

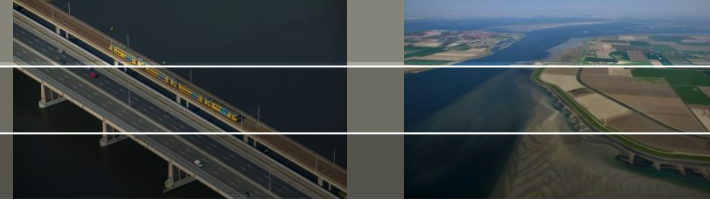


SURICATES: Reallocation of sediments in the Port of Rotterdam, the Netherlands

Hans Groot

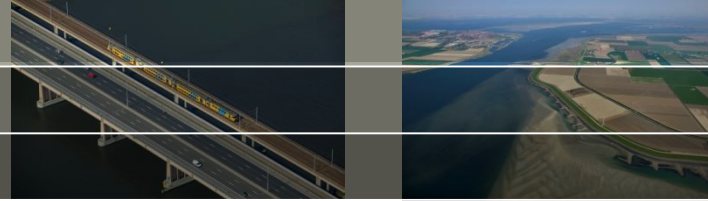
29 oktober 2019

Topics



- The SURICATES project, what is it about?
- Pilot reallocation of sediment in the Port of Rotterdam
- Questions/discussion

SURICATES?



SURICATES =

Sediment-**U**ses-as-**R**esources-**I**n-**C**ircular-**A**nd-**T**erritorial-**E**conomies**S**

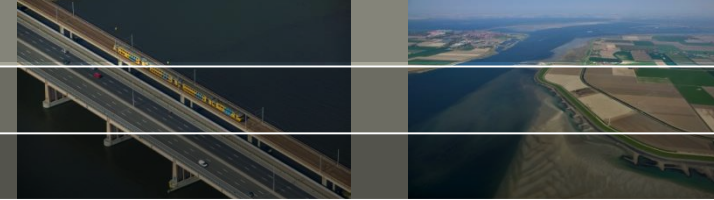
The project aim is to increase sediment reuse for erosion and flood protection.

We will provide authorities, port and waterway managers and erosion experts with new large scale solutions for sediment reuse in NWE ports, waterways and coastlines.

How?

- Pilot implementation within the project for UK and NL.
- Networking activities for dissemination and operational guidance illustrated by 3 new projects for Fr, UK and IE.

Objectives



SURICATES will formulate eco-solutions, define processes and evaluate pilots results to define replication conditions for:

- 4 solutions:
 - Reallocation of sediment within the system,
 - Bio-engineering with sediment,
 - Sediment as a pozzolanic material,
 - Concrete made with cement and sediment
- Tested through 5 pilots in two country's

Partners

€ 3.4 M

€ 5.67 M

TIMELINE

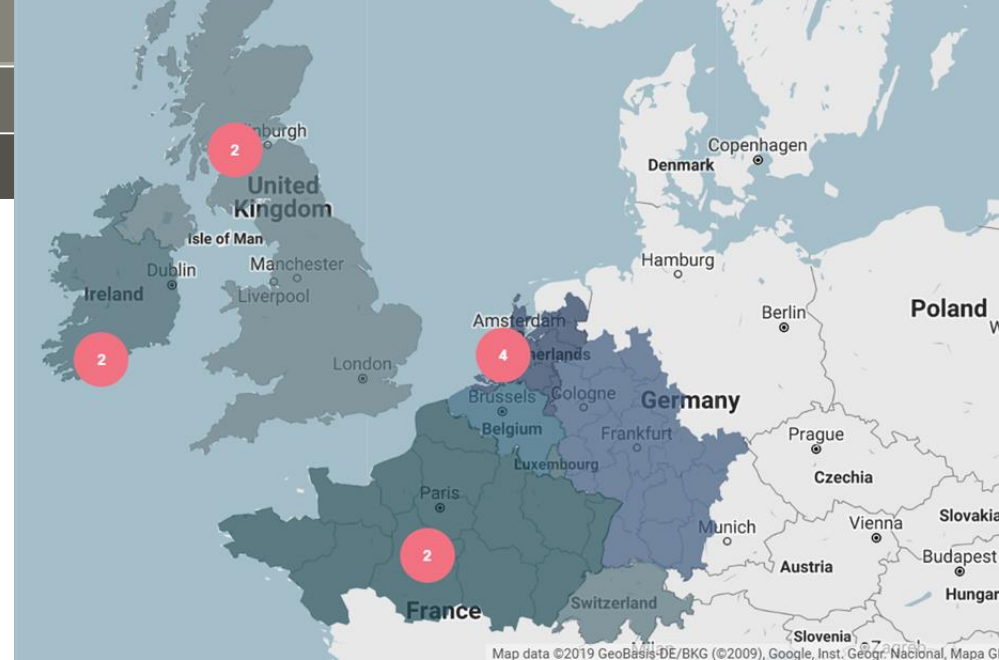
COUNTRIES

EU FUNDING

TOTAL BUDGET

2017-2021

FR | IE | NL | UK

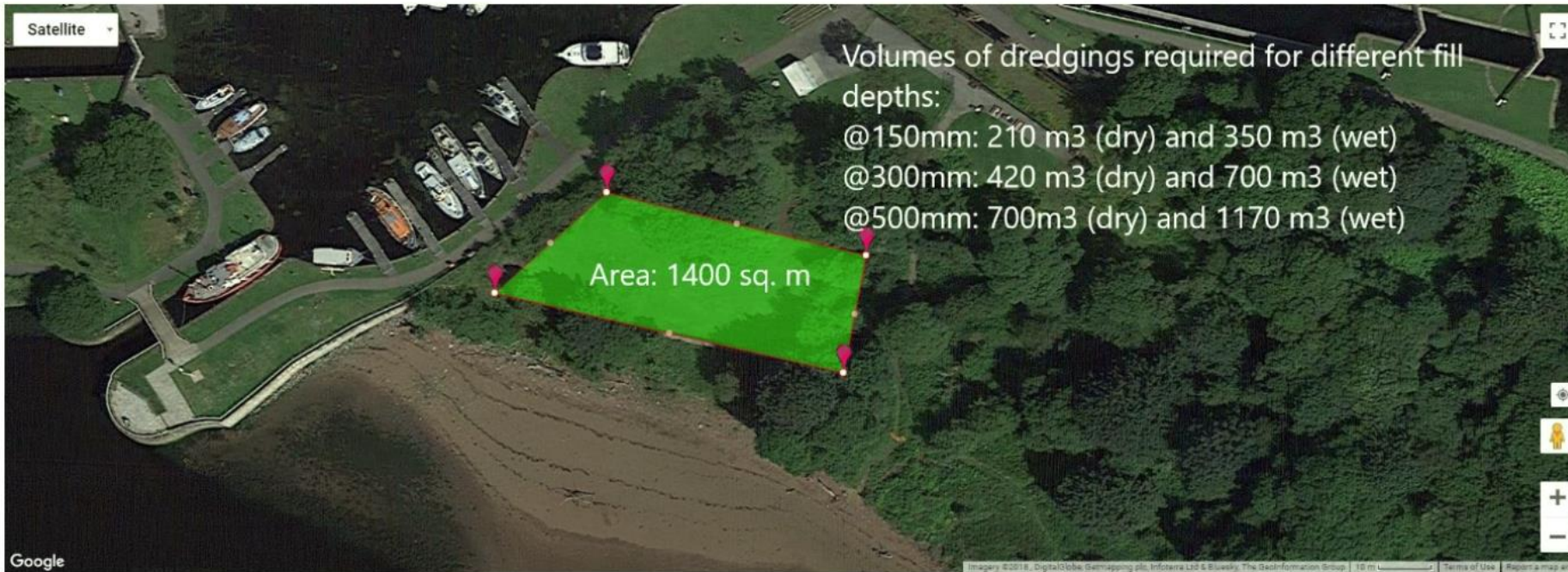
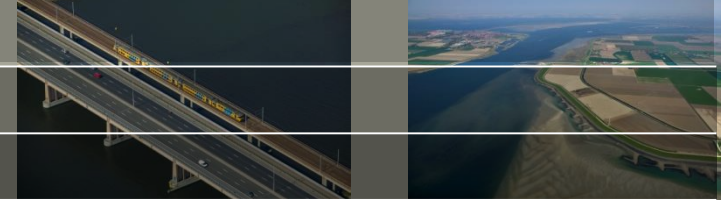


Partners involved:

- CD2E
- Cork Institute of Technology
- Deltares, Deltares
- University of Strathclyde
- Port of Rotterdam, Port of Rotterdam
- University of Lille Sciences and Technologies
- University College Cork, National University of Ireland
- IXSANE
- BRGM, the French Geological Survey
- British Waterways T/A Scottish Canals
- ARMINES

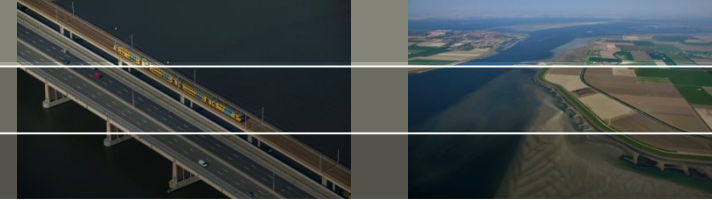


Bowling - Scotland

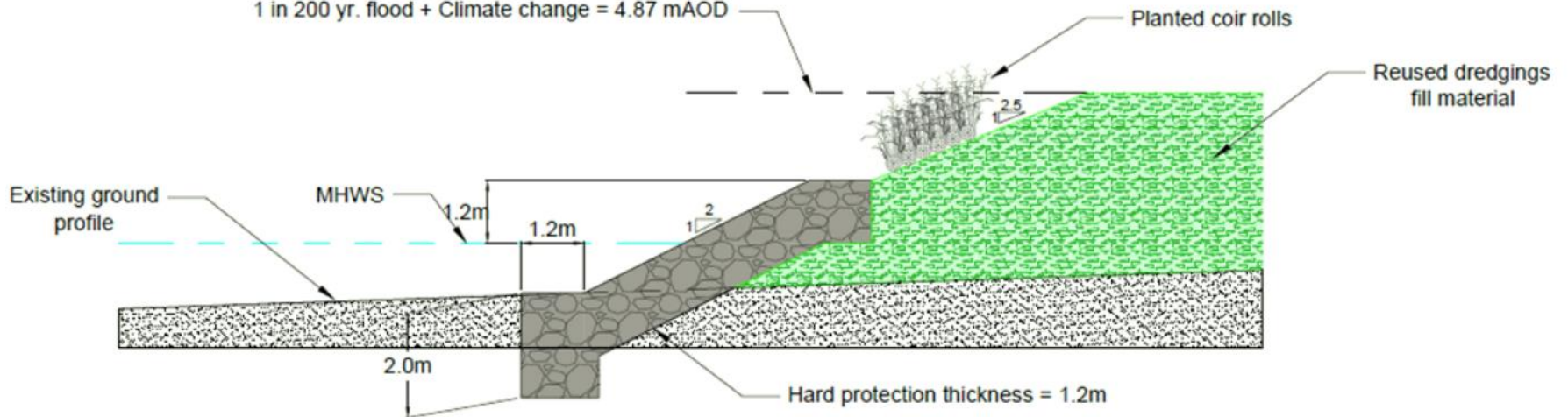


- phytoconditioning of sediments (1200 m³)

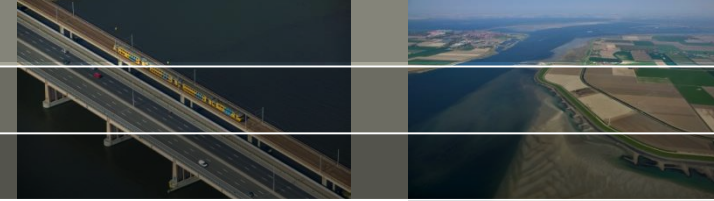
Bowling – bank protection



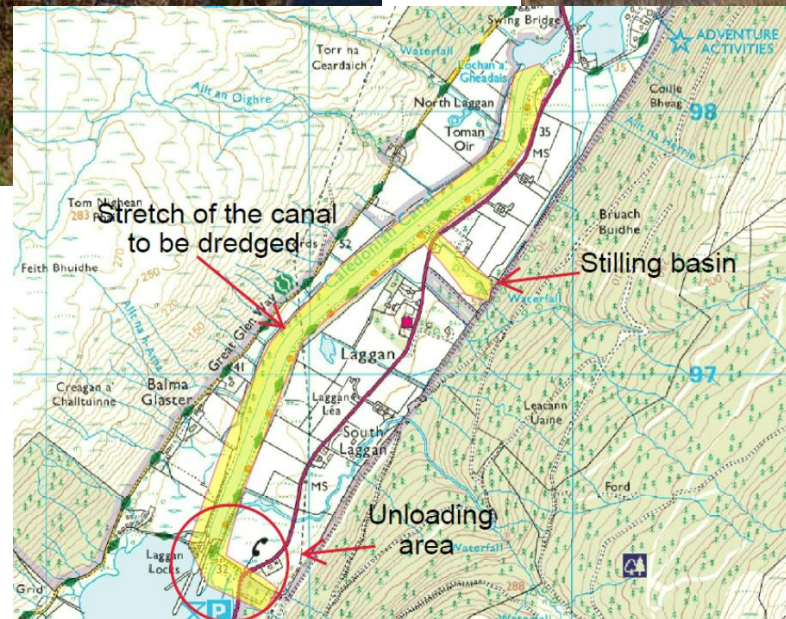
1 in 200 yr. flood + Climate change = 4.87 mAOD



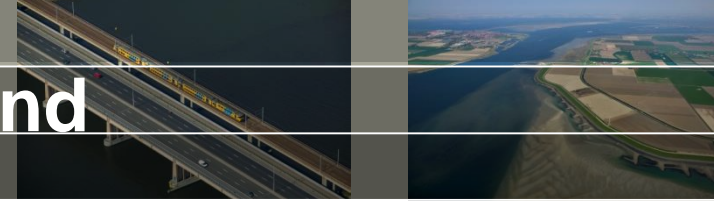
Caledonian canal - Scotland



Accelerated dehydration



Lagan locks Car Park - Scotland

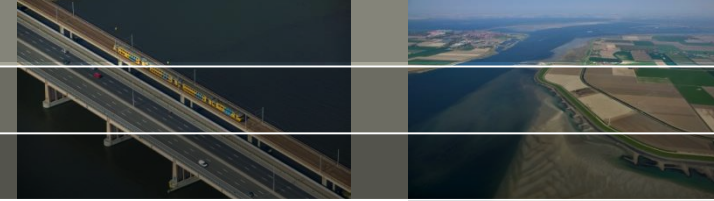


Dredgings processing ground lifting

Erosion protection at Laggan spout



Topics



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- Pilot reallocation of sediment in the Port of Rotterdam
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Pilot application Port of Rotterdam



Objective: Managing and monitoring the dredging and reallocation of 200.000 tons of sediment within the river in Port of Rotterdam

- Demonstrate and evaluate innovative sediment reuse solutions for flood and erosion protection
- Pilot application of sediment reallocation within the system to 'reset' a natural system for bank nourishment in Port of Rotterdam

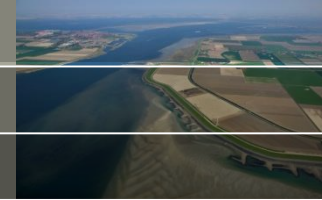
Output:

- 1 new eco innovative solution for sediment reuse
- 200.000 t sediment reused / 200.000t raw material saved
- Impact assessment on flood and erosion protection of target site -> validation of sediment eco innovative solutions (building with nature) for use on other NWE sites.

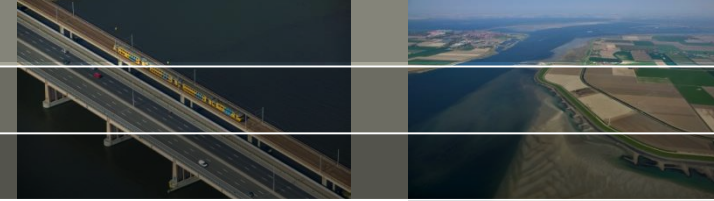
Pilot Rotterdam; location



Pilot Rotterdam, target site

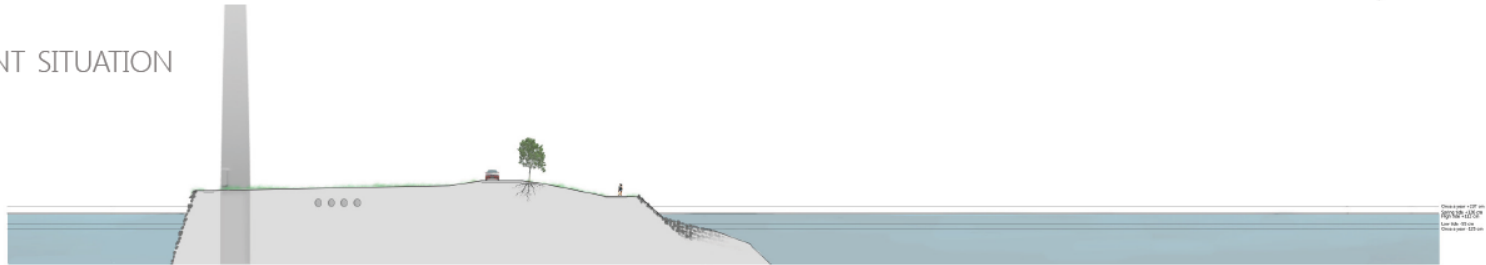


Pilot Rotterdam, target site

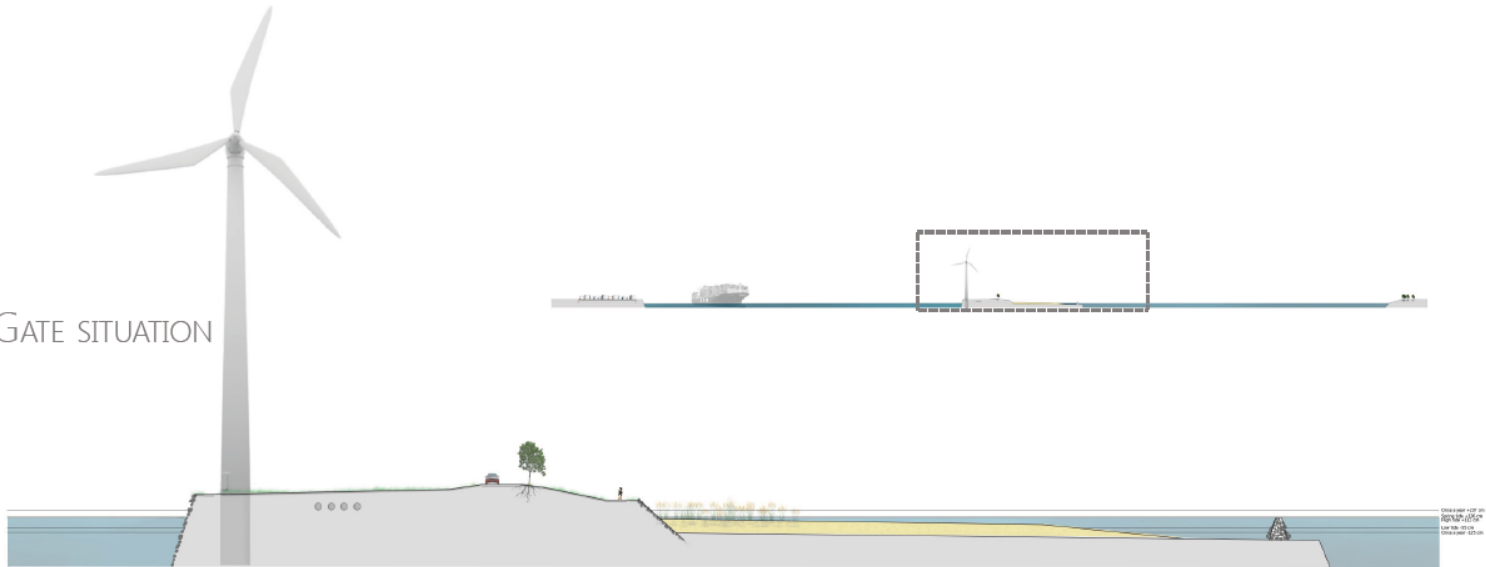


IMPRESSIONS SECTION ZOOM-IN

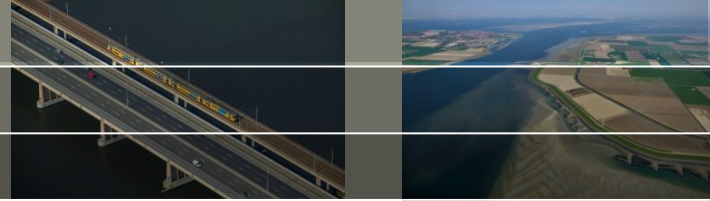
CURRENT SITUATION



GREENGATE SITUATION

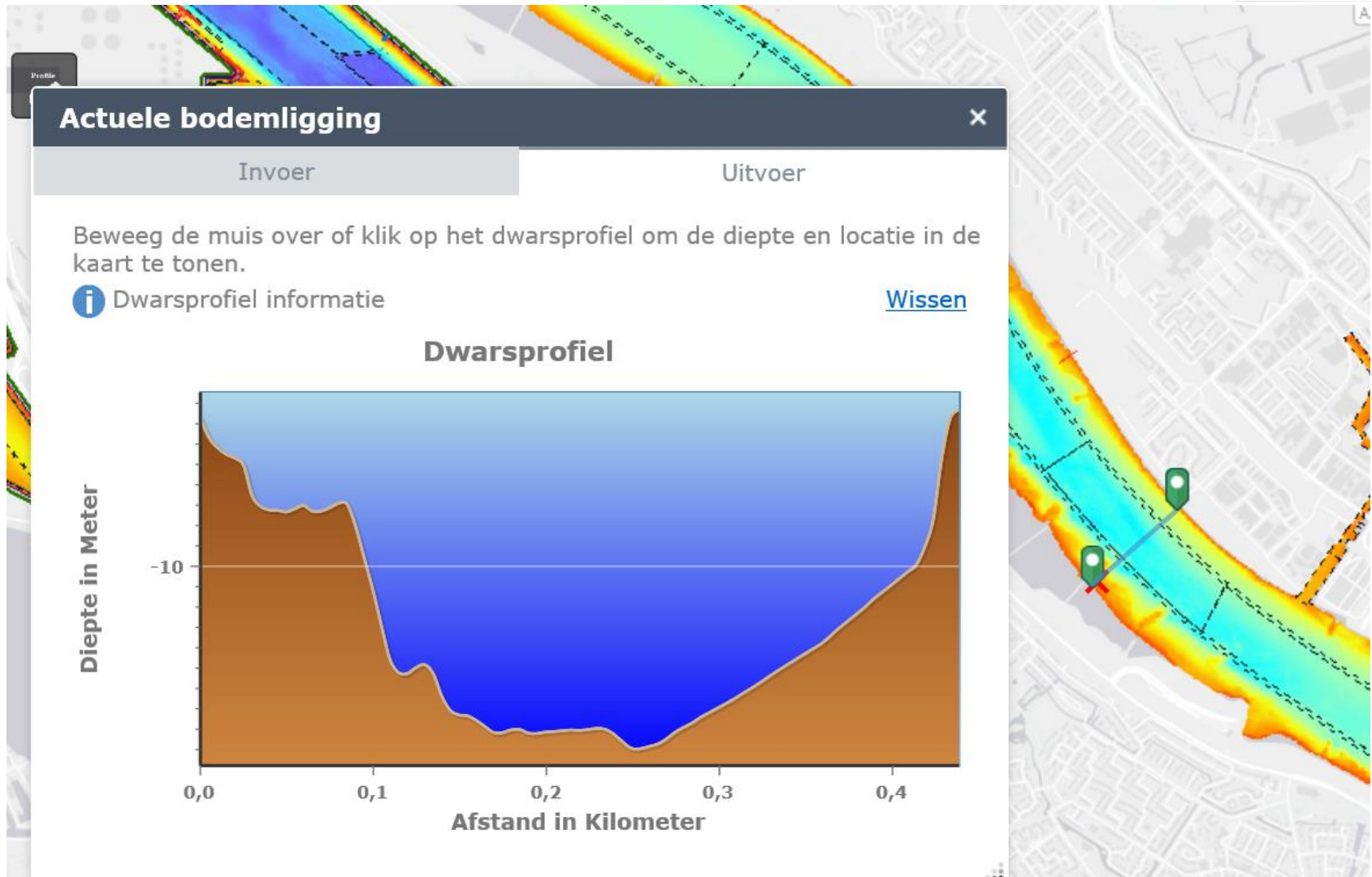
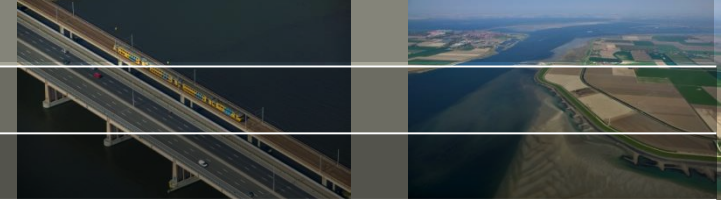


Activities

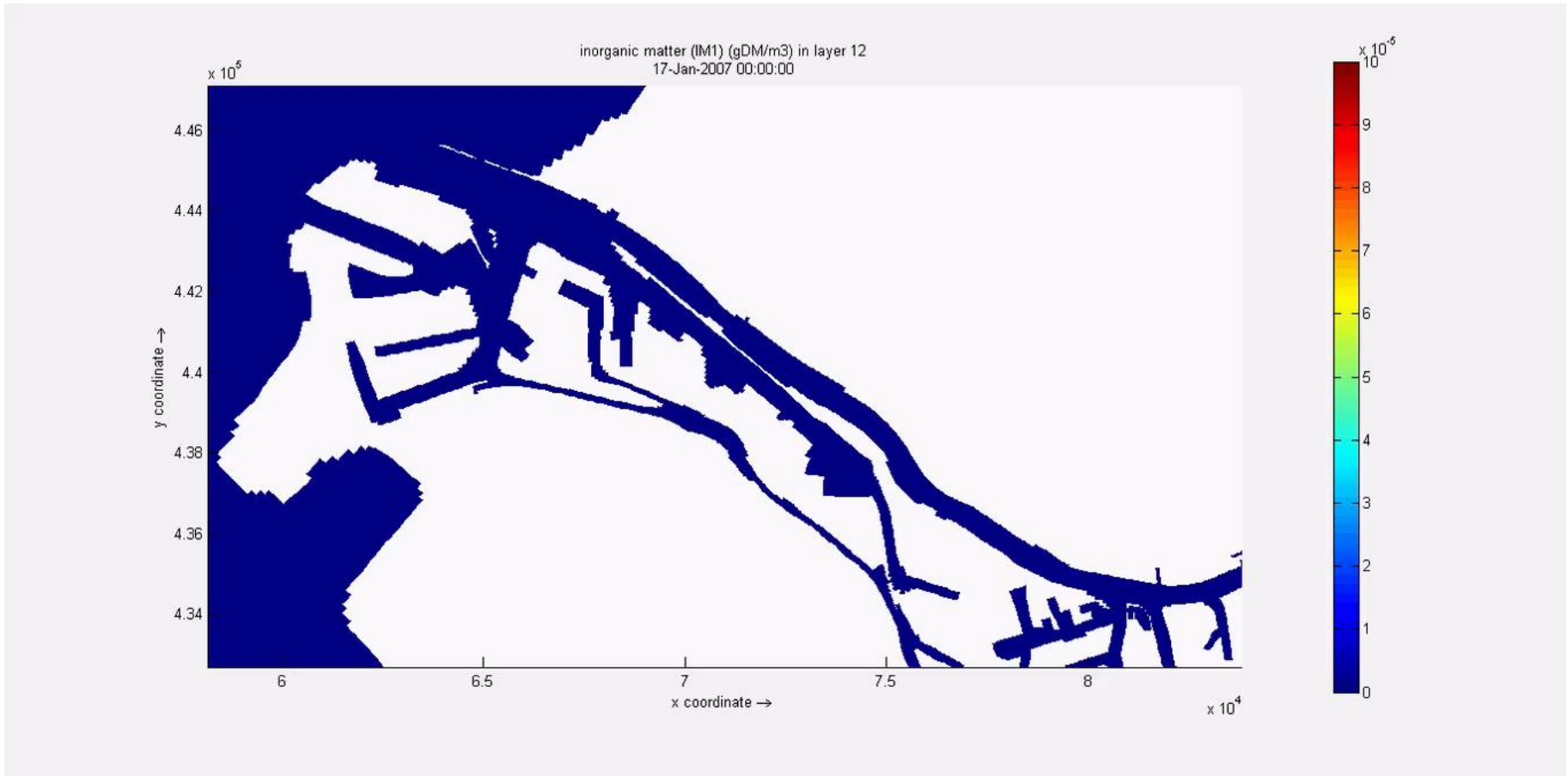
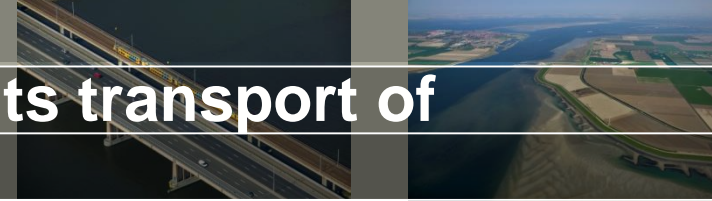


- Preparation of permits.
- Setting up the implementation program,
 - Site preparation for the dredging and allocation site,
 - Defining working window (also impacted by hydrological conditions)
 - Monitoring stations river/coast
 - Surveys
- Lab tests:
 - Evaluation of sediment before pilot application (characterization of source material, settling conditions, current bathymetry, hydrodynamic conditions, etc.)
 - Characterization of sediment during surveys
 - Lab scale test for different settling conditions -> validation of
- Dissemination of results for the target site (success for flood/erosion protection) & translation to conditions for other NWE area's.

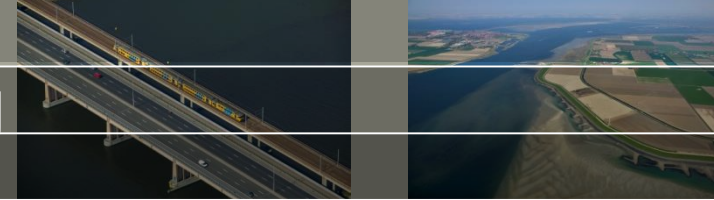
Bathymetry at reallocation site



Reallocation area, simulation results transport of sediments



Zooming in on the monitoring



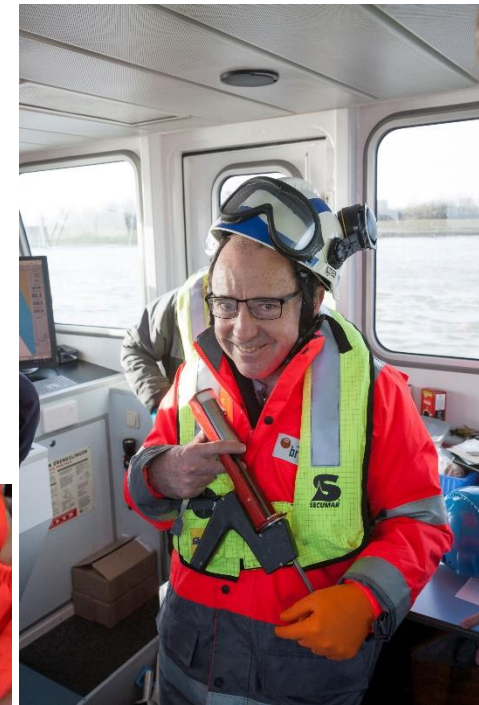
- Grab samples of sediments in the port, for baseline and rare earth elements fingerprint
- Optical cable for settling, erosion and sediment density
- Survey's to follow the flume
- Survey's to check the river bathymetry

Grab samples of sediments in the port

XRF for mineralogy (BRGM): XRF assists in the classification of the mineral fraction.

Elements for pXRF analysis																		He					
H																		B	C	N	O	F	Ne
Li	Be																Al	Si	P	S	Cl	Ar	
Na	Mg	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	Xe					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I							
Cs	Ba	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu							
			Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn						
Fr	Ra	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr							

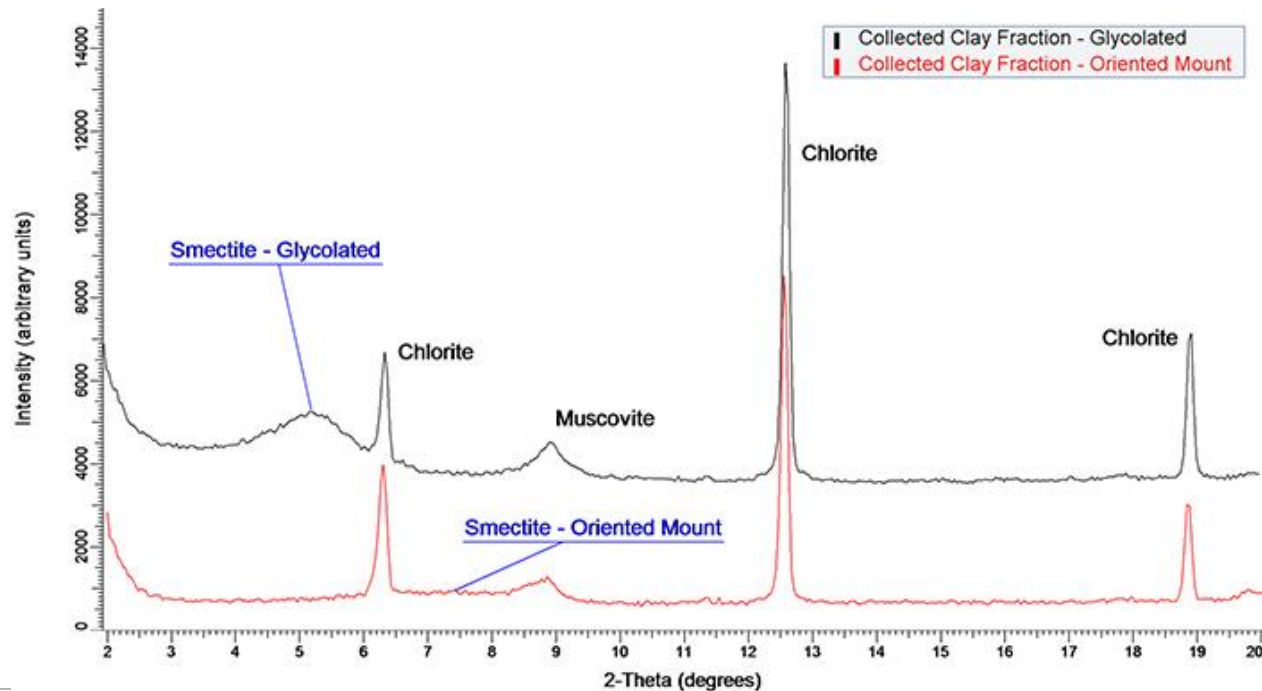
	cannot be analysed by pXRF, or out of scope of field analysis
	may be analysed with specific pXRF technologies
	may be analysed according to contents and matrix with current equipment
	can be analysed by pXRF in most cases
	detected but cannot be analysed individually by current equipment



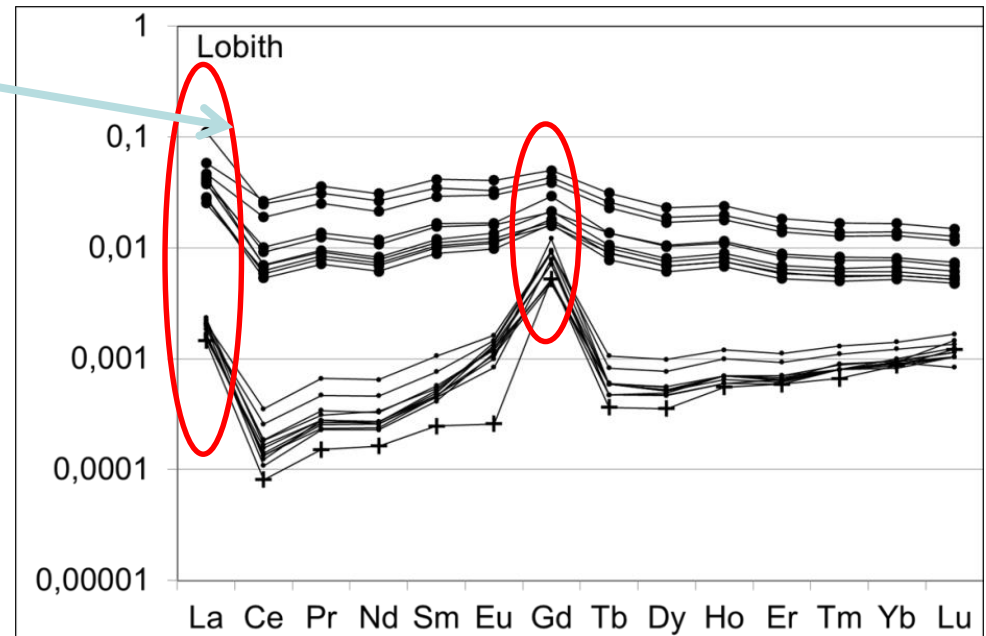
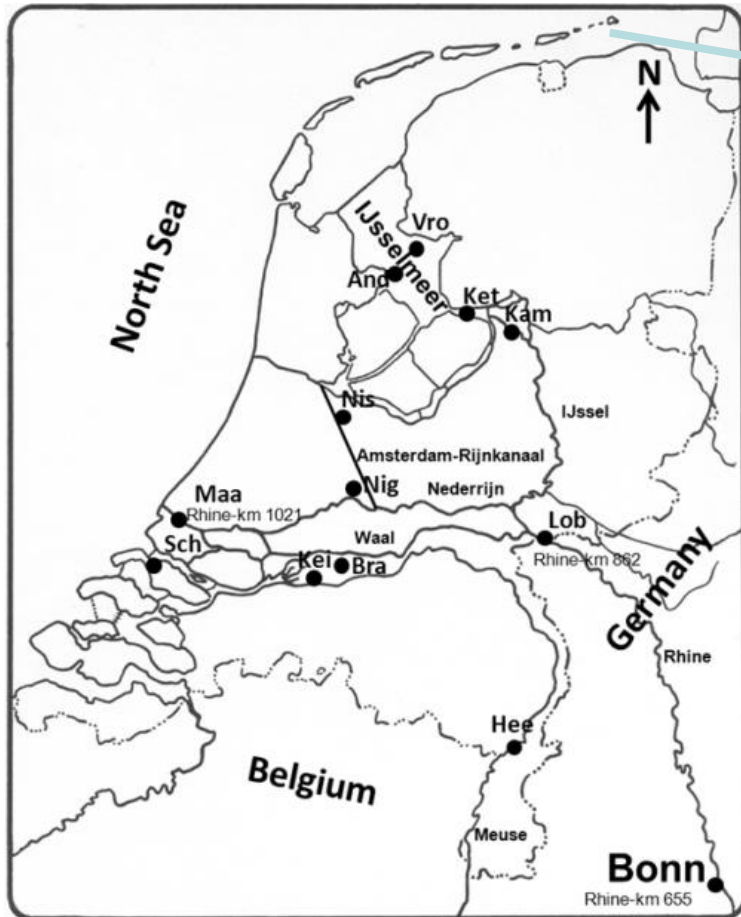
Grab samples of sediments in the port

Rheology and flocculation: To determine the settling behavior and shear stress of the sediment at different locations in the port.

Base line: XRD for clay mineral composition

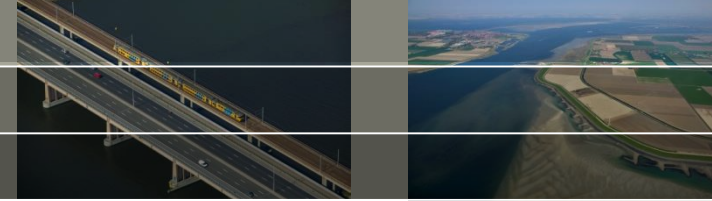


Rare earth elements as a tracer

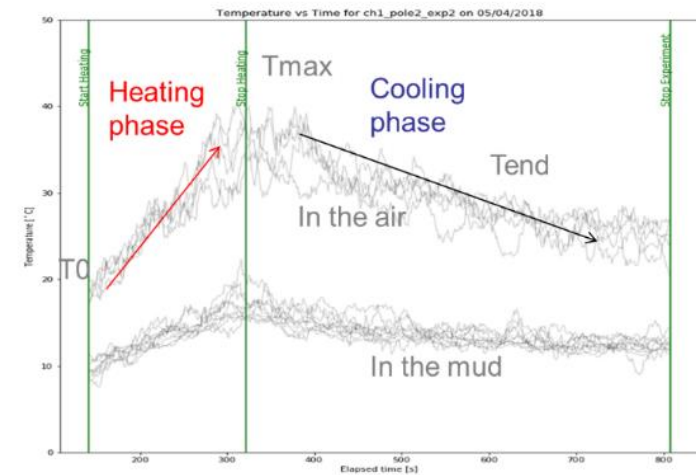
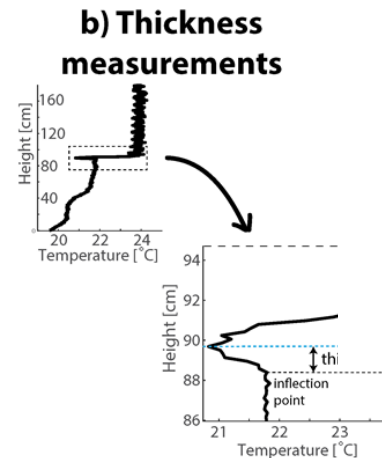
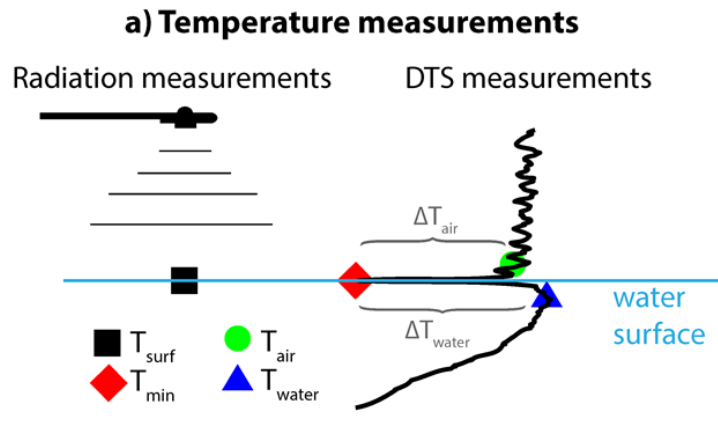


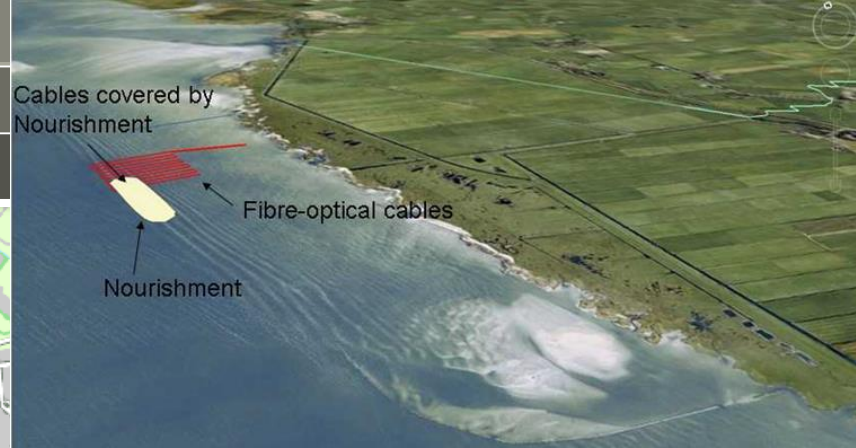
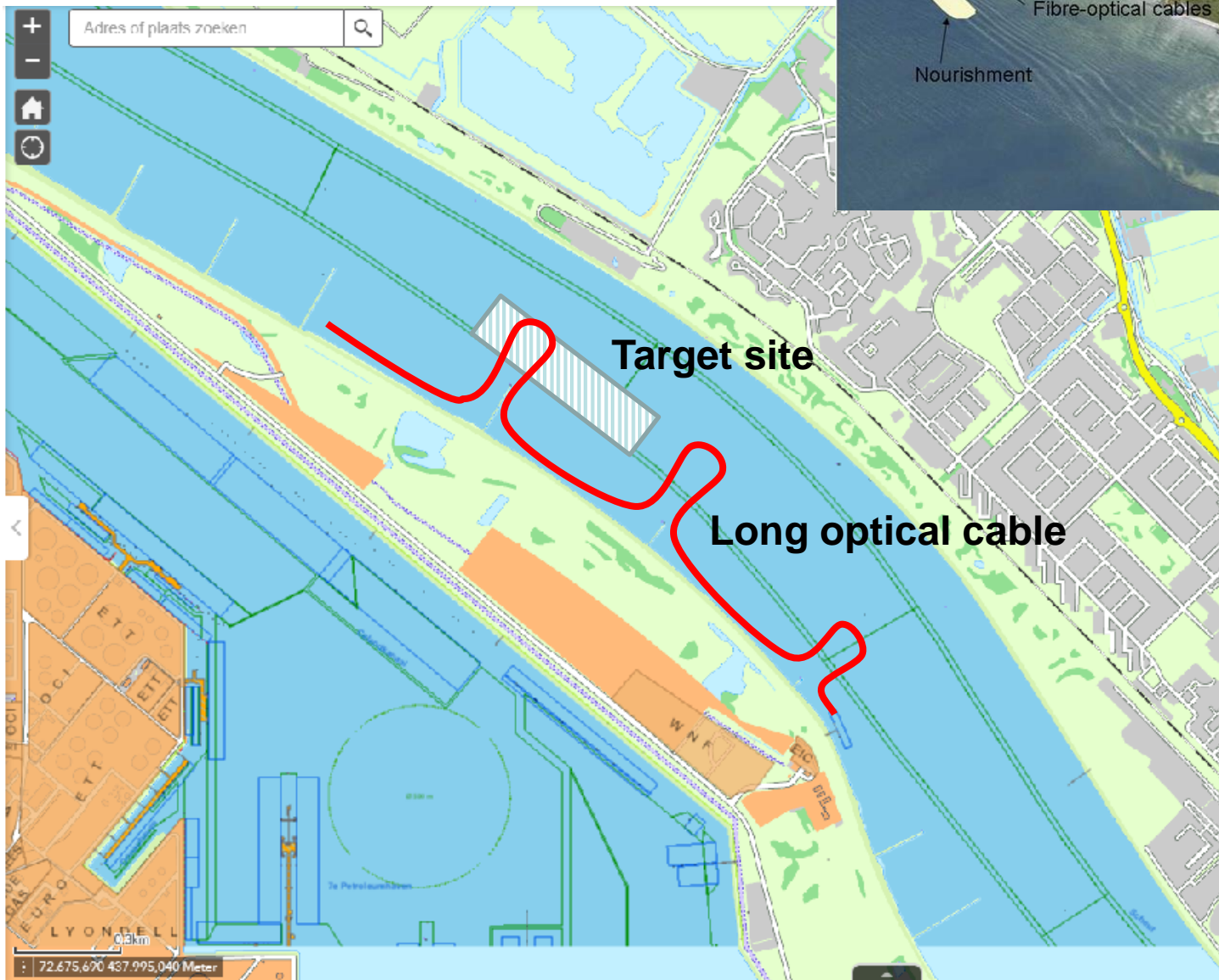
- Gadolinium (Gd) used for MRI-scan can be detected.
- Lanthanum (LA) and Samarium (Sm) from production plant for catalysts used in petroleum refining.

Optical cable

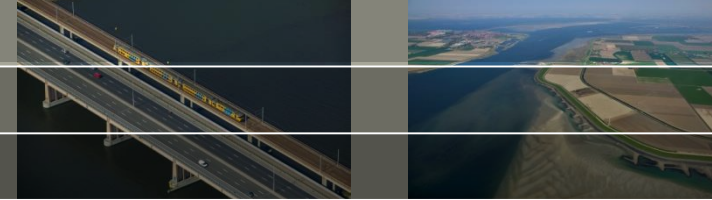


- **Long (1 km) horizontal cable:** To determine the coverage with sediments based on a delayed shift in temperature when the tide change (passive)
- **Short (1 m) vertical poles:** To determine the sediment density based on the thermal heat capacity of the sediment (active)

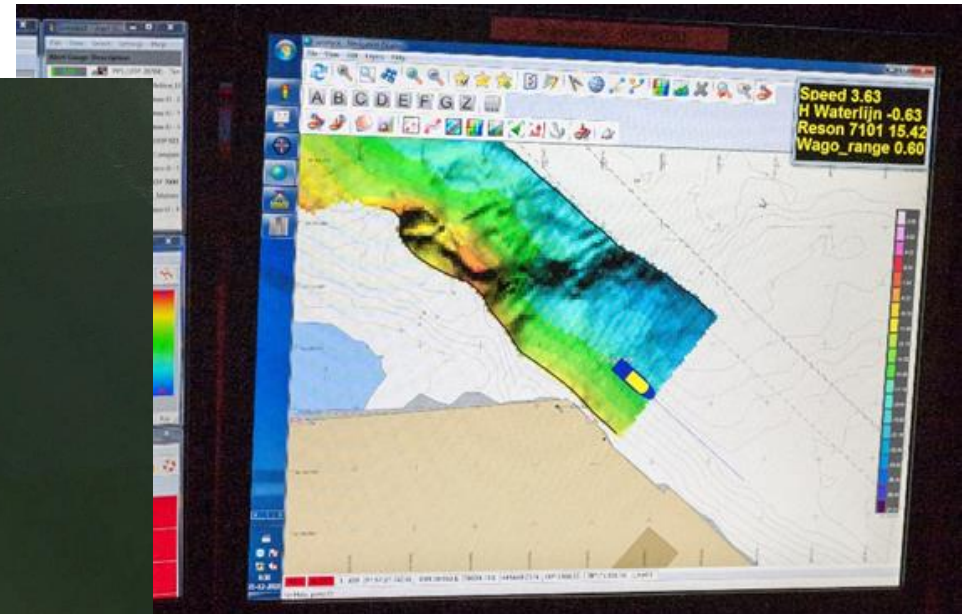




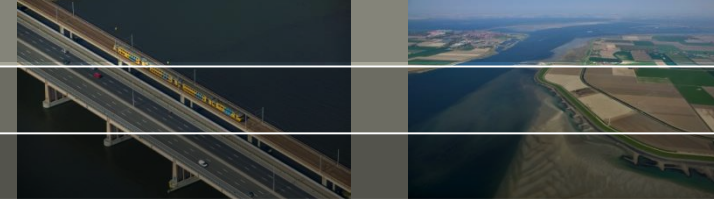
Surveys



- The bathymetry will be checked during the T0, T1 and T2 surveys of the impacted area (km 1013 – 1033) by Multi beam echo sounder (230 kHz).
- The turbidity directly after a reallocation (5.500 m3) will be checked by in total six survey's.

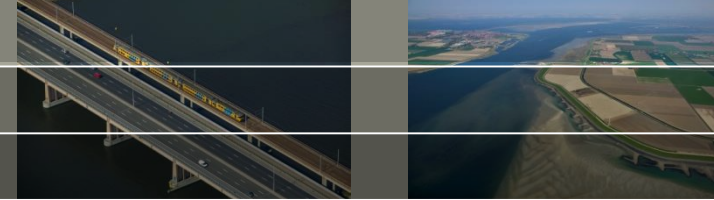


Execution



- Timeline: start May – finish July 2019 (end of stort season)
- Using the TSHD Ecodelta hopper (runs on LNG)
- Capacity 5.500 m³
- 2 trips per day (tide dependent, ca.100 trips)
- Reallocation period 9 weeks

Questions?



More information about the project:
<http://www.nweurope.eu/projects/project-search/suricates-sediment-uses-as-resources-in-circular-and-territorial-economies/>

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