



Lift up of Lowlands

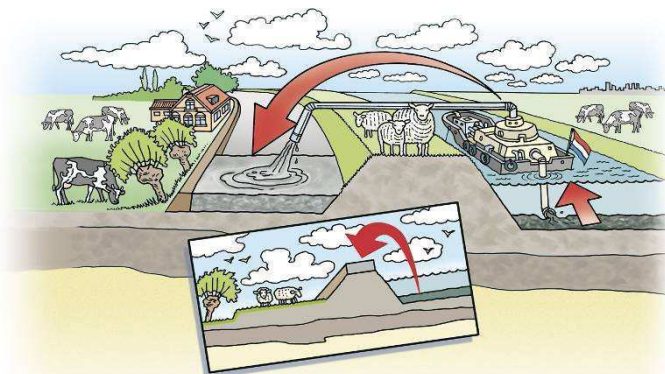
■ STW perspective Programme BioGeoCivil

● Lift up of Lowlands STW project 11344

- Upgrading of natural materials and methods for sustainable lift up of low lying polder areas

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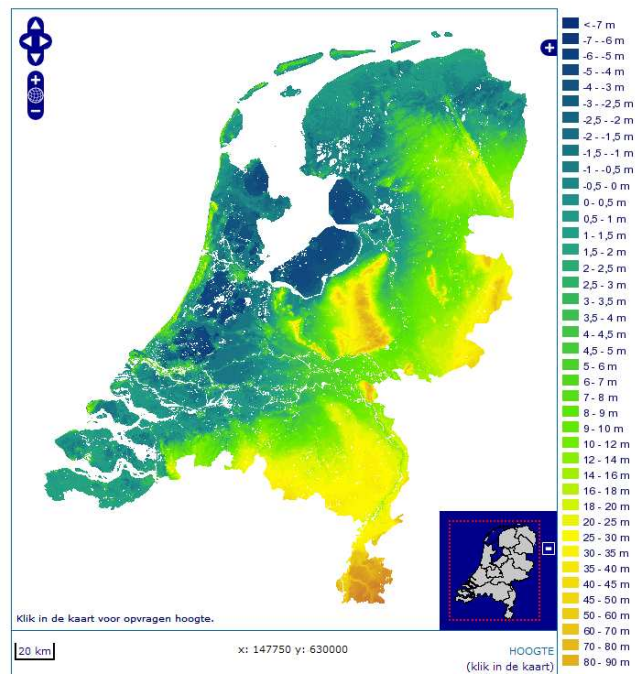
Context of the project: Low land (1)

- Low lying areas (polders):
 - Peaty soils: farmers lowering gw → aeration of upper 1 m of soil
→ peat oxidation → increased subsidence of soil level





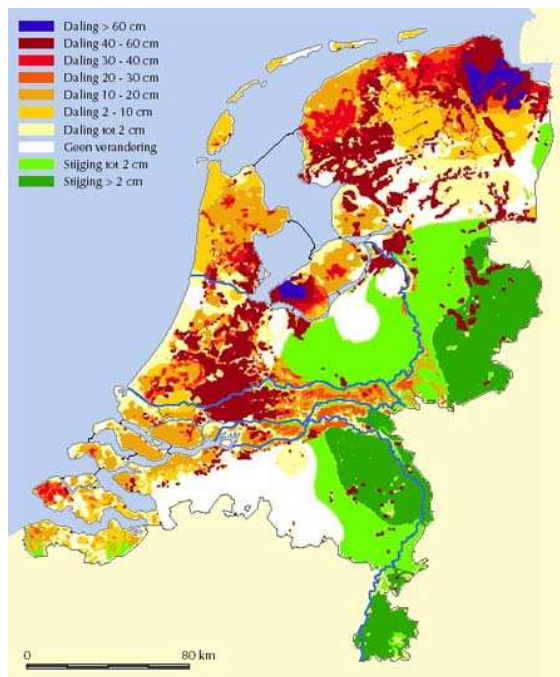
Low land



- 40% of The Netherlands lies below sealevel.



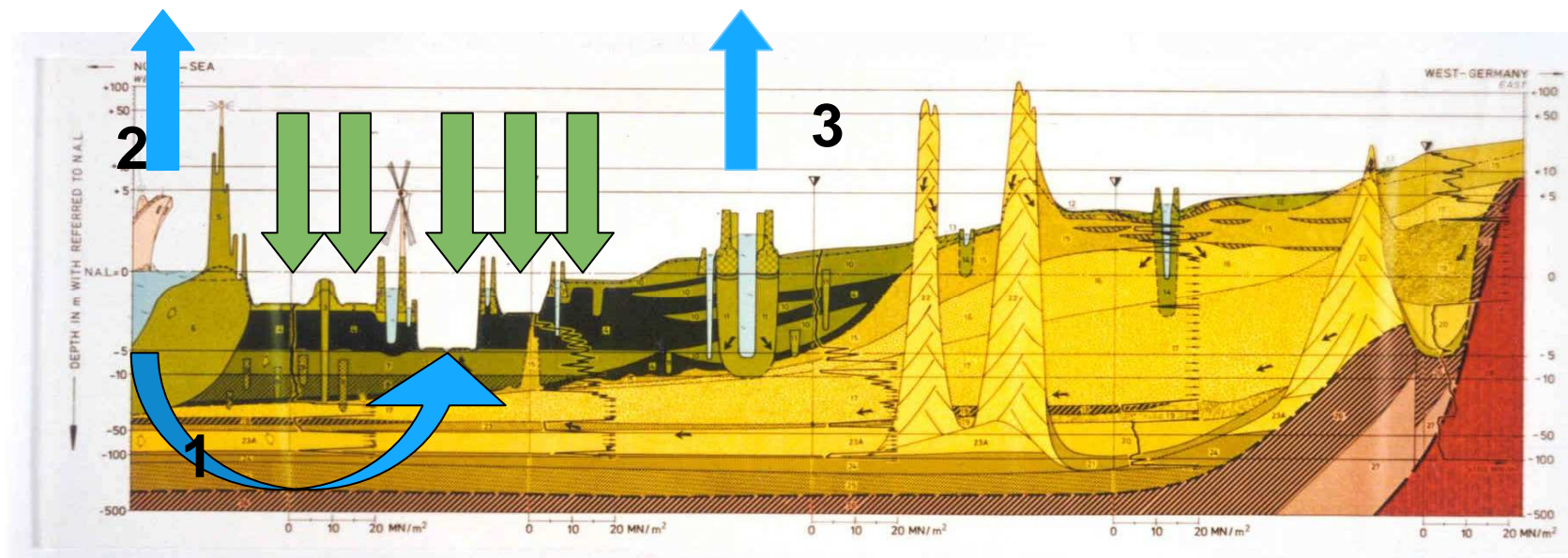
Subsidence



- Subsidence rates up to 1 cm /year due to:
 - Gas extraction
 - Peat oxidation
 - Compaction of soft sediment

Other problems related to land subsidence

- Salt intrusion from sea water: salinization of drinking water (1)
- Climate change: increased sea water level (2) + higher peak in river discharge (3)





Context of the project: excess sediments (2)

- NL in delta area → sediment settling
- Yearly: 15 million m³ excess dredging sludge





Other problems related to excess sediments

- Climate change: Programme 'room for rivers'
- 100 mln m³ sediment need to be dredged.
- NL Provinces: Stop on filling of former sandpits with clean sediment





Project aims

1. accelerated peat formation in constructed wetlands
2. increase the surface level by:
 - addition of ripened sediment
 - enriched with stable organic matter
 - cow manure
3. production of enhanced dredged sediments for civil engineering purposes:
 - high strength
 - rapid dewatering



Research methods

1. nature development and wetland construction to speed up the production of organic matter in Lowlands (Center for Wetland Ecology)
2. produce valuable resource materials by combining dredged sediments, digested organic waste and cow manure in different ratio's for agricultural practice
3. the physical and chemical properties for enforcement of dredged sediment for civil engineering applications like dike or road construction



Expected results

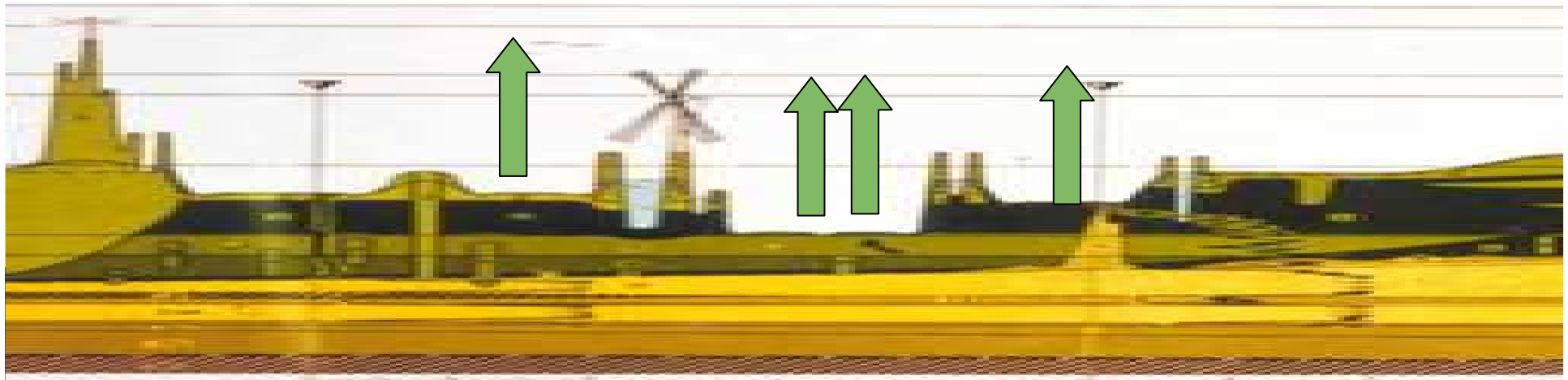
- Scenario 1:
 - Development of criteria for the design of constructed wetlands with high production of organic material





Expected results

- Scenario 2:
 - proof of principle for the production of valuable resource materials
 - Determination principle key factors for agricultural, physical and chemical quality of the produced material for the reverse of subsidence





Expected results



- Scenario 3:
 - parameters from the civil engineering laboratory experiments for:
 - design of dikes and road constructions with the enforced dredged sediment in eco-engineering approaches (14.000 km of dike needs improvement)
 - Combining dredging issues with dike safety, flood protection, and infrastructure



Utilization potential

Two problems:

1. excess of sediment
2. subsiding lowland due to inappropriate agricultural use

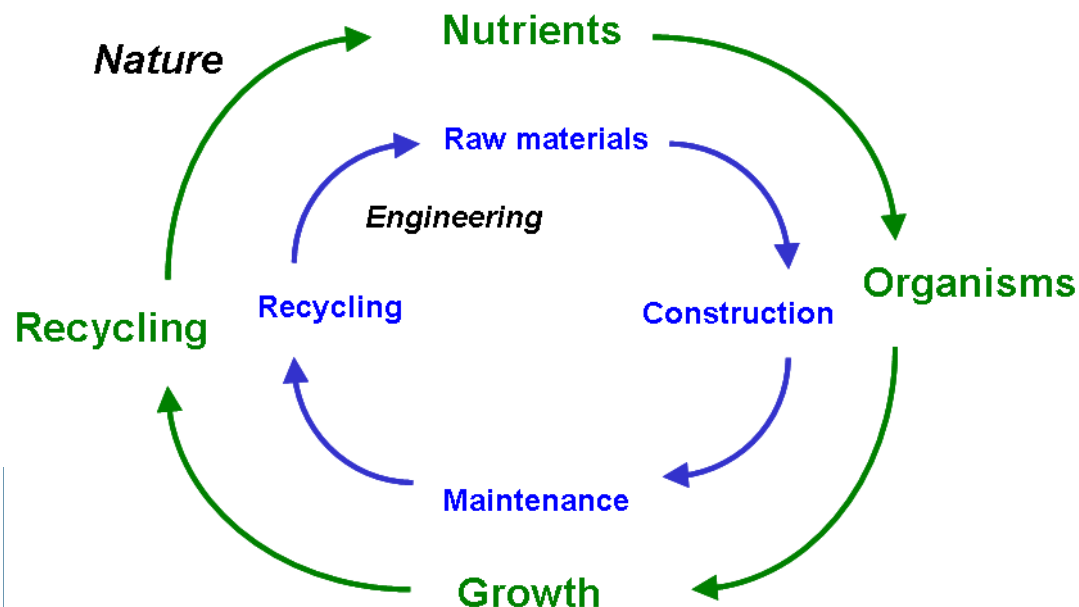
Lead by smart combination to:

- 1) increased dredging activities, resulting in reduction of changes for flooding,
- 2) public acceptance of reuse materials as resource
- 3) reverse of land subsidence



STW BioGeoCivil programme

- Bio-based Geo & Civil Engineering for a sustainable society (BioGeoCivil)
- A contribution of potential “users” of at least 25% of the total project budget is compulsory and adds up to the requested amount





Utilization: chosen partners

- scenario 1: Accelerated peat formation:
Tauw and Witteveen + Bos:
 - key factors for design of constructed wetlands

- scenario 2: Increase surface level:
Deltares and Arcadis:
 - developing new agricultural practices using regional sediment field depots, addition of organic materials and reduction of ammonia emissions from cow manure.

- Scenario 3 : enforced sediments:
Deltares, TAUW and Witteveen + Bos
 - Further development in “Sediment mattress”.



Thanks for your attention!

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