



A paradigm shift in the sediment management process: from waste to resources

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Agenda

01 Beneficial Use of Sediments

02 Nature-based Solutions

03 Beneficial Use in Practice



Beneficial Use
of Sediments

Natural



Human
activities

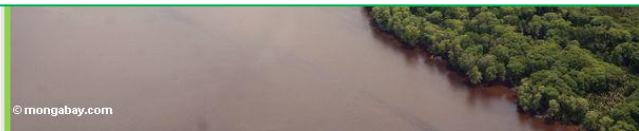


Natural

Human
activities



**Impact of human activities:
disrupt equilibrium, creating abundance and shortage**





Beneficial Sediment Use

CEDA and 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



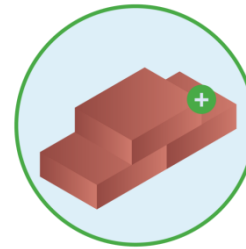
Navigability



Nature
development



Water quality



Building
material



Local
economy



Photo: DEME



Photo: DEME



Photo: EcoShape



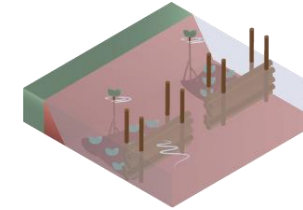
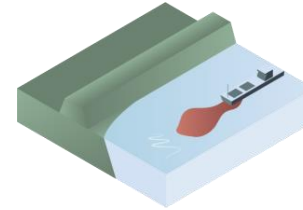
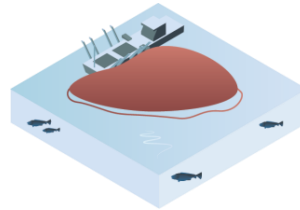
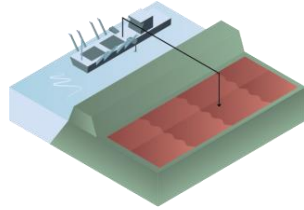
Photo: Hunze en Aa's

Beneficial Use Classification

CEDA

Technique

Function



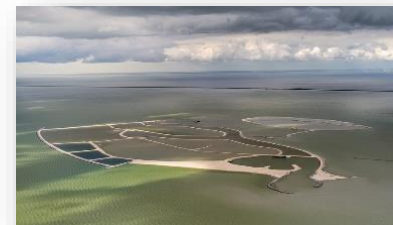
Raw Material

Remediation

Reclamation

Restoration

Resilience



Treatments and contaminants

With Nature (NBS)

CEDA WG Beneficial Use Website

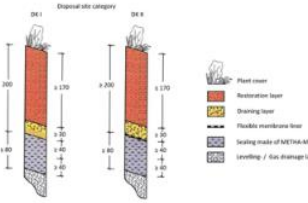
Used by SedNet and PIANC as open common shared case-studies bank

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Filters:




Use as sealing material
after dewatering, Hamburg - DE




Use in dyke 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




Use in ceramic industry



Use for coast defence and nature restoration



Creation of natural habitat and morphological



Raise elevation of low-lying peatlands

Use in dyke construction reinforcement

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Classification	BSA_2004_DE
Algae Function	Flexibility
Other Functions	Raw material
Location	Hamburg, Germany
Volume	Large volume - from case to case, some 10,000 m³ to some 10,000 m³ depending on the dike construction
Exchange	On Land Natural or enhanced treatment
Contaminants	Contains heavy metals and organic contaminants
Geography	City/County
Scale	Plot scale
Client	Hamburg Port Authority
Executive	Consultant: Gesellschaft für Grundbau und Umwelttechnik mbH (GGA), BWS GmbH Contractor: Hamburg Port Authority
Research program	Research projects at University of Hamburg and Hamburg University of Technology
Contact	Ulrich Schenkel, Hamburg Port Authority, Ulrich.Schenkel@hpa-hamburg.de, +49 (0) 153 1631055, +49 (0) 4204 72759
Year start - end	2004 - ongoing
Download	Download Case Study


Following the positive assessment of METHA material (see BSA_1993_0_Nachhamburg) as secondary raw material for landfill surface sealing systems, the Hamburg Port Authority (HPA) investigated its suitability as dike construction material. The objectives were to:

1. further the consequent beneficial use of mineral waste materials
2. spare natural resources (key-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 METHA material, while for the top layer the traditional, natural clayey material from the tidal marsh area in Northwestern Germany continues to be employed. Investigations are carried out in two phases: (1) Geotechnical suitability and (2) environmental suitability. The latter focuses on the potential mobilisation 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 opinion. The assessment is based on laboratory and field investigations. The latter comprise two long-term field pilot dikes which are in operation since 2004 (Elbholzkunstdamm) and 2006 (Dreher Hauptdamm).

Results indicate that from a geotechnical point of view the material is suitable for dike construction. In 13 years of operation a field pilot at Elbholzkunstdamm, regularly exposed to storm water, never gave reasons for concern of failure. Laboratory experiments on compression show that enhanced drying prior to construction minimises 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 inorganic as well as the organic contaminant inventory is firmly controlled in stable mineral 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 (BLE) to use METHA material as an alternative design variant in the process for current dike strengthening projects.

Graphical Information:



References/web links

1. Gebert, J., Tenenbaum, V., Grunert, A., Grube, J. (2014). Verwertung von behandeltem Baggergut als Ersatzbaustoff im Deichbau. Proceedings annual HTG Kongress 2014 Berlin.
2. Grunert, A., Gebert, J., and Eichenhardt, A. (2014). Water balance of dikes constructed with dredged material - results from a long-term field test. Proceedings of the South Baltic Conference on Dredged Materials in Dike Construction, pp. 61-66, Rostock, 10-12 April 2014, ISBN: 978-3-86029-405-8.
3. Southoff, F., Centre, S., Sikora, Z. (eds.) (2013). South Baltic Guideline for the Application of Dredged Materials, Coal Combustion Products and Geosynthetics in Dike Construction. https://www.vogelbau.eu/wp-content/uploads/2013/03/SBG_guideline_EU_enr.pdf

A PIANC ENVICOM REPORT ON THE SUSTAINABLE USE OF DREDGED MATERIAL



Burton Suedel

US Army Engineer Research and Development Center, Vicksburg, MS

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Ramboll, Chicago, IL, USA

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WODCON XXIII Copenhagen

May 2022

Guidance Report Goals

- Increase industry-wide Beneficial Use (BU) practices globally
- Develop strategies to overcome barriers to BU
- Advance circularity and sustainability goals by managing sediment as a resource



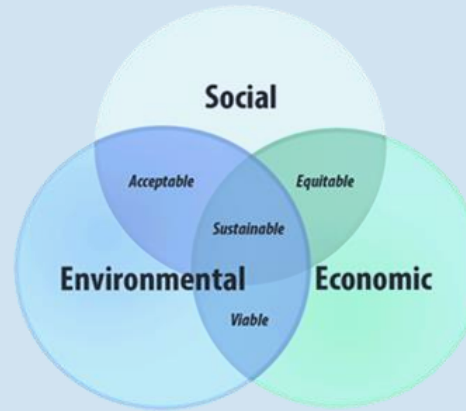
“Setting the course”

BU Catalysts

- **Redefine** cost to value
- **Connect** supply and demand
- Enlarge **stakeholders'** involvement
- Evaluate broad **(ecosystem) benefits** and **explore NbS**
- Use contaminated sediments on a **risk-management** basis, preserving safety for human and nature

From WODCONXXIII

- Project owner to **required 100% BU**
- **Ecosystem restoration** as objective of (BU) projects



Pictures, from top to bottom:

- Fehmarnbelt tunnel, D – DK → 100% BU required
- Port of Kokkola, FI → 100% BU of different qualities
- Markerwadden, NL → Main objective Ecosystem Restoration
- Source: PIANC WG 214 Report

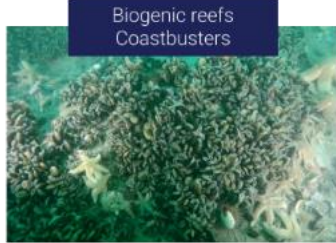


Nature-based Solutions

Nature-based Solutions Fundamentals

What


Nature-based




Engineered
ecosystem




Soft
engineered




Ecologically
enhanced hard
engineered




Hard
engineered

 increase
(ecological)
value

Building with Nature: Conceptual approach for creating, implementing and uscaling **Nature-based Solutions** for water-related infrastructures, with **proactive** use of natural processes





Central EU Strategy and Legislation

Central to DEME business

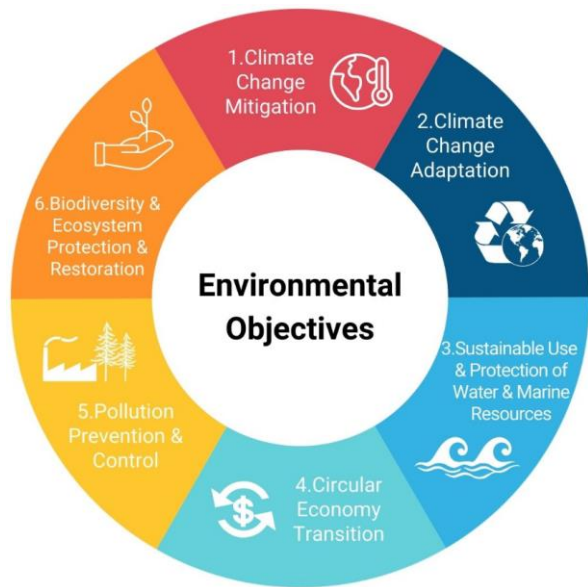
What is the EU taxonomy?

The EU taxonomy is a classification system, establishing a list of environmentally sustainable economic activities. It could play an important role helping the EU scale up sustainable investment and implement the European green deal. The EU taxonomy would provide companies, investors and policymakers with appropriate definitions for which economic activities can be considered environmentally sustainable. In this way, it should create security for investors, protect private investors from greenwashing, help companies to become more climate-friendly, mitigate market fragmentation and help shift investments where they are most needed.

Taxonomy Regulation and delegated acts

The [Taxonomy Regulation](#) ^(EN ***) was published in the Official Journal of the European Union on 22 June 2020 and entered into force on 12 July 2020. It establishes the basis for the EU taxonomy by setting out 4 overarching conditions that an economic activity has to meet in order to qualify as environmentally sustainable.

The Taxonomy Regulation establishes six environmental objectives



Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change

11. Promoting **nature-based** solutions for adaptation

^{43 44 45}Implementing **nature-based** solutions on a larger scale would increase climate resilience and contribute to multiple Green Deal objectives. Blue-green (as opposed to grey) infrastructures are multipurpose, "no regret" solutions and simultaneously provide environmental, social and economic benefits and help build climate resilience. For example, protecting and restoring wetlands, peatlands, coastal and marine ecosystems; developing urban green spaces and installing green roofs and walls; promoting and sustainably managing forests and farmland will help adapt to climate change in a cost-effective way. It is vital to better quantify their benefits, and to better communicate them to decision-makers and practitioners at all levels to improve take-up. In addition, the Commission will develop a certification mechanism for carbon removals, which will enable robust monitoring and quantification of the climate benefits of many **nature-based** solutions.

Nature-based solutions are essential for sustaining healthy water, oceans and soils. They must play a bigger role in land-use management and infrastructure planning to reduce costs, provide climate-resilient services, and improve compliance with Water Framework Directive requirements for good ecological status. Using **nature-based** solutions inland, including the restoration of the sponge-like function of soils, will boost the supply of clean, fresh water and reduce risk of flooding. In coastal and marine areas, **nature-based** solutions will enhance coastal defence and reduce risk of algal blooms. Simultaneously, they will provide benefits such as carbon sequestration, tourism opportunities, and biodiversity conservation and restoration.

Europe needs to leverage more investments in **nature-based** solutions to generate gains for adaptation, mitigation, disaster risk reduction, biodiversity, and health. Investments in **nature-based** solutions must be viable over the long-term, because climate change is amplifying stresses on ecosystems. This can be done through new and innovative financing approaches and products under InvestEU ⁴⁶, targeted support under Cohesion Policy programmes, and support for investments, eco-schemes and advisory services in the Common Agricultural Policy. Through carbon farming, the Commission will promote a new business model for land-based carbon removals, including financial incentives to rollout **nature-based** solutions.

The Commission will:

- o propose **nature-based** solutions for carbon removals, including accounting and certification in upcoming carbon farming initiatives;
- o develop the financial aspects of **nature-based** solutions and foster the development of financial approaches and products that also cover **nature-based** adaptation;
- o continue to incentivise and assist Member States to rollout **nature-based** solutions through assessments, guidance, capacity building, and EU funding.



SUSTAINABLE COASTAL AND ESTUARINE MANAGEMENT

CREATING NATURE-BASED SOLUTIONS FOR THE FUTURE

EU Soil Strategy for 2030

Reaping the benefits of healthy soils for people, food, nature and climate

Member States should better integrate soil and land use management in their river basin and flood risk management plans where possible by deploying **nature-based** solutions such as protective natural features, landscape features, river restoration, floodplains, etc.





BU in practice,
a step further

TTP1, SIN

Land reclamation with fine dredged materials



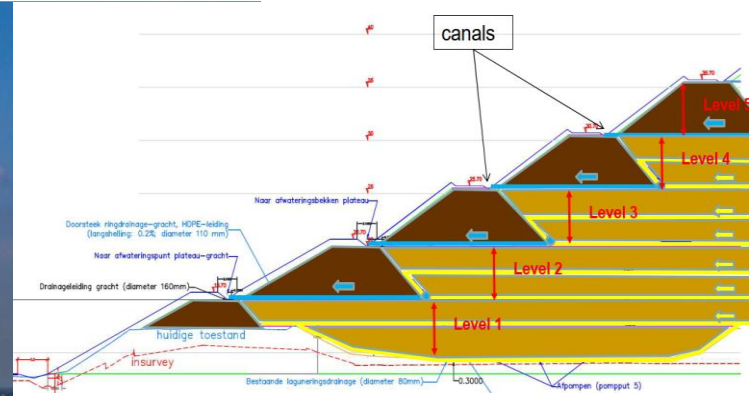
Brest, F

Land reclamation with fine dredged materials



Fasiver, B

Redevelopment with contaminated soil



Baarland, N L

Sand Nourishment – Beach Protection



Markerwadden, NL

Creation of nature islands



An aerial photograph showing a massive dike reinforcement project. A wide, light-colored earthen dike runs diagonally across the frame, separating a green agricultural field on the left from a large body of water on the right. The water is a murky brown color. In the background, a city skyline is visible on the horizon under a cloudy sky.

Kleirijperij and Brede Groene Dijk, NL

Dikes reinforcement



Pilot Ophoging agrarisch landen, NL

Raising agricultural land





Taken December 7, 2022

Patrick M. Quigley

www.gulfcoastairphoto.com

A SDAV owned small business.

Upper Barataria, USA
Marsh Creation

Venice Lagoon, I

Restoration of wetlands



The time for Beneficial Use and Nature-based Solutions



Technology



Practical examples / projects



Implementation
legislation and finance

***Thinking “how to” best use
this resource is far more
sustainable than hiding
behind “yes buts” and
continue to waste***

Thank you

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