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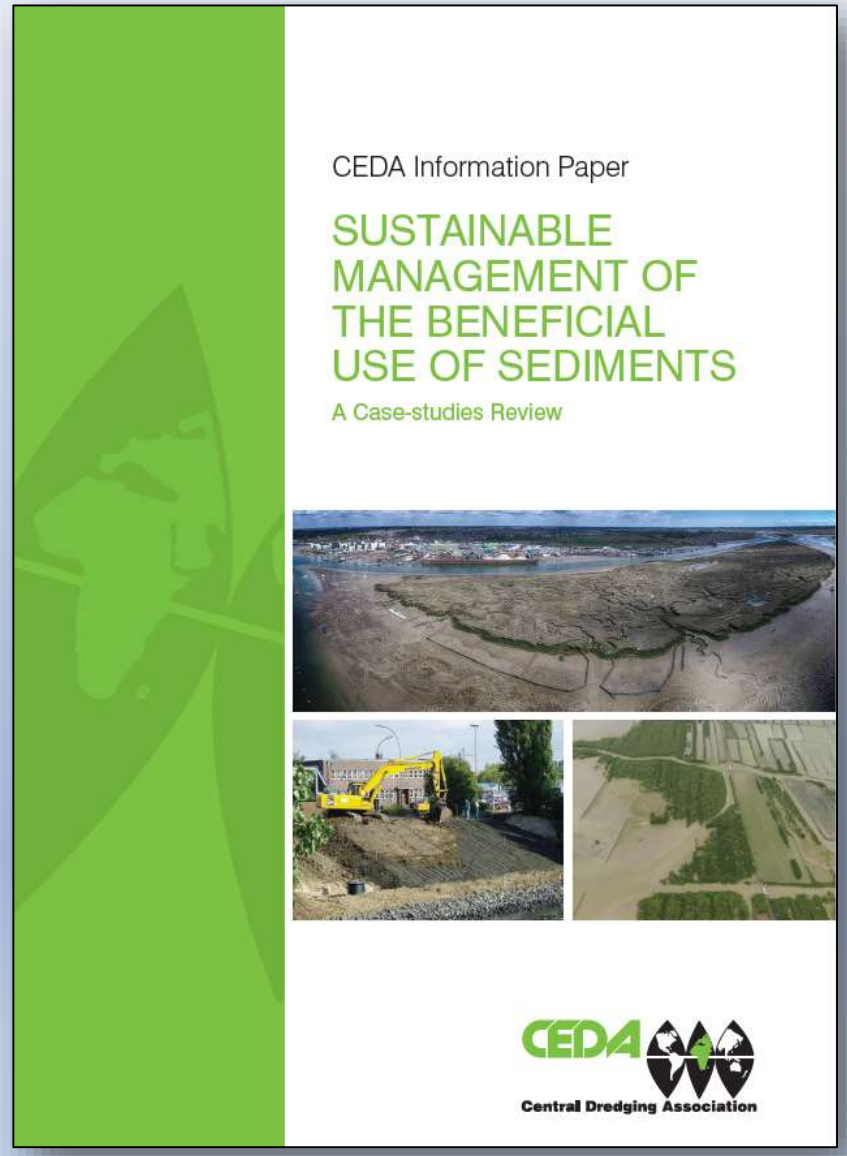
# Beneficial Use of Sediments

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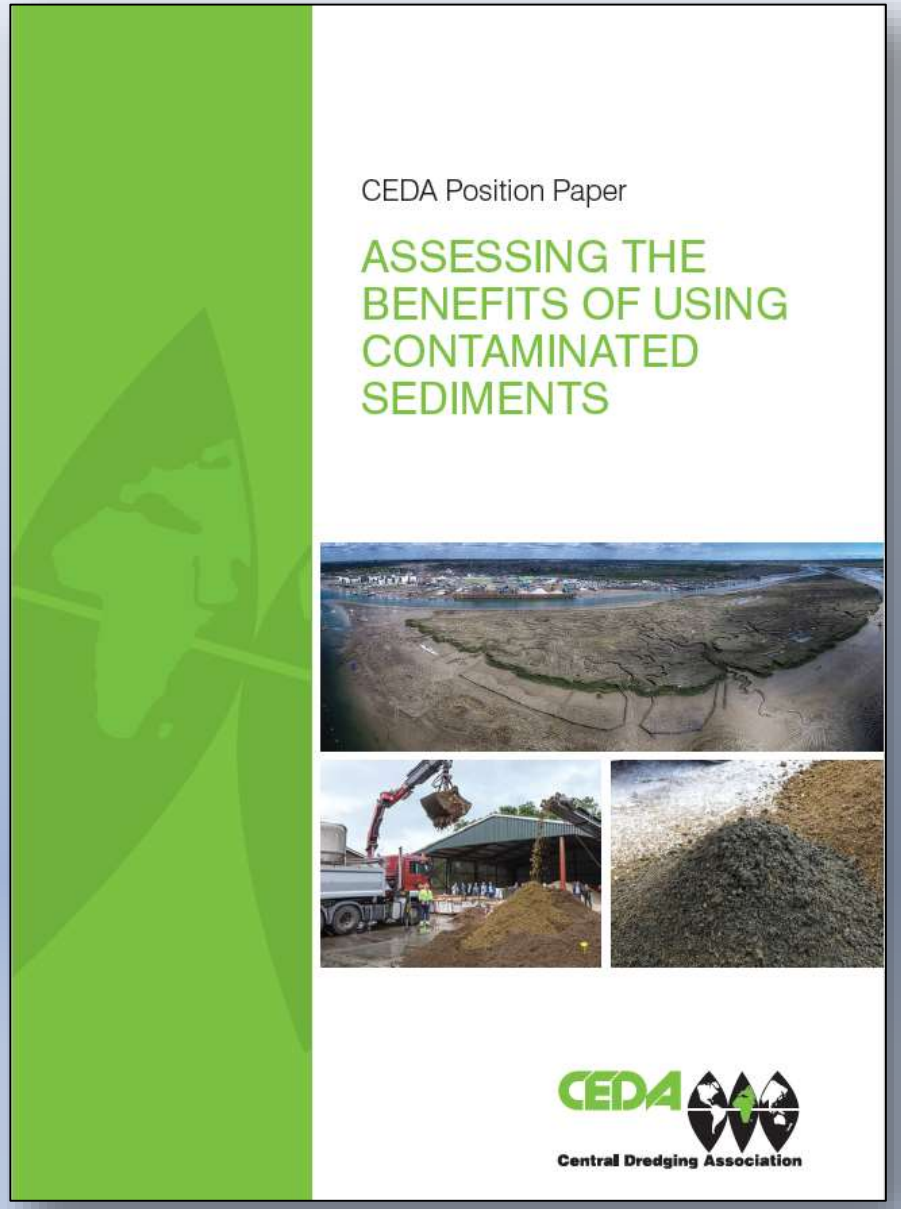
- Collected 38 case studies, 11 countries
- Beneficial use of clean and contaminated sediments



# CEDA Work Group Sponsored These Efforts and Defined Beneficial Use of Sediments

"The use of dredged or natural sediment in applications that are beneficial and in harmony to (human and natural) development."

# 5 Rs of Beneficial Use

- Raw Material: Substitution for virgin manufactured building materials or soil material / fertilizers / aggregates;
- Remediation: Clean-ups of contaminated sites, brownfields or closure of landfills and mines;
- Reclamation: Creating new or expanding existing land, for human/commercial development activities;
- Restoration: Creation of habitat to support aquatic organisms and wetlands to improve water quality; and
- Resiliency: Shoreline nourishment and (dike) reinforcement for flood defence and climate change.

# Beneficial Use with Contaminated Sediments

**Thesis:** Based on Case Studies, contaminated sediments can be used beneficially, as opposed to being treated as a waste material.

The driving principles are that:

(1) Sediments should be viewed as a resource

(2) Potential risks can be managed or avoided,

(3) The social - economic value is positive

# Exposure to Contaminants in Sediments Must Be Managed

- Perception and mitigation of risk is critical
- Legislation varies worldwide
- Beneficial Use vs. No Action
  - No action translates the issue to future generations
- Different Beneficial Use Treatment Techniques Exist (see the case studies):
  - Chemical Immobilisation
  - Bioremediation
  - Phytoremediation
  - Thermal Desorption
  - Sediment Washing and Sand Separation
  - Ex-situ Temperature Processing
  - Confined Disposal Facility

# Case Studies
# Examples

# Remediation
# Oostwaardhoeve, The Netherlands

# Oostwaardhoeve, The Netherlands

- Remediation and Restoration
- Bioremediation of contaminated sediments
- 1,000,000 $m^3$ of sediments in 100 ha
- Contaminants present:
  - PAH and mineral oil
- Dredged sediments from different harbors and sluices in the Netherlands brought on land and farmed
- Treatment: bioremediation
- Effective with biodegradable contaminants, not much with heavy metals

# Reclamation – On Land
# Toledo Dewatering Field, Ohio USA

# Toledo Dewatering Fields, Ohio, USA

- Reclamation and Restoration
- Deposition on land of organic content rich dredged sediments
- 60,000 $m^3$
- No Contaminants present, but nutrient rich sediment
- Dredged sediments from Lake Erie placed in four dewatering cells to be subsequently used to raise agricultural fields.
- Treatment: none
- Significant consolidation in 1 year (50% volume) and natural vegetation growth.
- Crop yields and impacts of pesticides/fertilizer to be demonstrated.

# Restoration
# Lift up lowlands, The Netherlands

# Lift up lowlands, The Netherlands

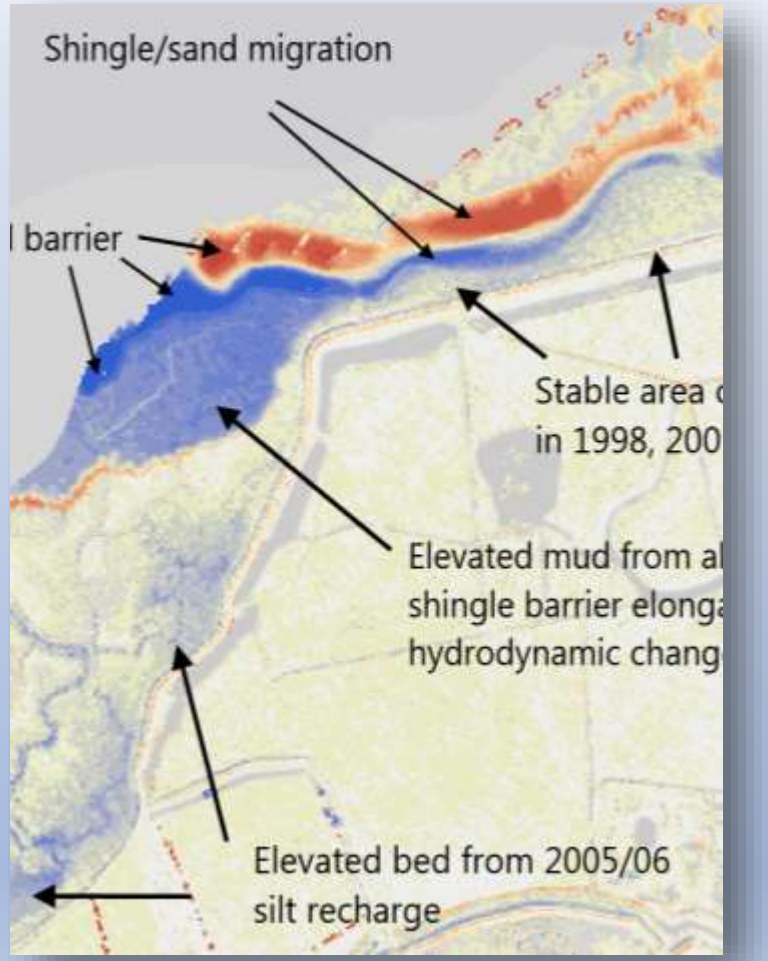
- Restoration and Raw Material
- Deposition on land of fresh water dredge material to overcome subsidence
- 60,000 $m^3$
- No Contaminants present, but organic rich sediment
- Treatment: none
- Consolidation time important to restitute land to farmers

# Objective:Restoration and Resilience Horsey Island, UK

Boskalis
Dredging & Marine Experts

# Horsey Island, UK

- Restoring coastal marsh with dredged material
- 255,000 $m^3$ in five separated campaigns
- Significant cost saving with respect to quarry aggregates
- Placed sediment remained stable
- Conversion of eroding coast into various habitats: mudflats and marsh




Ports of Harwich and Felixstowe

# Major Findings

- Sediment is a valuable resource for sustainable development, shown by many case studies and experiences over decades.
- Evolving from beach nourishment towards restoration and resiliency.
- Nature-based solutions becoming more considered in last 10 years.
- Attention focusing towards “mud,” traditionally lower quality building material.
- Legislation varies with each Country for beneficial and sustainable use.
- Focus is needed on governance (social, economics, policy), in addition to beneficial use techniques.
- Beneficial uses have been successfully applied → INFORMATION PAPER
- Beneficial uses of contaminated sediments should be based on the ability to create socioeconomic values, manage risk, and encourage natural functions → POSITION PAPER

# WEDA Work Group on Beneficial Use

- Just getting started.

Specific Work Group objectives:

- Review and discuss historical and current trends driving beneficial use
- Discuss impediments to beneficial use and potential solutions to overcome those impediments
- Review technologies and their effectiveness, limitations, and costs
- Discuss the potential impact of sediment contaminants
- Evaluate beneficial use economics, making sure that approaches are economical and affordable

Final Report

- Provide guidance to practitioners that will serve to identify, define and ultimately realize sediment management alternatives for waterborne navigation projects

# Take home message

Sediment from dredging and other sources is a critical resource for sustainable development and climate adaptation

Restoration – In Water
Marker Wadden, The Netherlands

Submit Case Studies to csiti@dredging.org