Beneficial use of dredged sediment to enhance salt marsh development by applying a ‘Mud Motor’

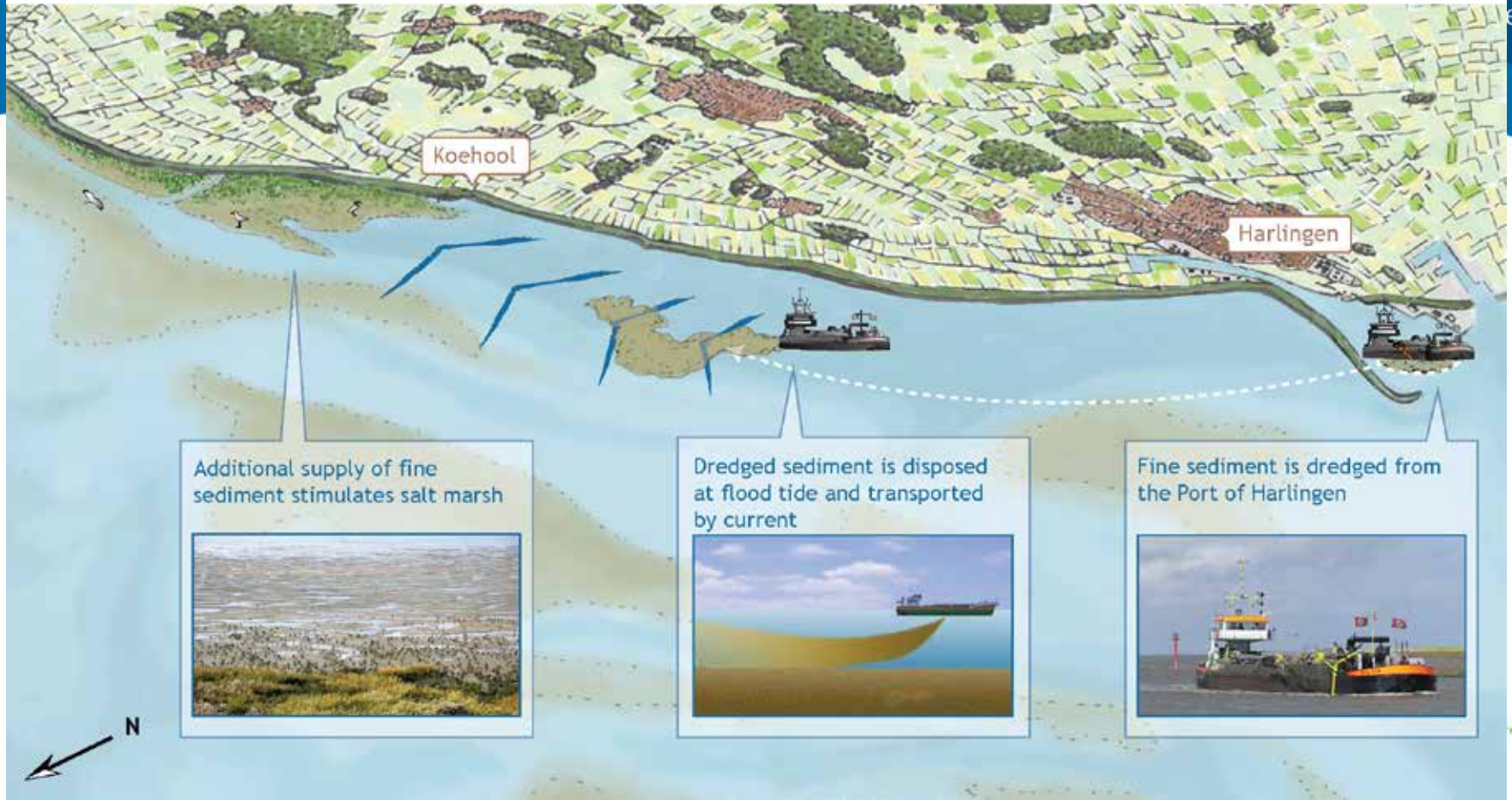
Martin J. Baptist, T. Gerkema, B.C. van Prooijen, D.S. van Maren, M. van Regteren, K. Schulz, I. Colosimo, J. Vroom, T. van Kessel, B. Grasmeijer, P. Willemsen, K. Elschot, A.V. de Groot, J. Cleveringa, E.M.M. van Eekelen, F. Schuurman, H.J. de Lange & M.E.B. van Puijenbroek

How did the Mud Motor project start?

1. Large maintenance dredging volumes in the Port of Harlingen (~1,2 million m^3/y).
2. Two rather close-by dredge disposal locations, possibly leading to high return flow of dredged sediment back into port.
3. Local nature organisation It Fryske Gea desired expansion of salt marshes.

1+2+3 gave the idea to bring dredged sediment to salt marshes.

The Mud motor



1. EcoShape Building with Nature project

- Preparation and execution of a pilot experiment in disposing dredged sediment: numerical simulations, tracer study, licences, technical feasibility, managing the contractor.
- Measuring sedimentation/erosion, vegetation (cover and species), drone aerial photos and LiDAR (topography)
- Knowledge sharing (lectures, excursions, publications, workshops).
- Wiki-page.

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Building with Nature Guideline > Projects > Mud Motor port of Harlingen – Koehoal - NL

Mud Motor port of Harlingen – Koehoal - NL

Title: Mud Motor Port of Harlingen, (Koehoal)
Location: Port of Harlingen, Wadden Sea (NL)
Date: 2016-2018
Involved parties: Van Oord, Royal Haskoning DHV, Arcadis, It Fryske Gea, Wageningen University, Deltares
Technology Readiness Level:7 (system prototype demonstration in operational environment)
Environments: Estuaries, Ports & Cities
Keywords: salt mash, dredge, flow chart, mud, intertidal areas, port

Building With Nature Design | Traditional Design

EcoShape pilot project

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5 Basic steps towards Building with Nature

Outline

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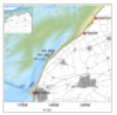
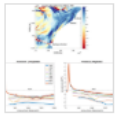
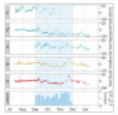
Figures (7)

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Tables (3)

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Highlights

- Salt marsh sediment dynamics increases with a well-designed Mud Motor.
- Small salinity gradients can significantly affect mud transport fluxes.
- The success of a Mud Motor is highly dependent on wind and wave forcing.

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2. NWO project

- Fundamental studies into physical and ecological processes.
- Two PhDs and one post-doc.
- Additional measurements and experiments (sediment transport in tidal channel and flat, germination of salt marsh plants influenced by bioturbation).

connecting innovators

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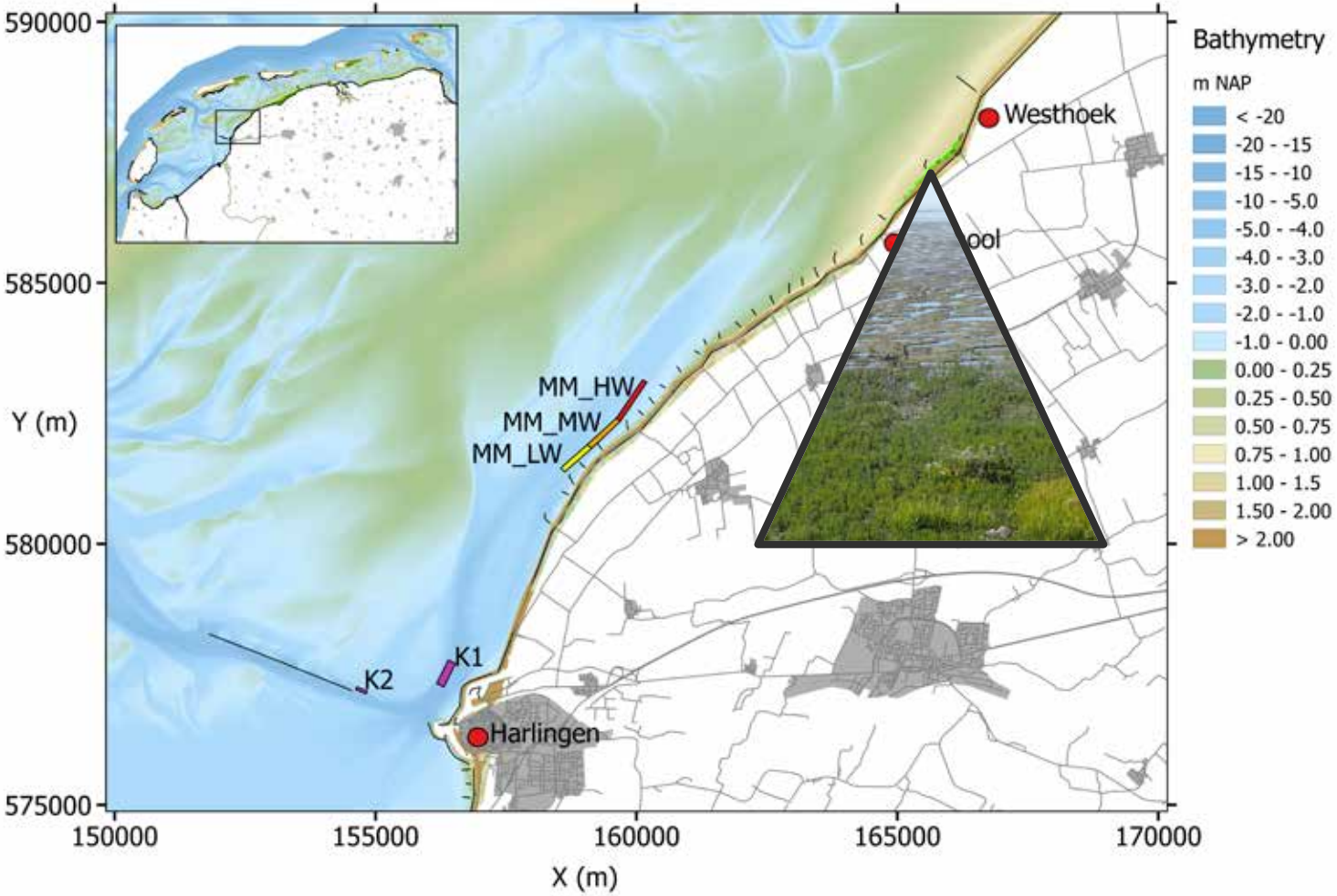

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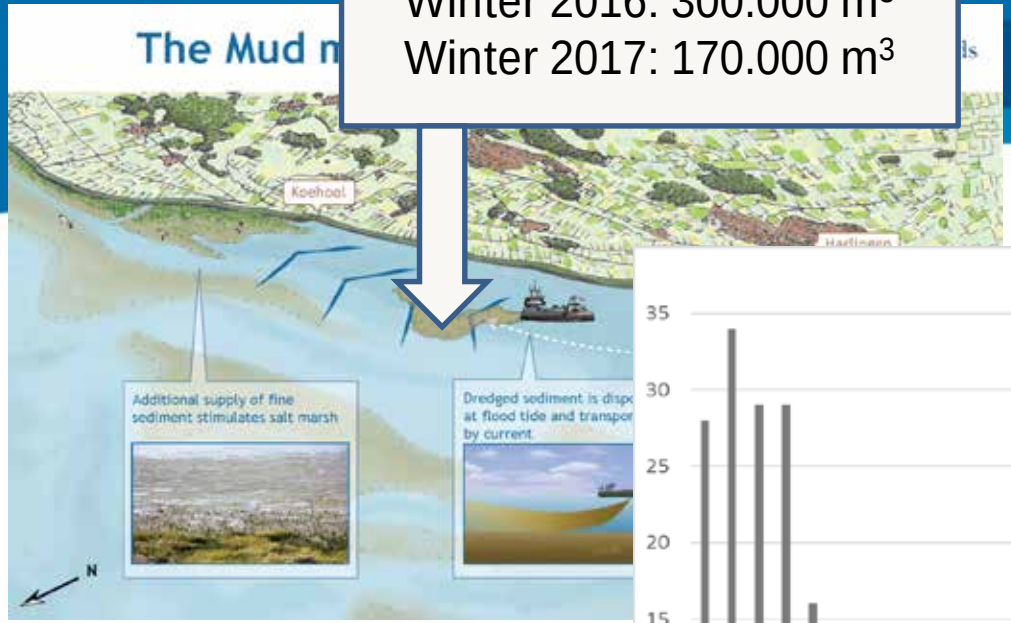
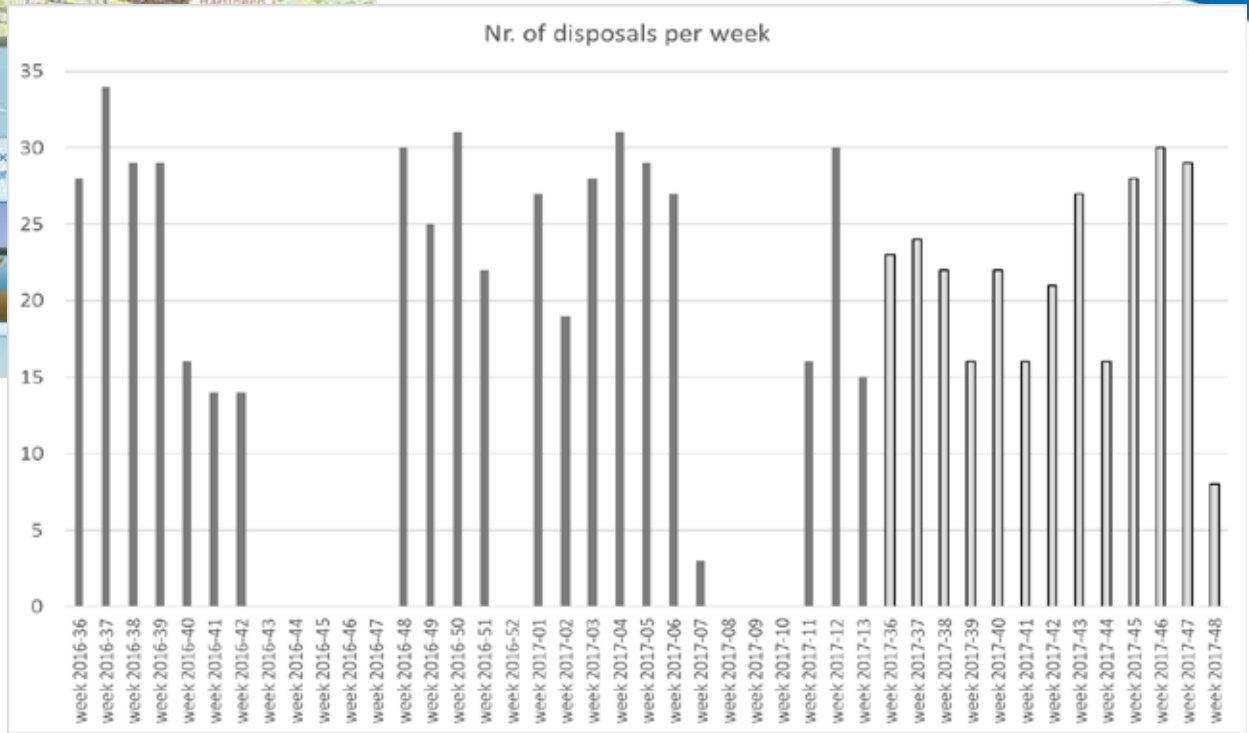
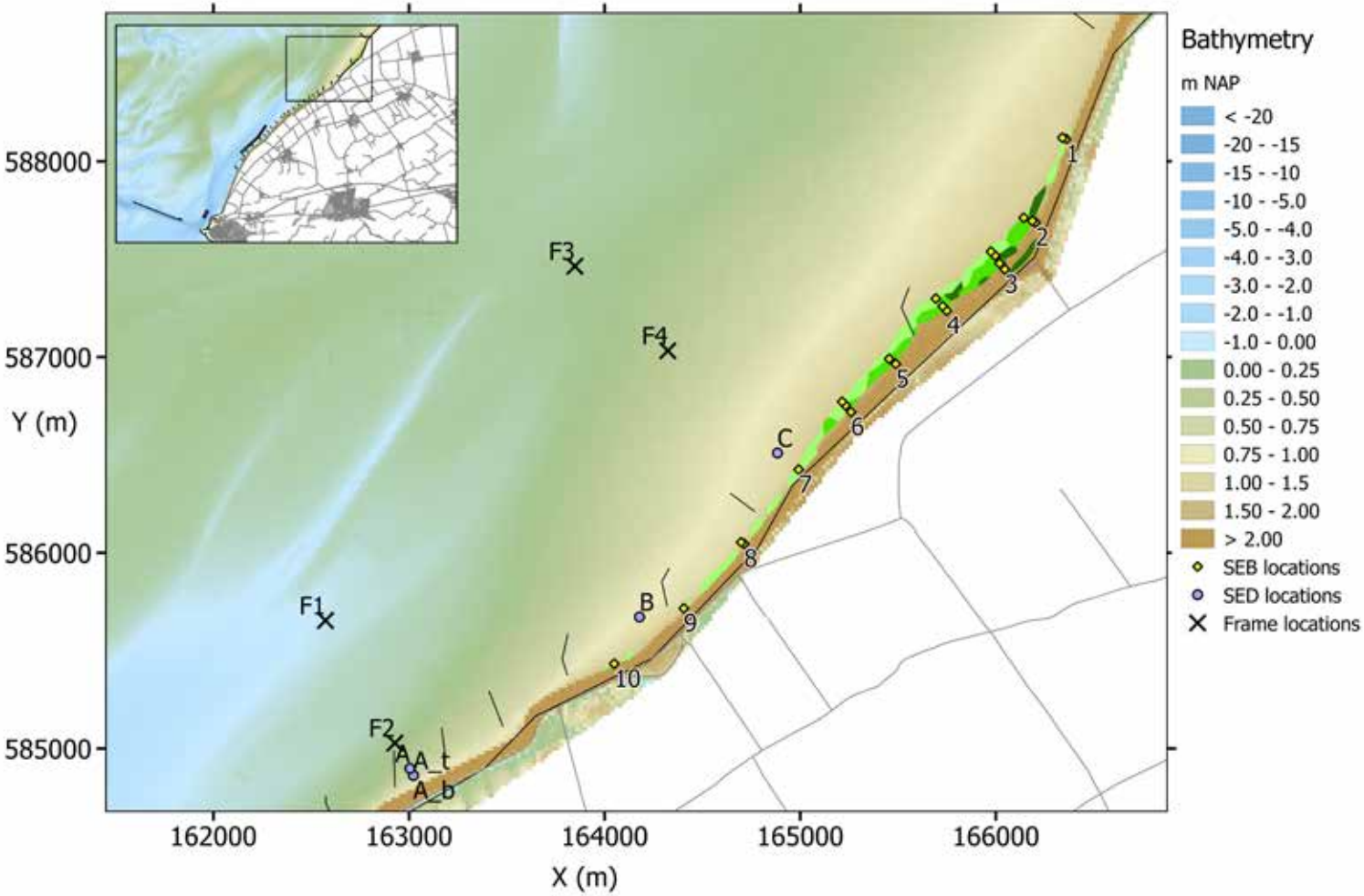
Winter 2016: 300.000 m^3
Winter 2017: 170.000 m^3







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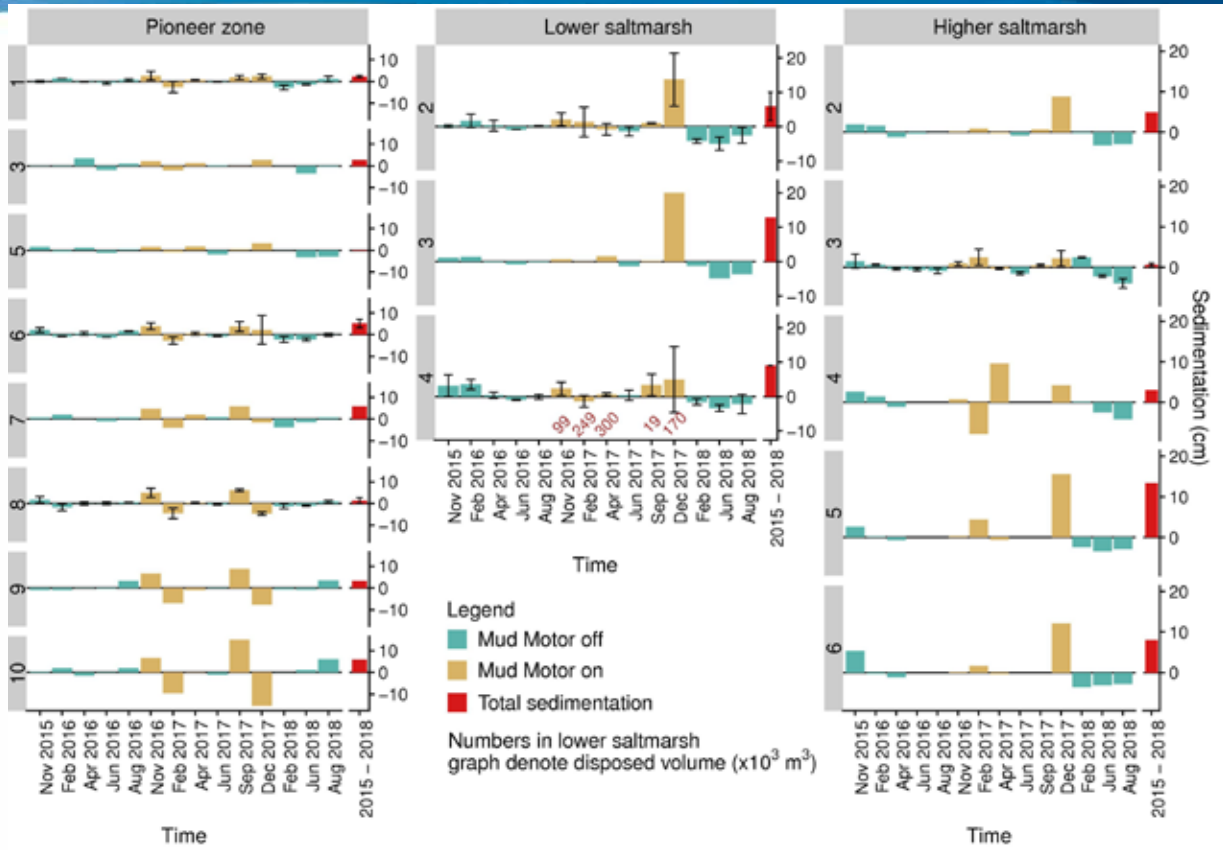
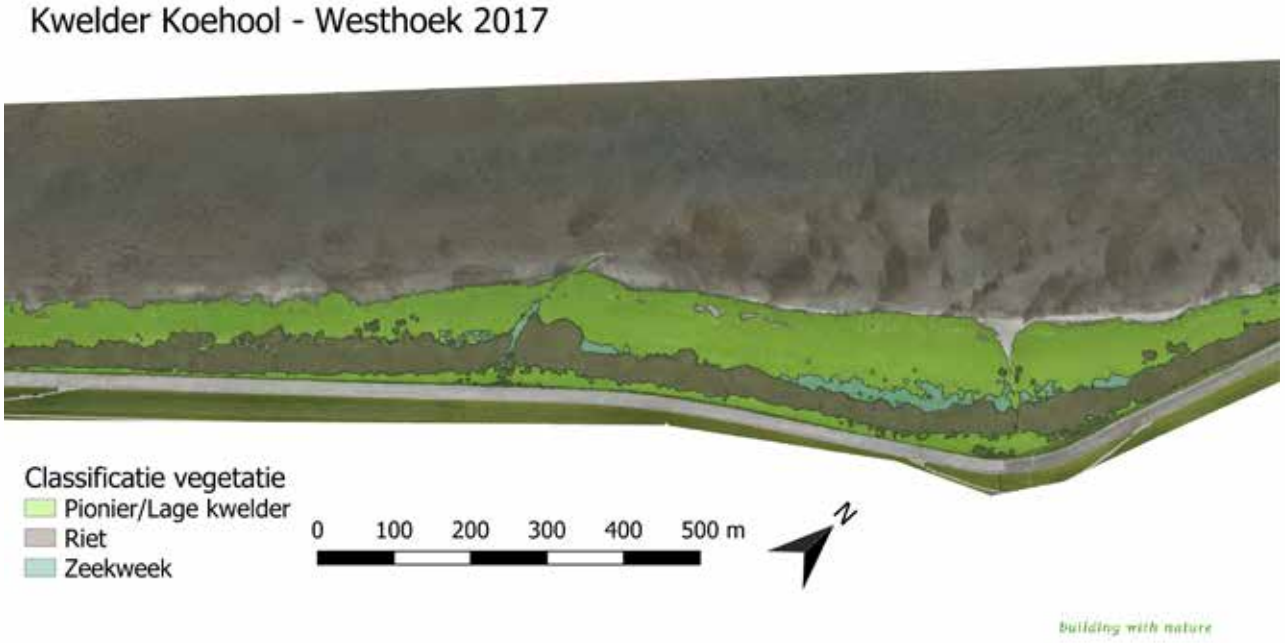
Thick layers of watery mud were deposited on the salt marsh, but also disappeared



No horizontal vegetation expansion occurred



Considerations on costs

- A Mud Motor extends sailing distances and dredge cycle time, thus increasing costs.
- Environmental regulations and practical issues prescribe particular seasons and time slots.
- A cost-benefit analysis should include long-term and indirect financial costs and benefits (flood safety, blue carbon, biodiversity).