

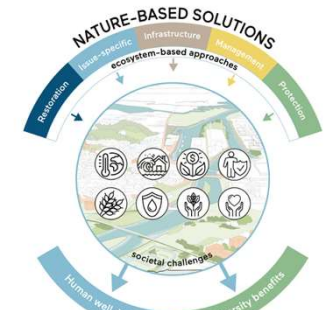
Beneficial Sediment Use and Nature-based *Opportunities for Sustainable and Circular Development*

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Building with Nature and Nature-based Solutions

Building with Nature is a conceptual approach for creating, implementing and upscaling **Nature-based Solutions** for water-related infrastructures, with **proactive** use of natural processes

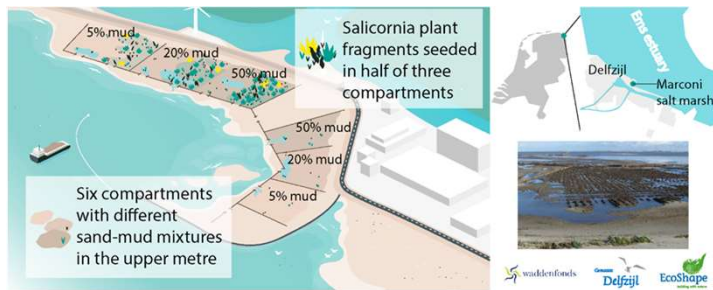


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Nature-based Solutions (NbS) fundamentals

Marconi project, Delfzijl



From Baptist et al. 2021, in review



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Nature-based Solutions (NbS) fundamentals

NbS are:

1. Dynamic (adaptive)



Figure 5-29 Tidal creek inside compartment D at 27-05-2019, 30-06-2020, and 20-08-2020 (from left to right).

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Nature-based Solutions (NbS) fundamentals

NbS are:

1. Dynamic (adaptive)
2. Innovative

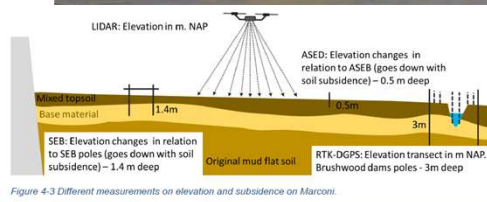


Figure 4-3 Different measurements on elevation and subsidence on Marconi.

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Nature-based Solutions (NbS) fundamentals

NbS are:

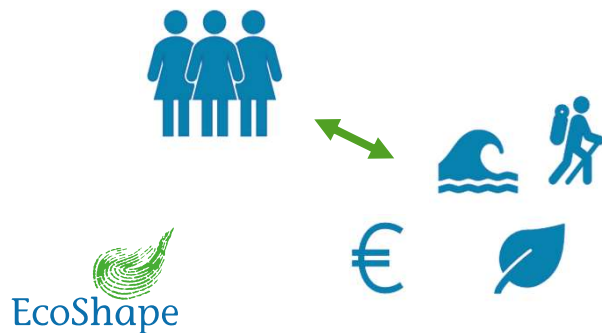
1. Dynamic (adaptive)
2. Innovative
3. Site specific



Nature-based Solutions (NbS) fundamentals

NbS are:

1. Dynamic
2. Innovative
3. Site specific
4. Multifunctional



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Beneficial Use 2020 CEDA/PIANC Definition

“the use of dredged or natural sediment in applications that are beneficial and in harmony to (human and natural) development”

(...as opposed to waste it at sea or store it in a remote deposit forever)



Flood risk
management



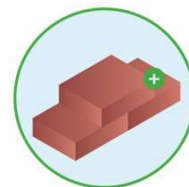
Navigability



Nature
development



Water
quality



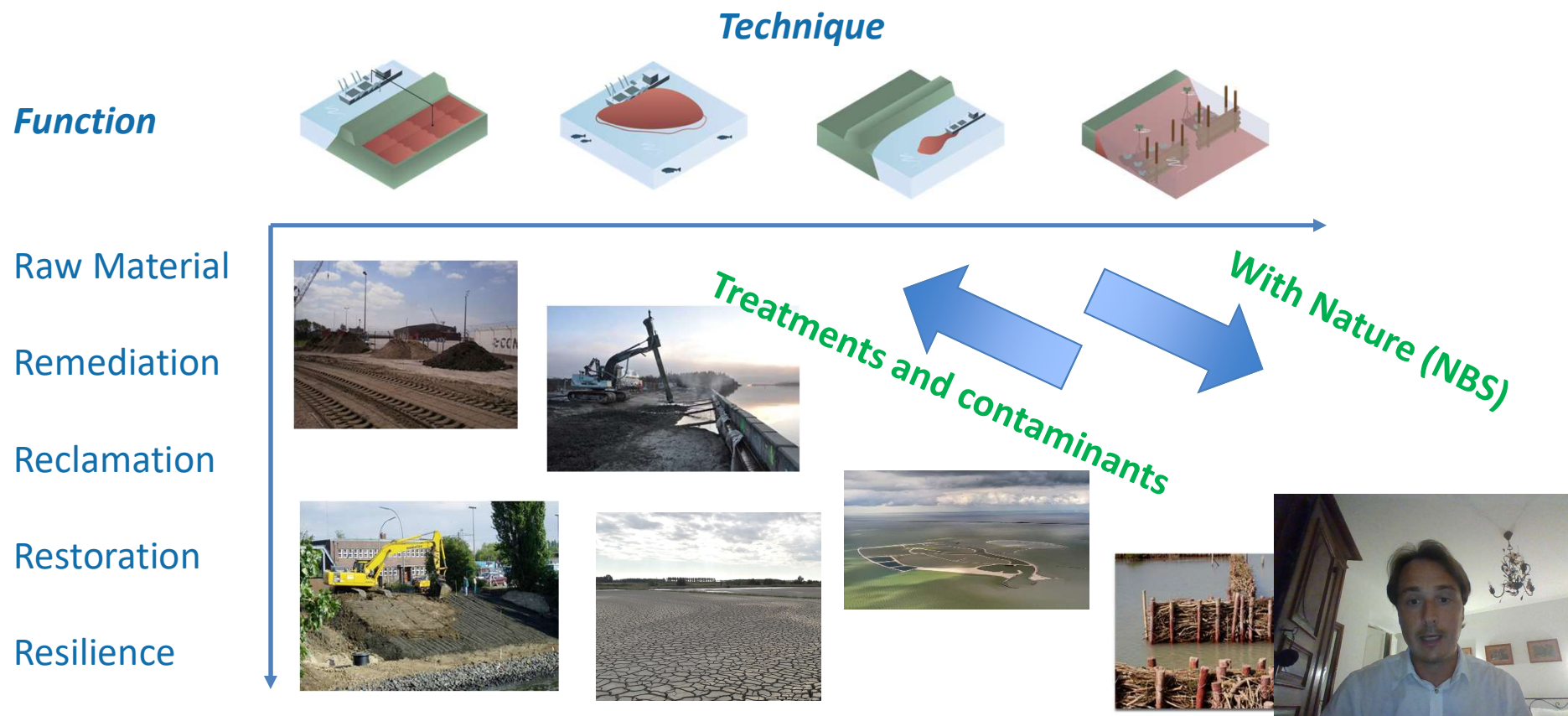
Building
material



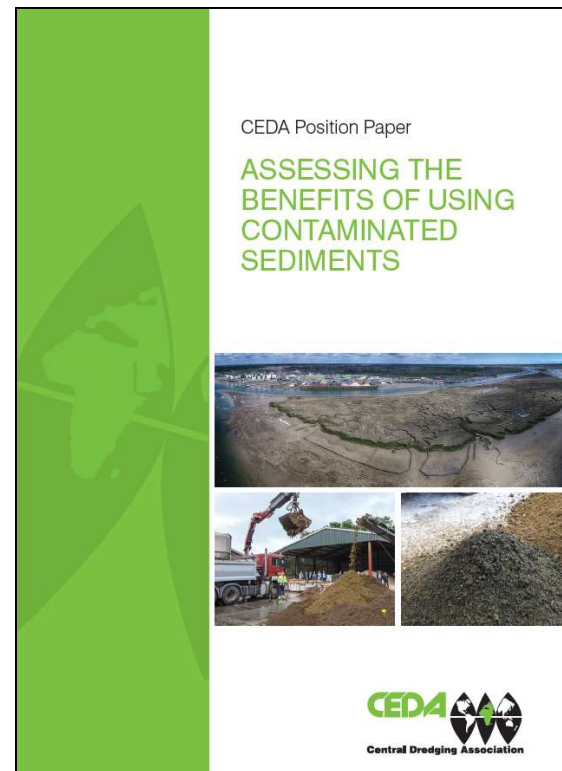
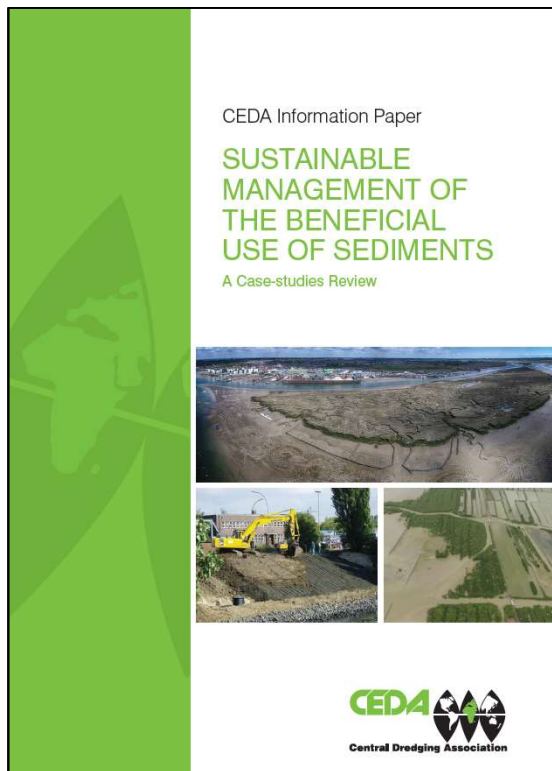
Local
economy



CEDA Beneficial Use Classification



CEDA WG Beneficial Use2019 Publication



- Collected 38 Case Studies, 11 Countries
- Clean and contaminated
- Last 30 yrs, focus last 10 yrs

Case Study Beneficial Use of Dredged Sediments

Project	Marker Wadden
Location	Marker (dredged), the Netherlands
Volume	Approx. 200,000 m³
Technique	Land reclamation: sediment from lake bottom dredged with cutter dredger; hydrocentric pumped to fill area
Geographical area	N/A
Year/years	Completed 2007
Tasks	Land reclamation
Client	Ministerie van Infrastructuur en Ruimte (Ministerie van Infrastructuur en Ruimte)
Contractor	Bechtel
Researcher	TU Delft, University of Applied Sciences (Hogeschool van Amsterdam)
Research program	Harbour in Amsterdam
Contact	Thomas van der Meer (Bechtel)

Description of the project

The Marker Wadden is an artificial shallow fresh water lake in the Netherlands, which was formerly part of the Markermeer (lake). After the area was closed off with dams it became a fresh water lake with unique ecological value (Natuurmonumenten). Over the past decades, several ecological problems have arisen related to emergent effects: high turbid water, dunes in the lake, and changes in the water level. One of the solutions is to create the Marker Wadden, which is a natural landscape area, due to the use and shallow character of the lake, and also the fact that the lake is not a natural lake. The Marker Wadden project was set up to develop such areas. The basic idea is to build islands with sediments and soft sand material. From this idea, by using the material, the total amount of fine sediments available in the lake for reclamation will increase, improving the light climate. The islands are designed to be a new habitat for birds, due to the shelter and the higher vegetation (reed). The described project requires, with respect to the design of the islands, the marsh area and strength. These requirements are challenging due to the difficulty to predict the sediment consolidation of the sediment, characterized by large volume variations which are sensitive to the varying local sediment characteristics.

The Marker Wadden project was set up by the Ministry of Infrastructure and Water, as part of the Marker Wadden consortium. This design was integrated during a holistic design process allowing for a high quality, sustainable design and operational work. One of the important design items was the consolidation and mud formation behavior of the soft material. At a final stage, vegetation will grow on the islands. During the design phase of the project, the Marker Wadden project and a number of other projects, the consolidation behavior of the material in the Marker Wadden, to monitor emergent effects, the consolidation behavior of the material in the Marker Wadden, and after construction. Based on the knowledge gained during construction, and consolidation combined with the integrated adaptive management process, the work method was continuously updated to reduce the risk of not fulfilling the project requirements.

Case study showing the use of dredged sediments

Explore and submit your case study @
https://dredging.org/content/case_studies.asp?q=&major_function=&major_technique=

CEDA WG Beneficial Use Website

Used by SedNet and PIANC as open common shared case-studies bank

Home



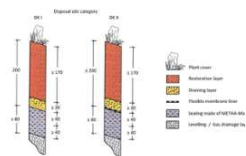
Submit case study

Filters: Free search

Function

Technique

Search



Use as sealing material

after dewatering, Hamburg - DE



Use in dike construction reinforcement

to enhance flood resilience after industrial dewatering, Hamburg - DE



Habitat restoration

through creation of islands, Lelystad - NL



Habitat restoration

through creation of islands, Wisconsin - US



Raise elevation of low-lying peatlands



Use in ceramic industry



Use for coast defence and nature restoration



Creation of natural habitat and morphological

Use in dike construction reinforcement



Classification	RSA_2004_DE
Major function	Reinforcement
Other function	Flow material
Location	Hamburg, Germany
Volume	Large volume - from low to case, some 10,000 m³ to some 10,000 m³ depending on the dike construction
Reinforcer	On Land Natural or enhanced treatment
Contaminant	Contains heavy metals and organic contaminants
Geotechnology	Stabilization
Scale	Plot scale
Client	Hamburg Port Authority
Contract	Consultants: Gesellschaft für Geotechnik und Umwelttechnik mbH (GGU), BGRS GmbH Contractor: Hamburg Port Authority
Research program	Research projects at University of Hamburg and Hamburg University of Technology
Contact	Ulrich Schreckel, Hamburg Port Authority, ulrich.schreckel@hpa.hamburg.de, +49 (0) 40 2020200, +49 (0) 40 2020209
Year start - end	2004 - ongoing
Document	Download Case Study

Following the positive assessment of MTHA material (see RSA_1993_DE Hefthafen Hamburg) as secondary use material for landfill surface sealing systems, the Hamburg Port Authority (HPA) investigated its suitability as dike construction material. The objectives were to:

1. factor the consequent beneficial use of material waste materials;
2. spare natural resources (lay rich natural marsh soils);
3. enhance cost effectiveness of dike maintenance in the port of Hamburg.

The design envisages replacement of the lower part of the dike cover with MTHA material, while for the top layer the traditional material of clayey material from the tidal marsh areas in North Frisia (Germany) continues to be employed. Investigations were carried out in two phases: (1) Geotechnical suitability and (2) environmental suitability. The latter focuses on the potential mobilization and release of contaminants. Both aspects were investigated by research projects for which the Hamburg University of Technology and the University of Hamburg were contracted and thereafter assessed by a third independent expert system. The assessment is based on laboratory and field investigations. The latter comprises two long-term field plots which are in operation since 2004 (Elterhofkullerick) and 2005 (Dreier Neusick).

Results indicate that from a geotechnical point of view the material is suitable for dike construction in 15 years of operation a field plot at Elterhofkullerick, regularly exposed to storm water tides, never gave reasons for concern of failure. Laboratory experiments on compression show that enhanced drying prior to construction minimizes in situ crack formation. The release of contaminants to the groundwater or surface waters is judged irrelevant based on comparison with the current environmental legislation. Leachate analyses indicate that the leachate, as well as the organic contaminant inventory is hardly detectable in soluble material and organic compounds. Following the experts' assessment, HPA has started in 2017 the process of approval by the Hamburg Ministry for Environmental Protection and Energy (BMUE) to use MTHA material as an alternative design variant in the process for current dike strengthening projects.

Graphical information:



References/web links

1. Gabel, J., Timmer, U., Grögnitz, A., Gabel, J. (2014) Second conference JGK Berlin
2. Grögnitz, A., Gabel, J., and Eschenbach, A. (2014) Water 2014 Proceedings of the South Baltic Conference on Dredged Matter
3. Sackhoff, F., Carver, S., Skene, J. (eds) (2013) South Baltic Sea Deep-sea Mining in the Construction <http://www.southbalticsea.com>



PIANC WG 214 on Beneficial Sediment Use



- Started in Jan 2019 → DRAFT report by Dec 2021
- International / Global coverage (EU, USA, China, Japan, Australia)
- Transition from technical to governance with Regional focus

Key messages so far:

- BU is not new, but **current sustainability ambitions offer a new wind of opportunities**
- **Barriers:**
 - Cost
 - Perception and partnership (supply – demand)
 - Legal and contamination
- **Enablers:**
 - International sustainability ambitions (e.g. circularity)
 - Proactive stakeholders' engagement (incl. private – public)
 - Inclusive business cases and financial models
 - ...



SedNet Sediment and Circular Economy WG



- Exchanges and open discussions on BU options, sustainability (environmental, social and economic benefits);
- Gathering information from other groups (CEDA, PIANC) and events;
- Submitting good practice to the **EU stakeholders platform on CE**
- Supporting RTD initiatives, especially trying to include Sediments topics in incoming **Horizon, ERDF and Life call texts**, and favouring the constitution of partnerships,
- Connecting with SedNet “Sediment quantity” WG to exchange information and perspectives

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Defining circular use of dredged material

Following nature

1. Maximizing: ADVANTAGES AND VALUE
(Builds economic, natural, and social capital)

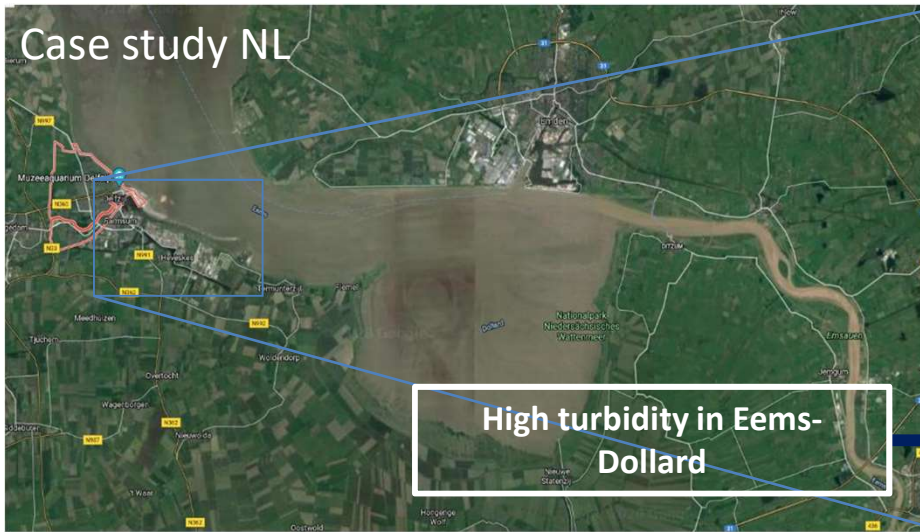


Together with partners

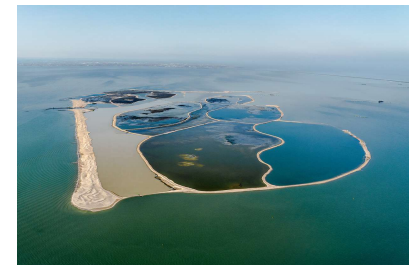
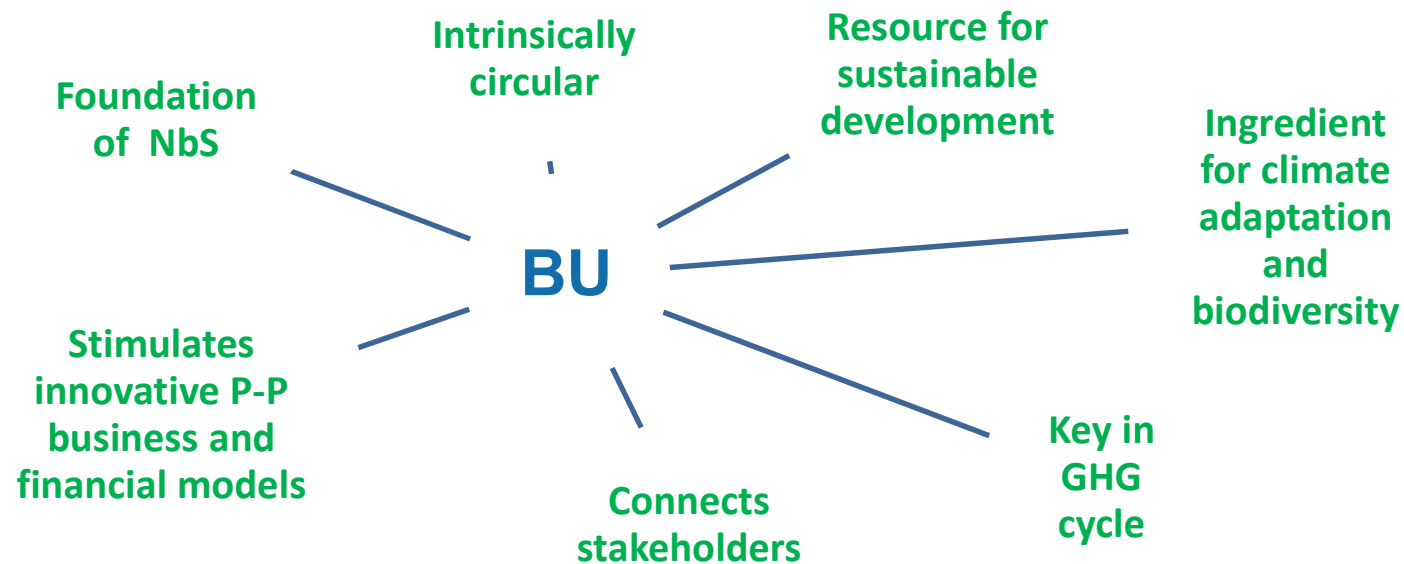


2. Maximizing: Closed cycles and reusability
3. Minimizing: Production of waste





Global relevance of Beneficial (Circular) Use



bu

The time is ripe for NbS, BU and circularity



EU Strategy on Adaptation to Climate Change:

1. Integrating adaptation into macro-fiscal policy
2. *Nature-based Solutions for adaptation*
3. Local adaptation actions

“Implementation of NbS on a larger scale would increase climate resilience and contribute to multiple Green Deal objectives.”



Road to CAS 2021, October 22nd: https://youtu.be/QHQB_dBLb3c.



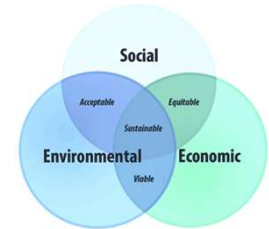
Min 1'55". Cora van Nieuwehuizen, Minister of Infrastructure and Water: "BwN is obviously the best way to counter the effect of climate change. Nature is by far our most important ally"



Min 11'15". Peter Glas, Commissioner Delta: "This book is the way forward...one of the motto's of the Delta Program is "Soft where we can, solid if necessary".



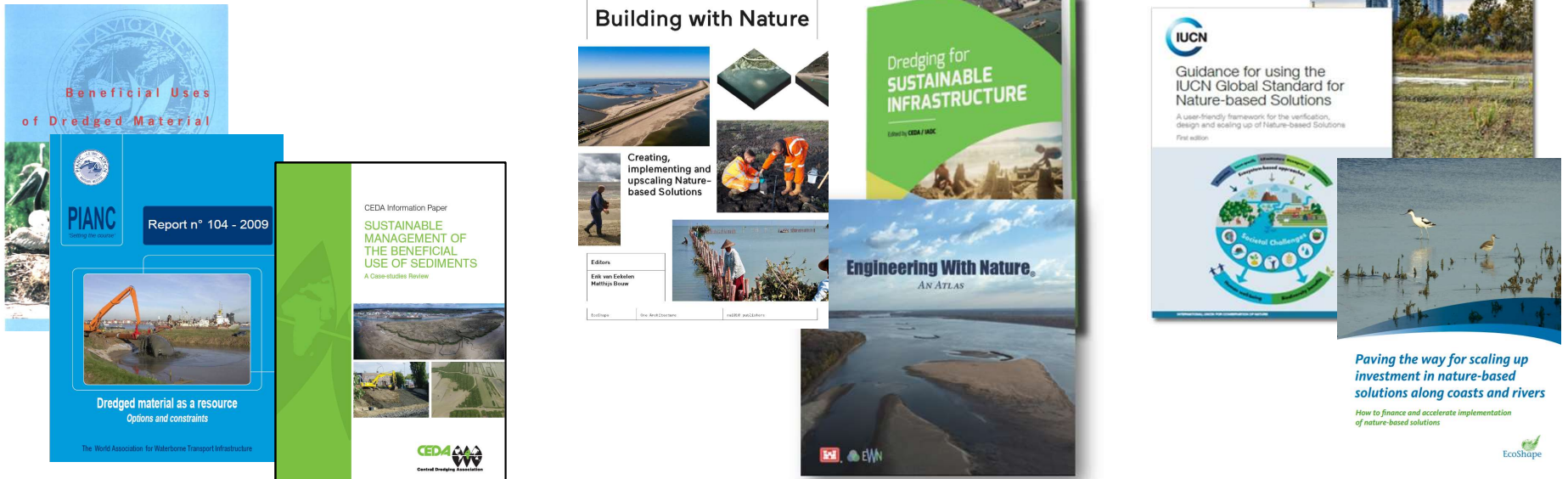
Virginijus Sinkevičius (EU Commissioner Ocean and Fisheries) at EMD Mare 2021: "it is time to connect human and nature needs for sustainable development"



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The time is ripe for NbS, BU and circularity



Technology



Practical examples / projects



Implementation
legislation



Join us at the EcoShape BUS Table
<https://www.ecoshape.org/en/tables/beneficial-use-of-sediments-table/>

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Thank you

Contact: luca.sittoni@ecoshape.nl

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