Engineering our way into trouble? Sea level rise and estuaries

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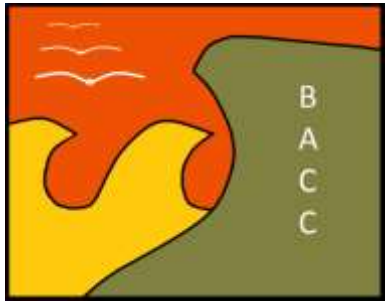

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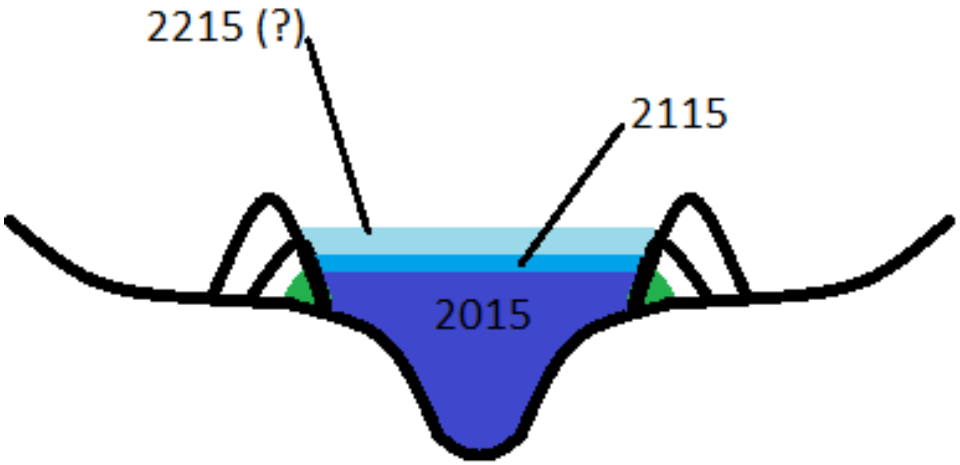
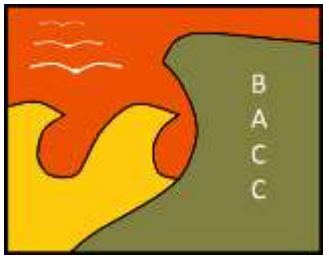
The problem

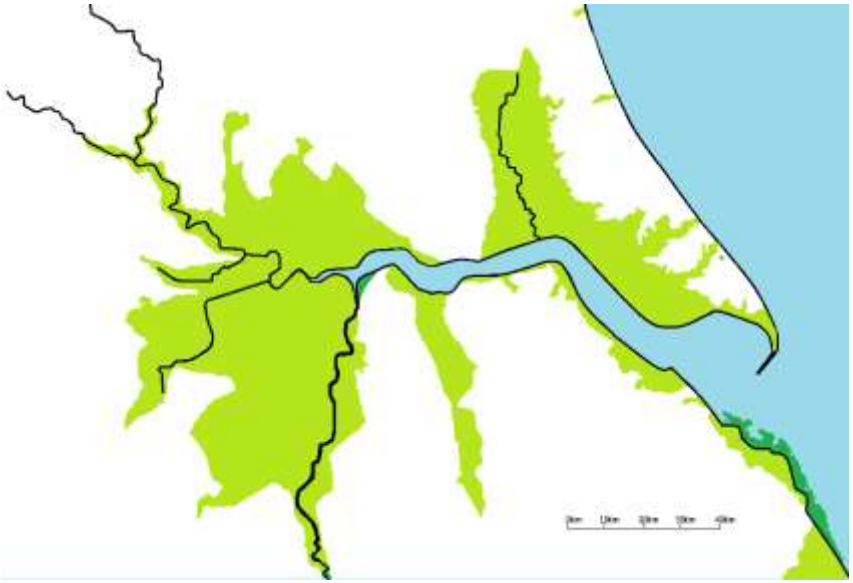
- Sea level rise is here to stay.
- It will not go away in 50 or 100 years time but is likely to continue for several centuries.
- Current measures to address flood risk are not sufficiently holistic or forward-looking.



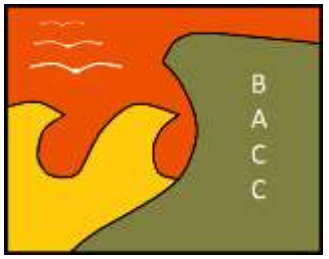
Defining ‘Estuaries’



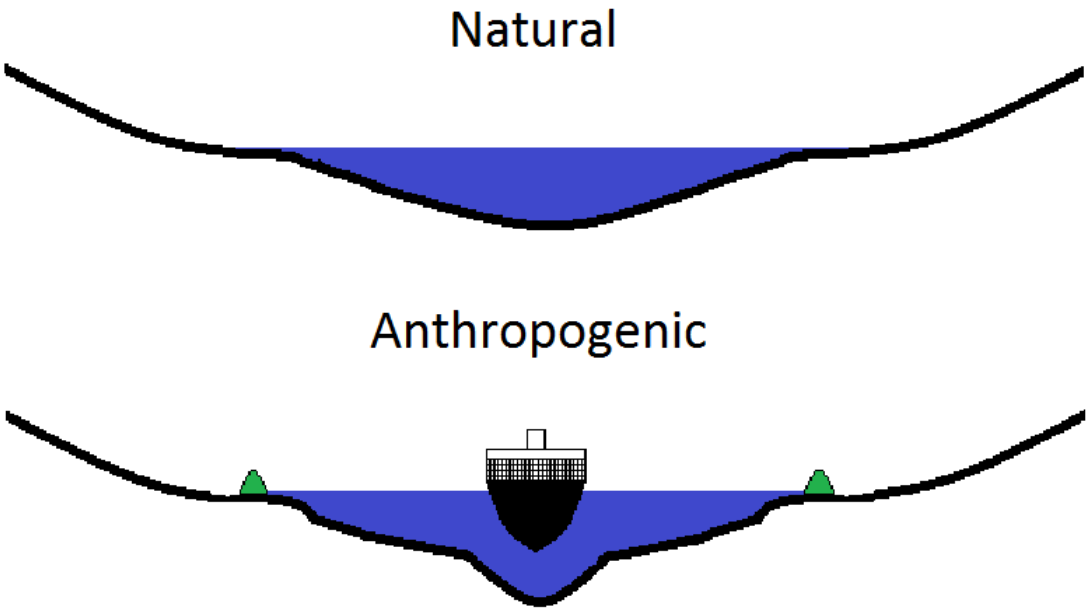
- Various classifications of estuary morphology.
- Mostly based on their original geomorphology.
- But they overlook the difference between their modern and pre-anthropogenic form.



Tidal canals



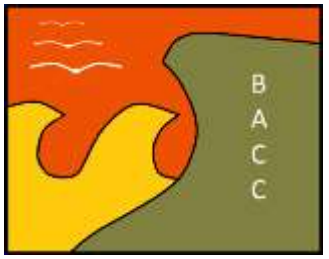
- Accommodation space lost.
- Thalweg deepened.
- Inter-tidal squeezed.
- Increased tidal propagation?

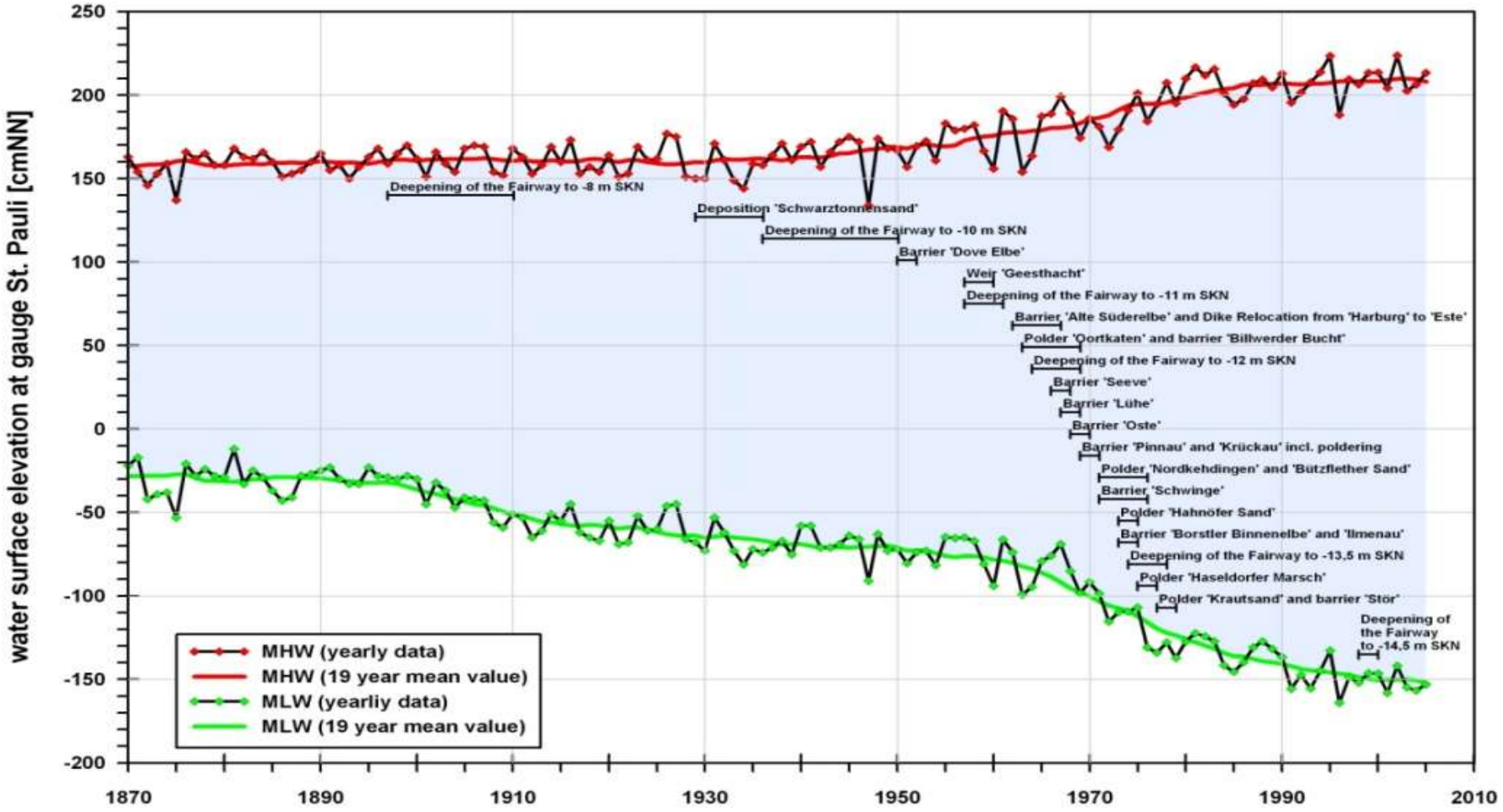


There is nowhere for water to go

Except upwards

The evidence:
Increased tidal propagation

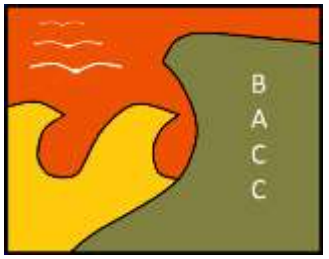




The result

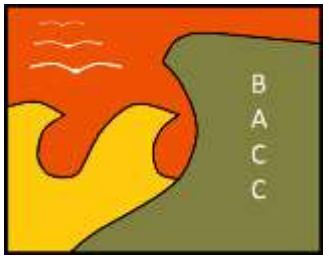
- Coastal squeeze
- Leads to loss sediment.
- It is irreplaceable!
- And we are busy dumping ‘black gold’ at sea!

The critical problem



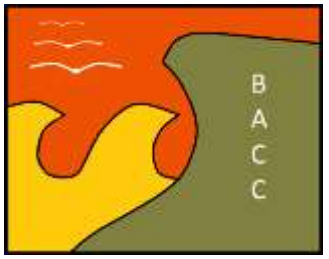
- Generations of coastal managers think of estuaries as ‘natural’, yet their form is anything but!
- As sea levels rise, the effects of canalisation will worsen.
- There will be a greater tendency for sediment export in short estuaries and higher turbidity in long estuaries.
- We use classification systems that do not reflect anthropogenic effects.

The differences?



- In many estuaries there is an almost complete lack of freshwater tidal components.
- Lack of capacity for ‘rollover’.
- Lost of adaptation capacity.
- Increasing flood risk.
- Increasing costs to maintain and replace infrastructure.
- In some estuaries, greatly increased turbidity.

The problem 1

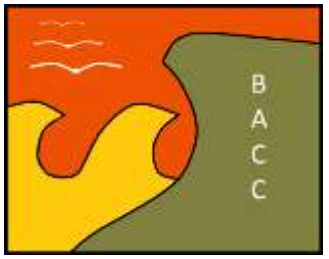


- Water quality will decline as suspended sediment loads increase in longer estuaries.
- The risk of flooding will increase.
- Maintenance and capital costs will rise.
- Managed realignment invariably results in green foreshore – good from one flood risk perspective but less helpful in terms of increasing the tidal prism and providing mudflats for fish and wildlife.

The problem 2

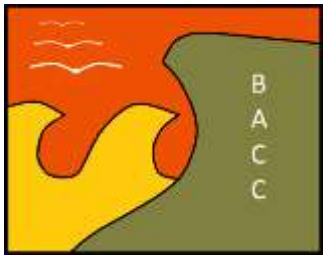
- Lack of holistic thinking – issues mostly focus on flood defence but also involve water quality, fisheries and wildlife.
- A bigger socio-economic picture.
- The solutions are possible but politically unpalatable.

What needs to be done?



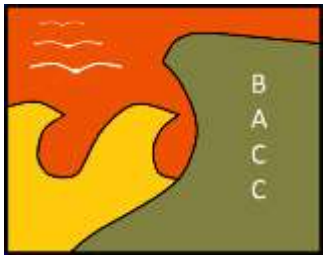
- Increase accommodation space – but not at a small scale.
- We have to ‘think big’. Not tens or hundreds of hectares, but at the thousand hectare scale in some places.
- We must think strategic – long-term land allocations for ‘making space for water’.
- Make sure society really understands the problem.

Some answers?

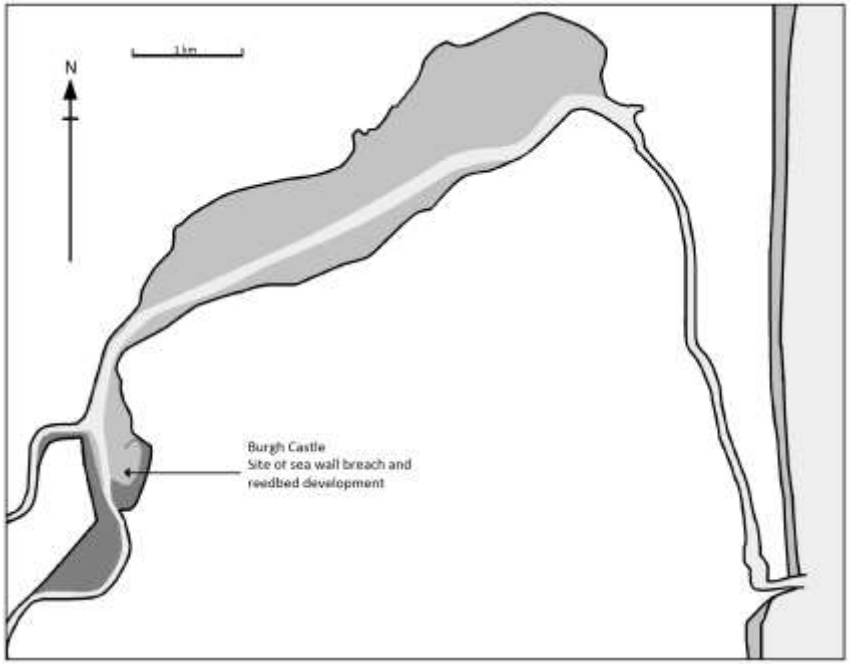


- Lots of work in Germany to address many of these problems on the Elbe and Ems estuaries – definitely the leaders in this thinking.
- Look for analogues – are there existing situations that might be used to develop conceptual models for designs?

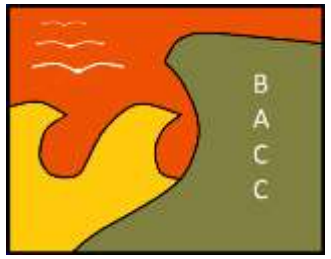
One idea



- Realignment almost always goes to saltmarsh?
- Why?
- But some estuaries have plenty of accommodation space and limited saltmarsh.
- Why?



The big question



Can we engineer our way out of trouble?