DESALINATION OF DREDGED SEDIMENTS FOR CIRCULAR REUSE: TWO EEMS-DOLLARD CASES

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EcoShape
building with nature

NETICS
THE SEDIMENT ENGINEERS

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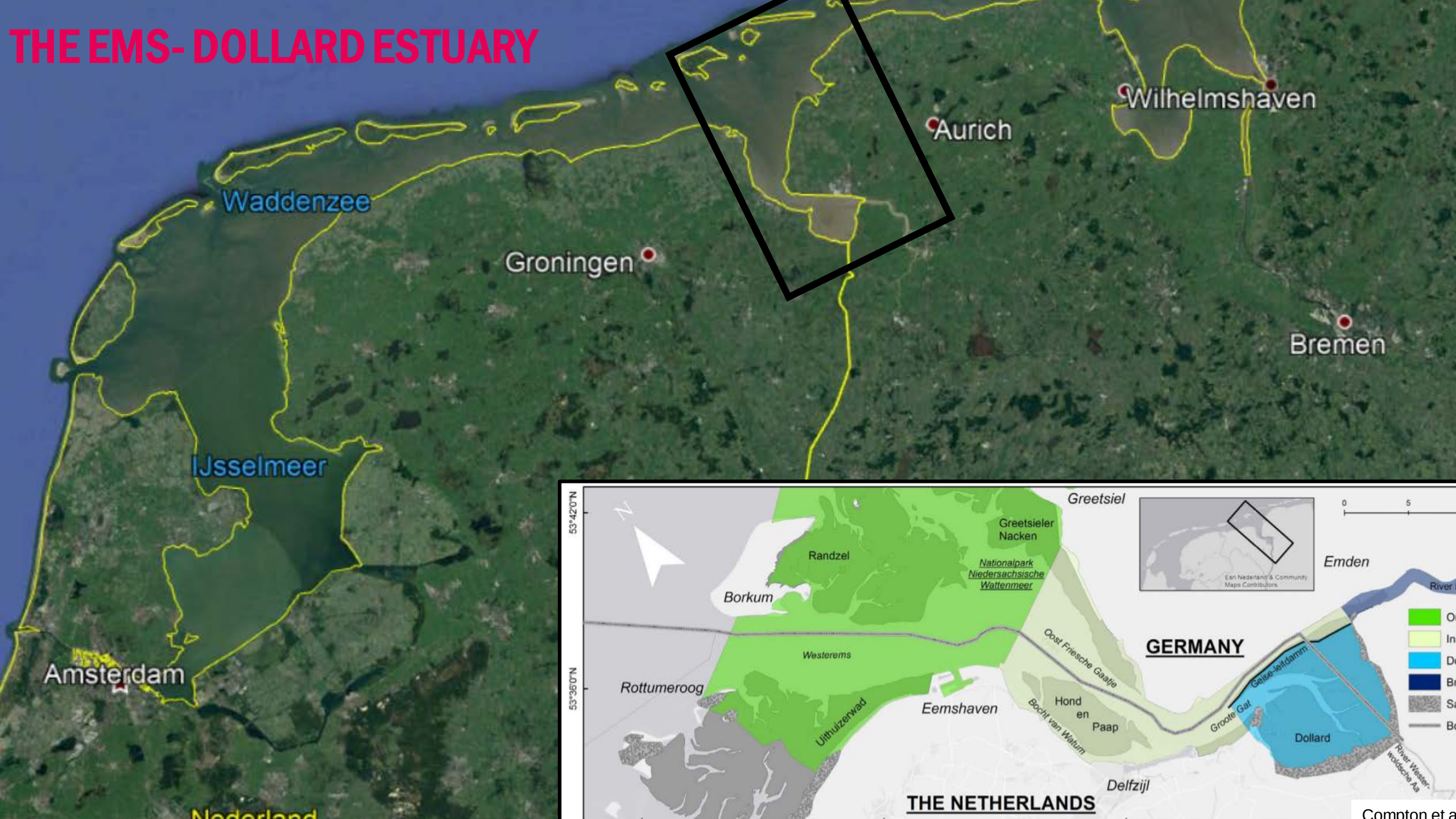
THE EMS- DOLLARD ESTUARY



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EXCESS IN WATER, OPPORTUNITY IN LAND

CLAY RIPENING PILOT

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CLAY RIPENING PILOT

Kleirijperij (2018)

Kleirijperij in April 2021, Barciela-Rial

CLAY RIPENING PILOT – LESSONS LEARNED

Limiting factors for reuse:

- Large salt and organic contents
- Water content

- Since sediment is in plots, reduction of salt and organic content is very slow ➡ need of a desalination strategy prior to ripening (dredging, transport, filling) or reuse undesalinated

STRATEGIES FOR REUSE OF MARINE DREDGE SEDIMENT - SALT

1. Remove salt by:
   - Higher density dredging (less water, less salt)
   - Mixing with fresh water (fluid phase, n.b. seasonal availability of water)
   - Natural consolidation process
   - Ripening process

2. Reuse of the sediment as it is (need to adapt afterwards, e.g. vegetation that can grown in salty sediment)

STRATEGIES FOR REUSE OF MARINE DREDGE SEDIMENT - ORGANIC MATTER

1. Remove OM by:
   - Higher density and deeper dredging/ dredging in seasons with lower OM
   - Mixing with fresh water (fluid phase)
   - Natural processes of drying, oxidation, ripening

2. Reuse of the sediment as it is (OM good for agricultural use, not so good for dikes)

STRATEGIES FOR REUSE OF MARINE DREDGE SEDIMENT - ORGANIC MATTER

1. Remove OM by:
   - Higher density and deeper dredging/ dredging in seasons with lower OM
   - **Mixing with fresh water (fluid phase)**
   - Natural processes of drying, oxidation, ripening

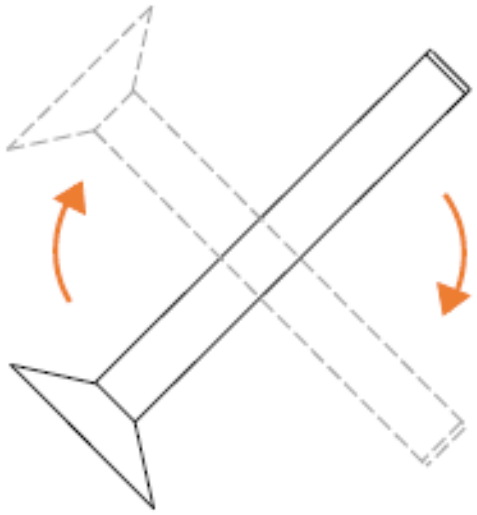
2. Reuse of the sediment as it is (OM good for agricultural use, not so good for dikes)

PILOT RAISING AGRICULTURAL LAND (POL)

Mechanical dredging in Eemshaven ➡ **Flushed with fresh water** ➡ **Transported to plot with a centrifugal pump** ➡ **Ripening** ➡ **Beneficial reuse (agriculture)**

Beens Groep

THE DESALINATION OF SLURRIES FOR DELTA PROTECTION PROJECT: STUDENT PROJECTS



Marine sediment is mixed with fresh or demi water at a c=200 g/l (1125 kg/m3)

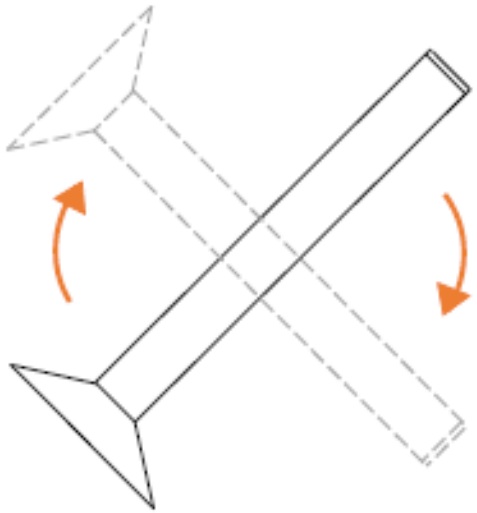
<u>Mixing speed</u>

- Low speed: one 180 degrees rotation every 30 seconds
- High speed: one rotation per second

<u>Mixing duration</u>

- Short duration: 3 minutes
- Long duration: 8 minutes

THE DESALINATION OF SLURRIES FOR DELTA PROTECTION PROJECT: STUDENT PROJECTS



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Mixing speed

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Mixing duration

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- Longer mixing times work best to remove salt (big differences observed with different mixing durations)
- Salt removal occurred fast during the mixing
- During the following settling and (first phases) of consolidation no further salt removal was observed

B Felix & C Vaz Perez

CONCLUDING DISCUSSION

- Pilots like Clay Ripener, POL open doors for upscaling of beneficial reuse of sediment.
- Salt or OM are not per se limiting factors for all reuse possibilities
- Different desalination strategies possible
- For desalination in fluid phase:
  -Quantitative research mixing duration and turbulence needed
  -Better coupling with (dredging) techniques in the field needed
- Work in progress, advice very welcome!

QUESTIONS, TIPS, IDEAS FOR DESALINATION STRATEGIES?

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