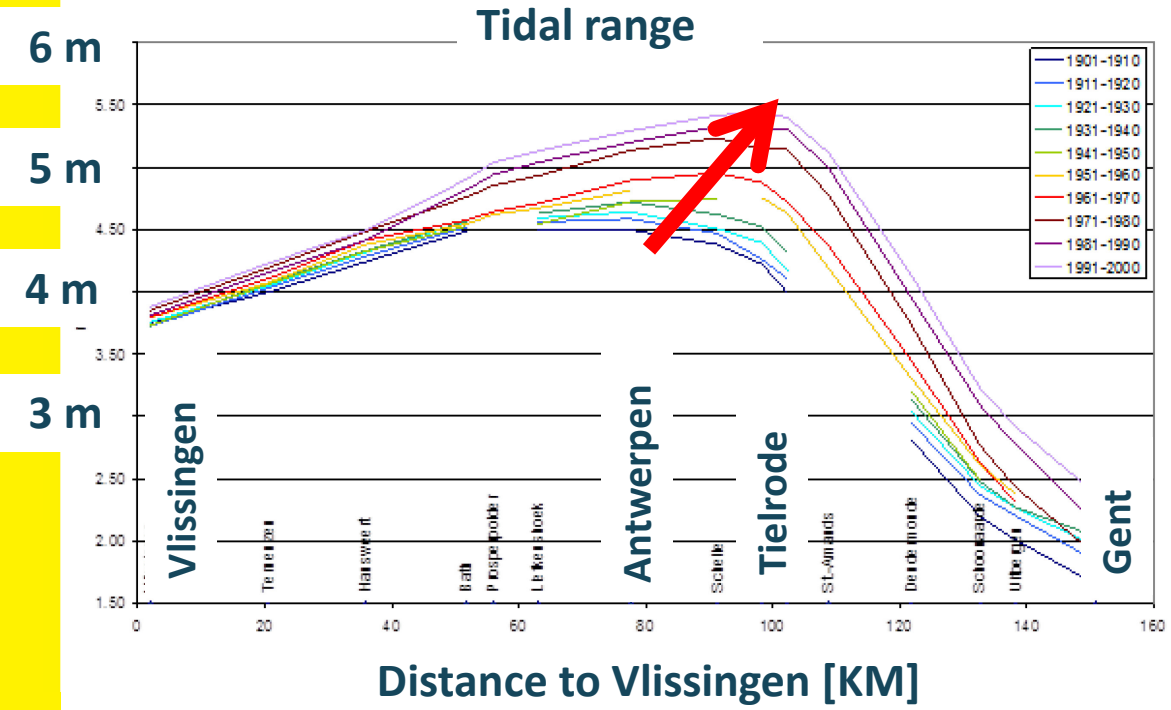
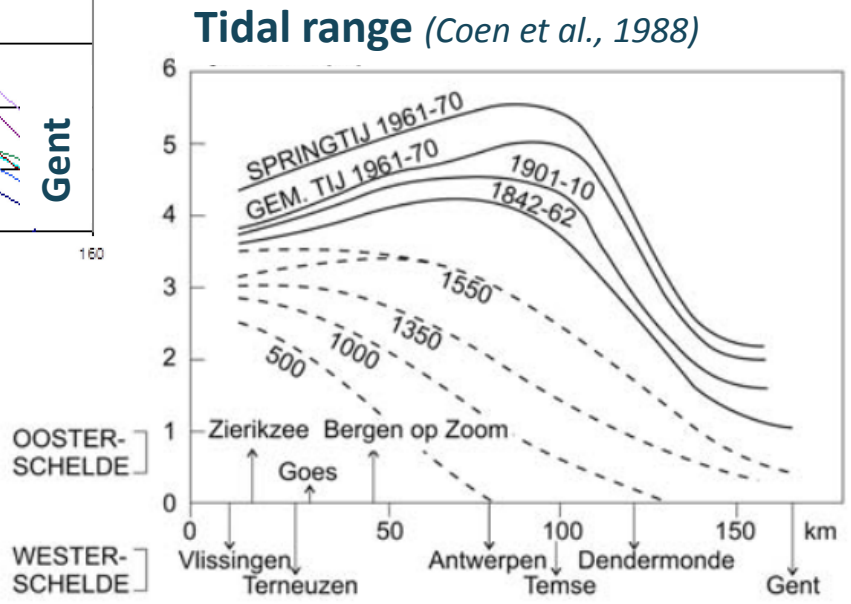
Tidal propgation: processes





… tides changed … (LT)





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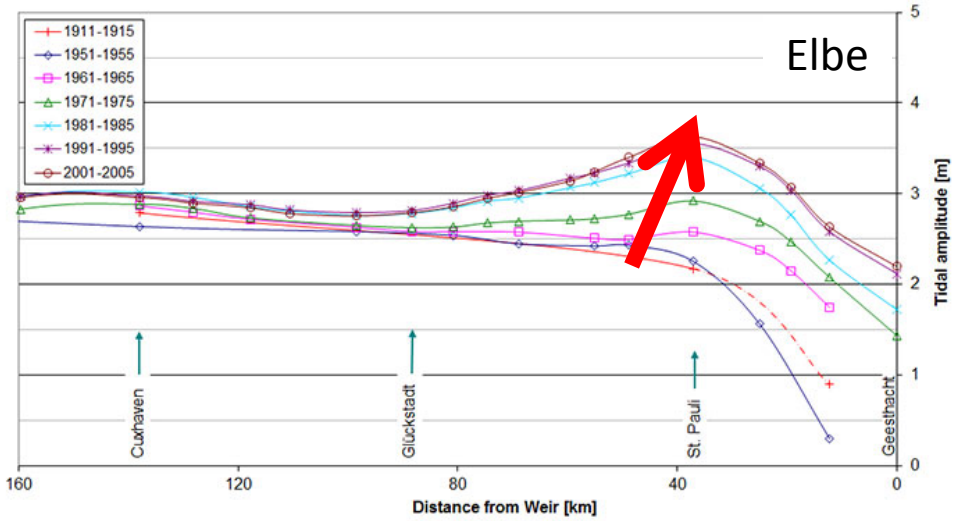
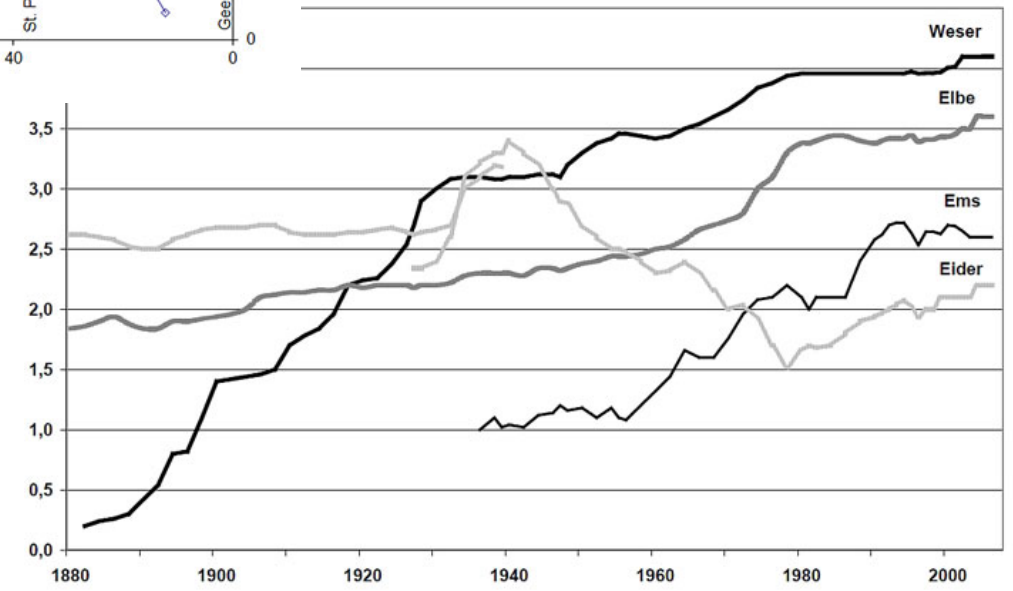
… but also outside the Schelde!



Source: Tide toolbox



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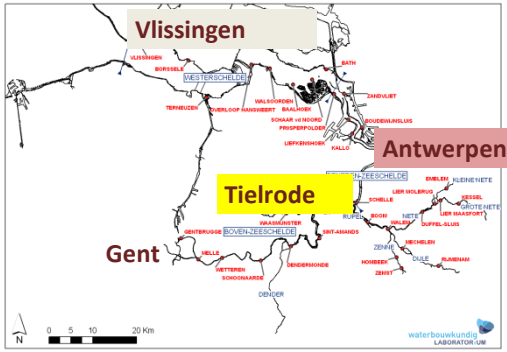
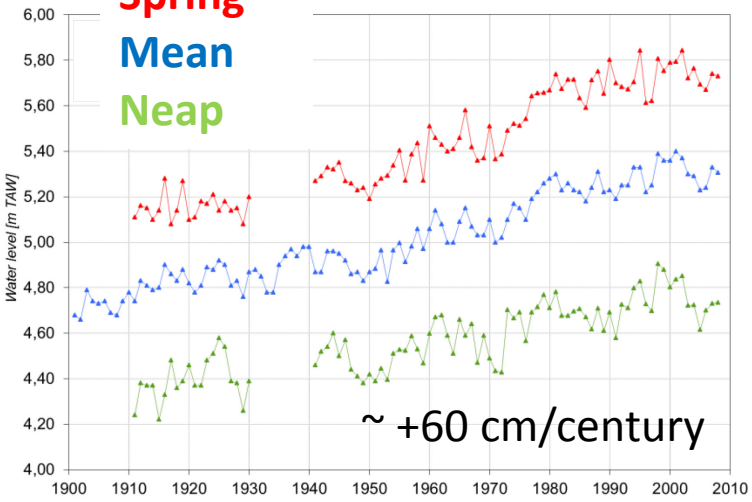
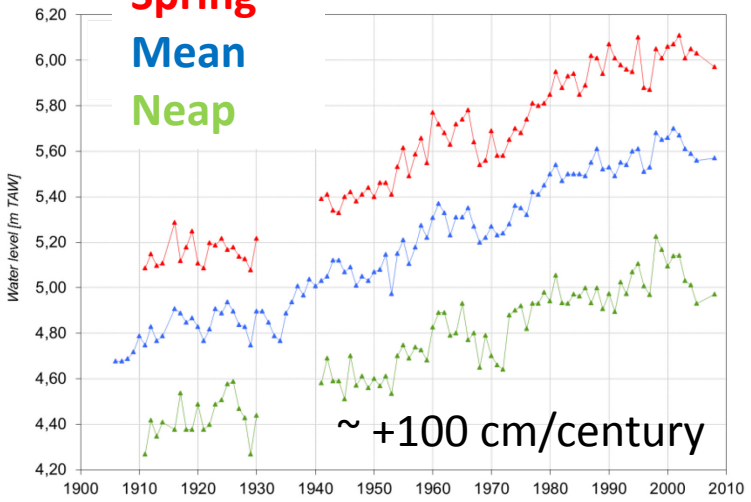
Tides: up-estuary

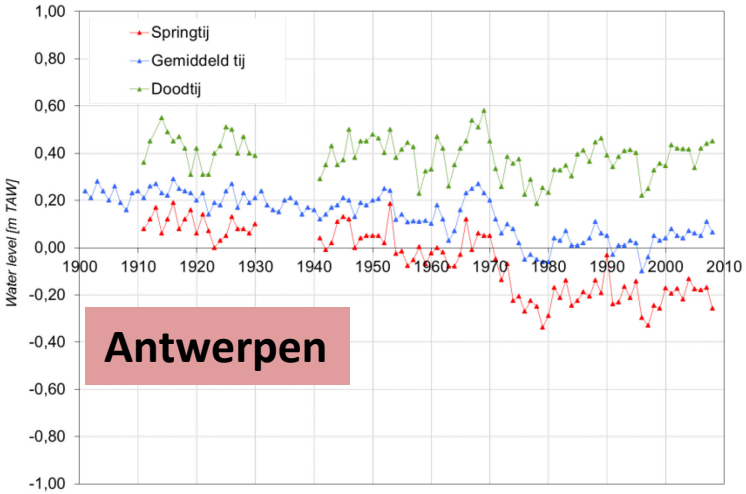


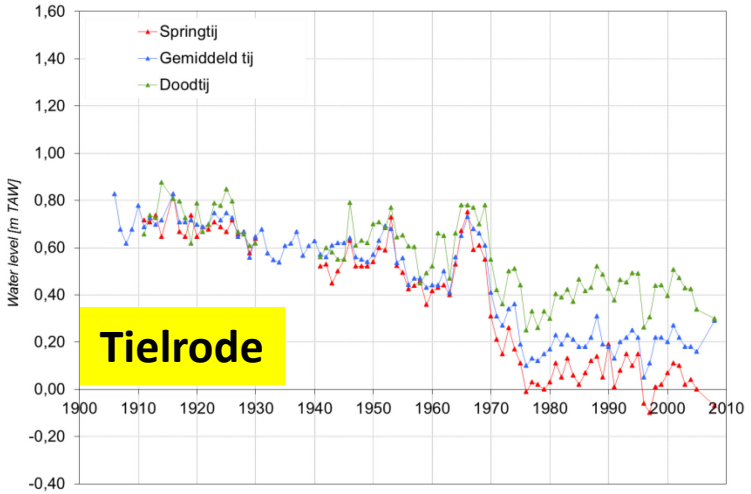
High water





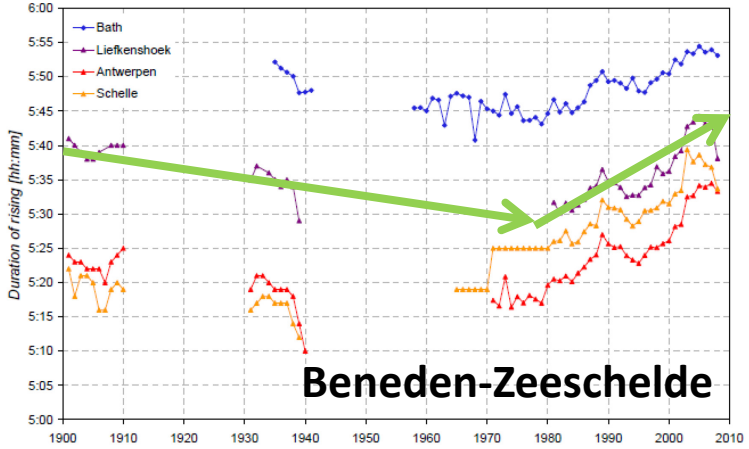
Low water

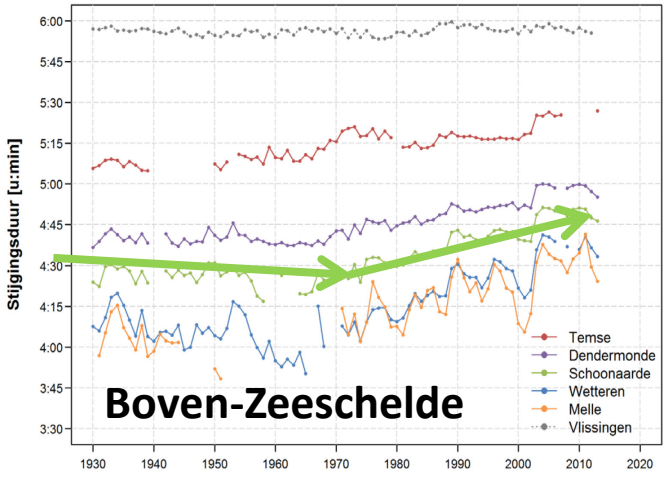




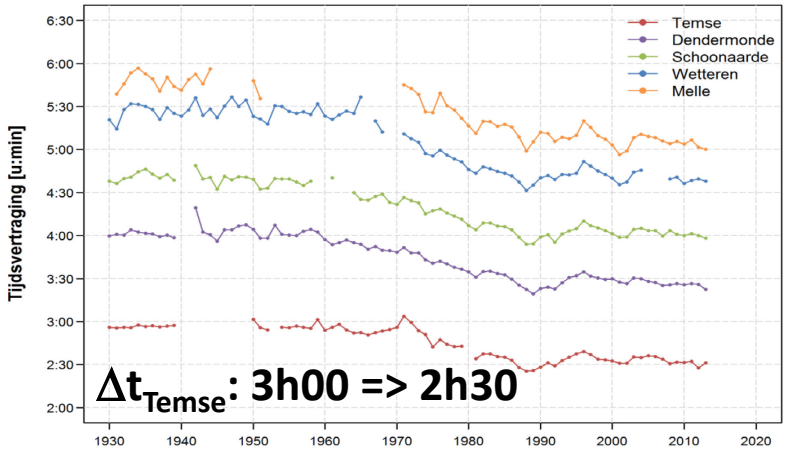
Tides: up-estuary

Time of rising (LW => HW)

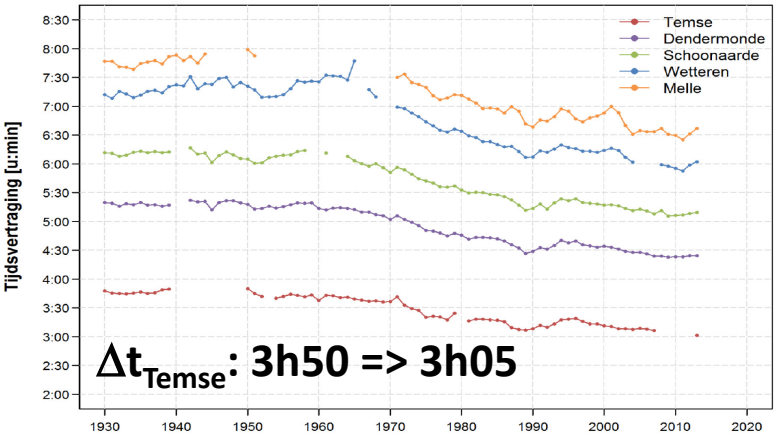




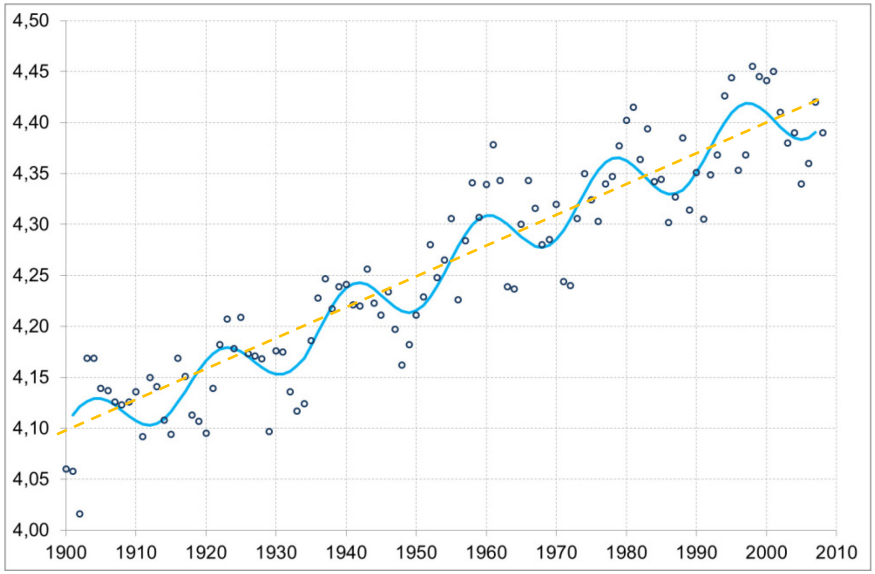
Delay of HW to HW Vlissingen



Delay of LW to LW Vlissingen



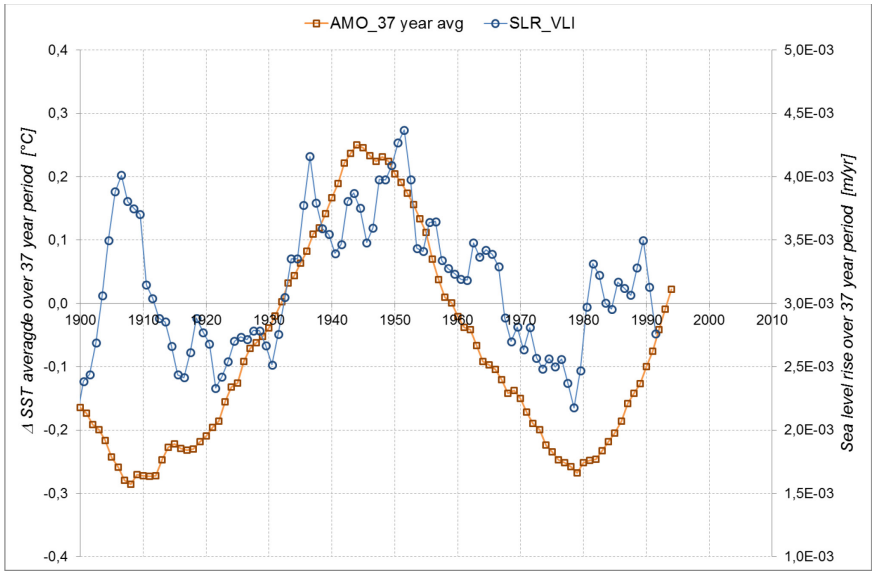
… natural changes and human interference.



Sea level rise

18,6 year nodal cycle

Atlantic Multidecadal Oscillation



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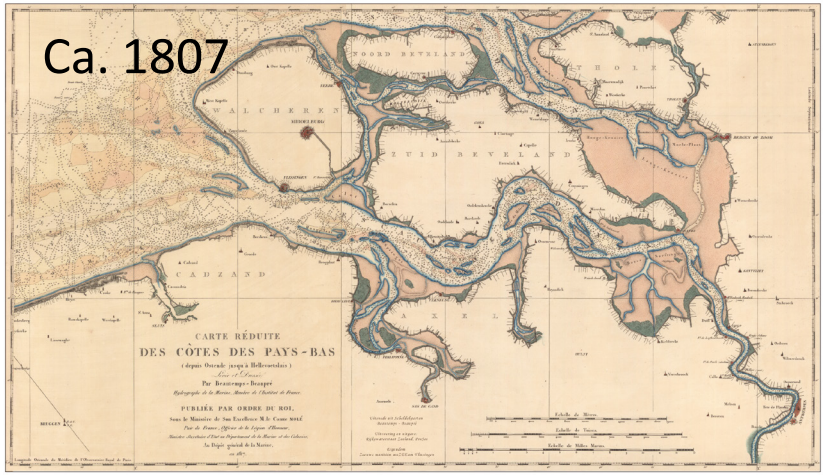
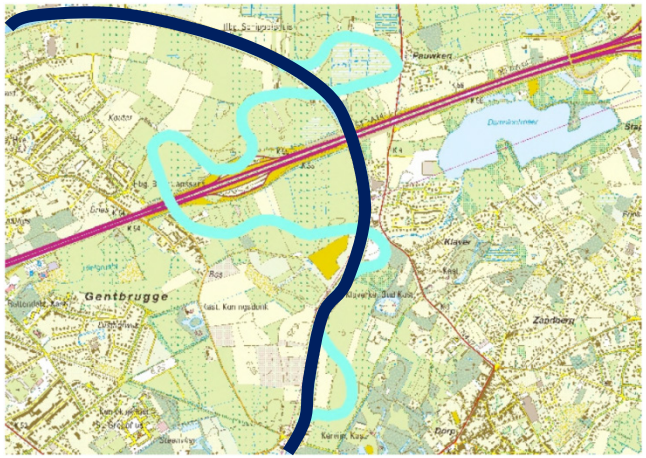
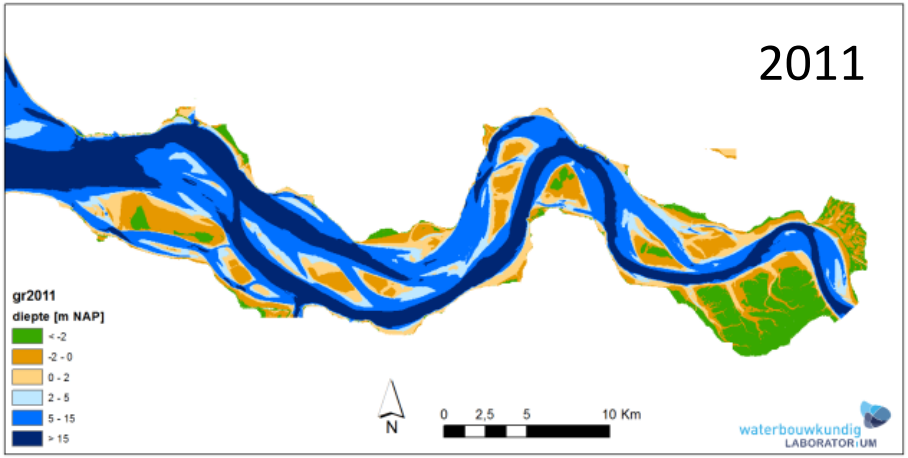
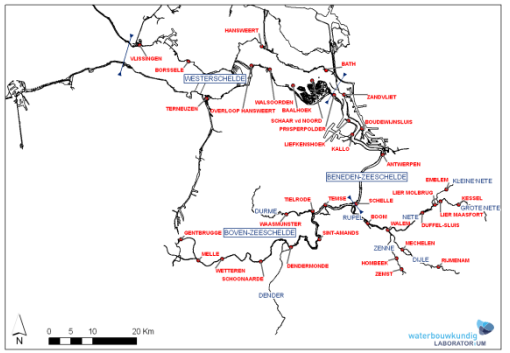


- Sea level rise
- Poldering
- Sediment extractions
- Channel enlargement
- Canalisation
- Hard bordering

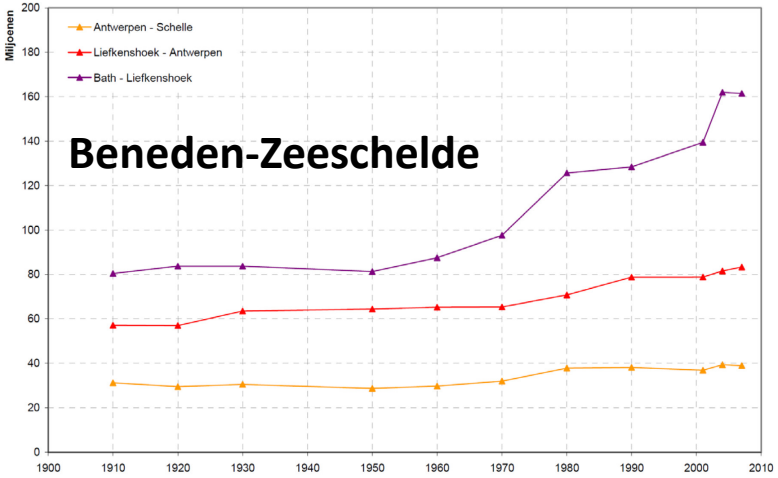




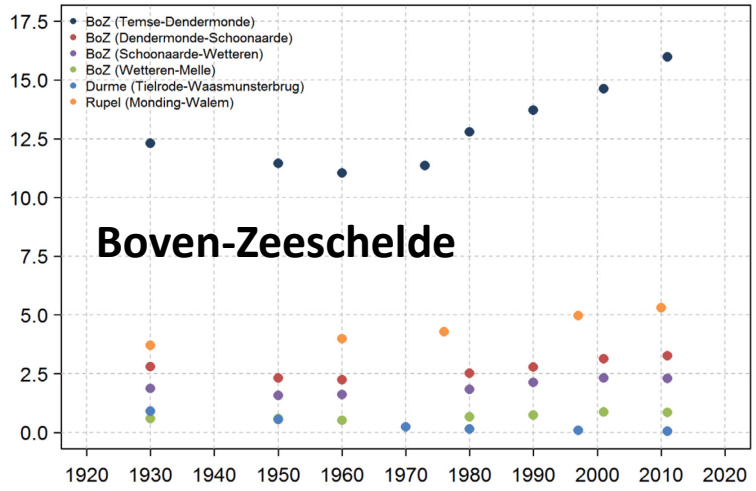
Morphological changes



Water volume in channel



Water volume in channel



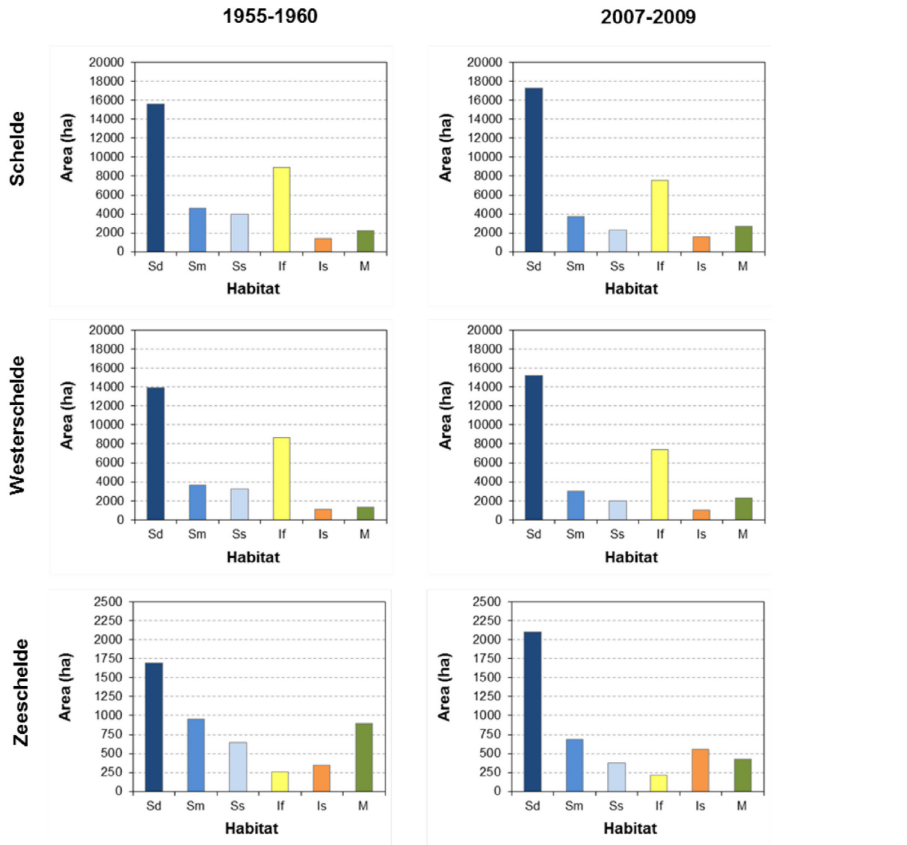
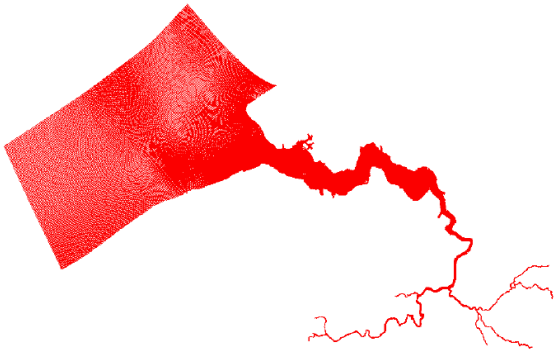


Figure 10 – Comparison of historical habitat areas (1955-1960) and present habitat areas (2007-2009) (in ha) for the Schelde, Westerschelde and Zeeschelde
(Sd = subtidal deep, Sm = subtidal moderately deep, Ss = subtidal shallow, If = intertidal flat, Is = intertidal steep, M = marsh)

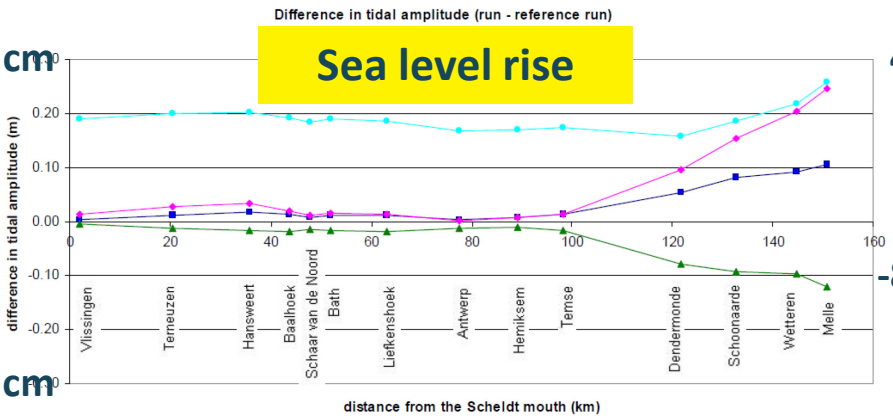
Human interference



Sea level rise

30 cm

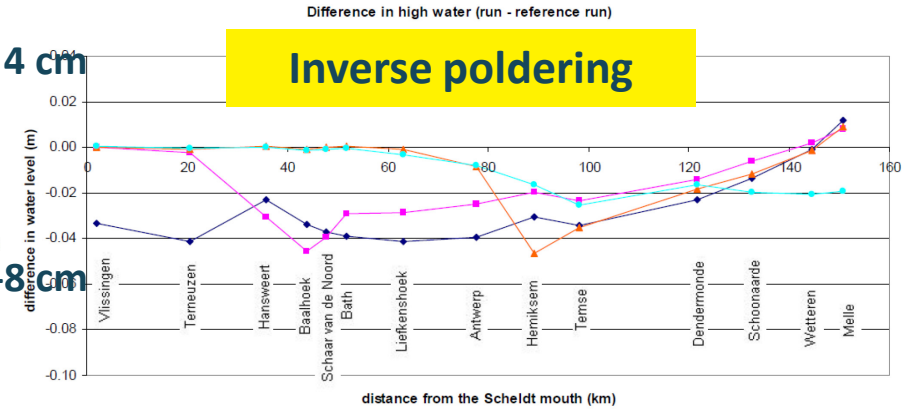
-30 cm



Inverse poldering

4 cm

-8 cm

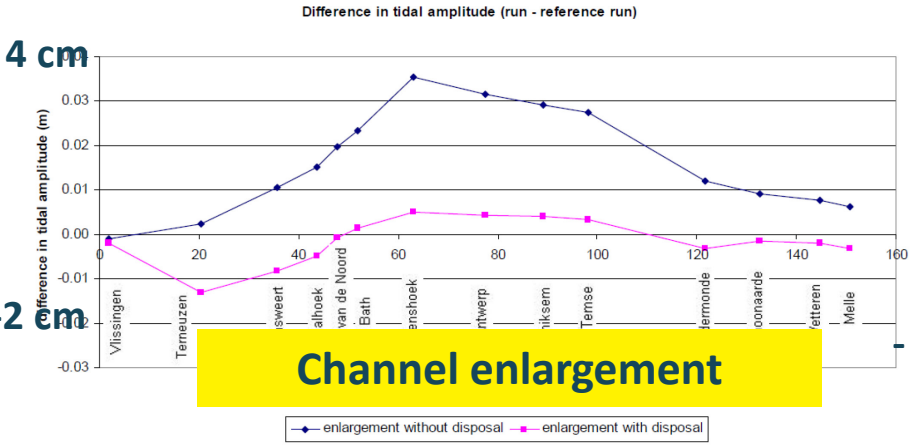


Sum of individual initial effect of measures ≠ real evolution

Channel enlargement

4 cm

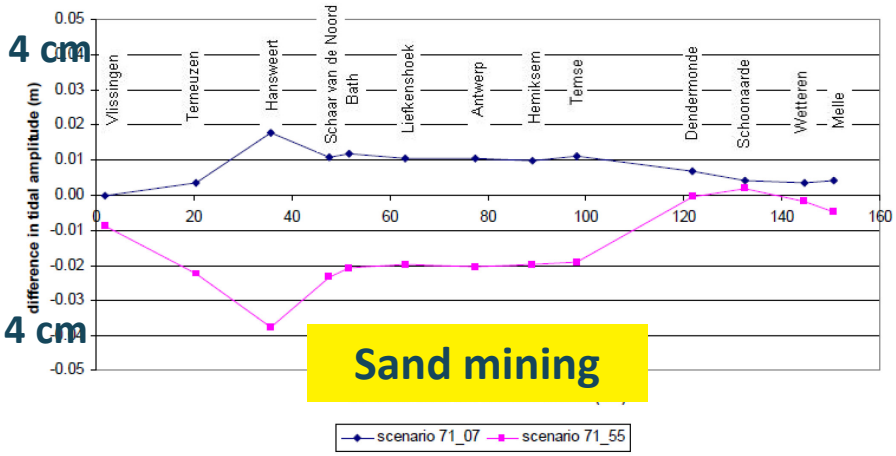
-2 cm



Sand mining

4 cm

- 4 cm



Conclusions

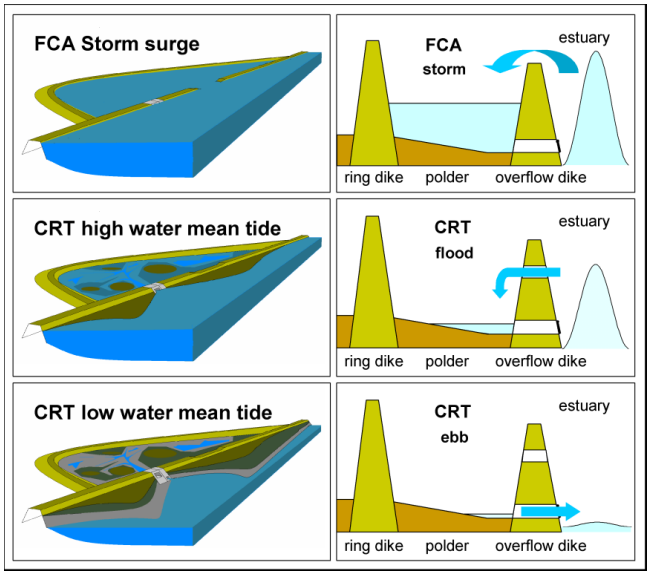
- **Gradual increase HW ~ sea level rise + human activities**
- **Stepwise decrease of LW ~ human activities**
- **Importance of morphological evolutions (indirect effect)**

=> important increase of tidal range + maximum up-estuary

- **Similar evolution in other estuaries (Elbe, Weser, Loire,…)**

- **Future challenges (~ "morpho-system" services):**
  - → Reduction high water level ~ inundations
  - → Reduction tidal dynamics ~ safety + ecology
  - → Measures creating "win-win"-situations
  - → "Global" measures with effects in whole estuary

Measures: present and future



Source: cCaspar, 2012

Crucial to strive for win-win-situations !

… or doing more with less!

More information:

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