Beneficial Uses of Dredged Material: from a stigma to a resource

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Beneficial Uses of Dredged Material: from a stigma to a resource

- Concept of beneficial uses of dredged material
- Types of beneficial uses
- Examples of beneficial uses
- Environmentally responsible port operations
- Why port expansion is seen as unsustainable
- Ways to promote sustainable port expansion
- Sohar Port Case Study, Oman
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• What is dredged material?
  - Maintenance dredging (Ports, harbors, navigation channels, entrance to harbors)
  - Capital Dredging (Ports, entrances to access channels)
  - Remediation dredging (Environmental clean up)

• Disposal of dredged material
  - Clean, contaminated
  - Regulators, Public
  - Environment, Economy
  - Practice
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- “to dredge or not to dredge?” “how best to dredge for safe navigation and environmental protection?”

- Necessity is the Mother of Invention

• Concept
  - 1980s, London (Dumping) Convention ‘72, CEDA, PIANC, IAPH
  - PIANC 1992 “Beneficial Uses of Dredged Material”
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• **Why dredged material?**
  - Natural processes, weathered rock, soil, silt
  - Dredged material from, rivers, estuaries

• **A valuable resource not a waste**
  - Engineered uses
  - Agricultural/ product uses
  - Environmental enhancement uses
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Types of Beneficial Uses of Dredged Material

• **Engineered uses**
  - Capping (earliest form)
  - Land creation
  - Road embankment, road foundation
  - Noise barriers
  - Strip mine reclamation
  - Solid waste management
  - Derelict land restoration
  - Beach nourishment
  - Offshore berms
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Types of Beneficial Uses of Dredged Material

- **Agricultural/ horticulture/ forestry uses**
  - Topsoil/ Landscaping

- **Environmental enhancement** (Habitat restoration, enhancement, creation):
  - Wetlands creation
  - Upland habitats
  - Fisheries habitat
  - Sediment cell maintenance (maintenance dredging)
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Beneficial use options by material type

Gravel and sand

Engineered uses
- Land creation
- Offshore berms
- Beach nourishment
- Capping
- Road foundation

Agricultural/ product
- Construction material
- Solid noise barriers

Environmental enhancement
- Habitat creation
- Fisheries improvement
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Beneficial use options by material type

- Silt/soft clay
  - Engineered uses
    - Land creation
    - Land improvement
  - Agricultural/product
    - Topsoil
    - Construction material
  - Environmental Enhancement
    - Wetland creation
    - Upland habitat creation
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Beneficial use options by material type

- Maintenance dredged material
  - Engineered uses
    - Land creation
    - Offshore berms
    - Capping
    - Replacement fill
  - Agricultural/product
    - Topsoil
    - Construction material
  - Environmental Enhancement
    - Wetland creation
    - Upland habitat
    - Fisheries habitat
    - Cell maintenance
Building with DREDGED MATERIAL daily practice!
Building with DREDGED MATERIAL
daily practice!
“I thought ‘Nothing will ever come of this. It’s unbelievable that cars are driving over it now.’

Mr A. de Graaf, Senior Project Manager Department for Public Works and Water Management North-Brabant
Land elevations and noise barriers

"As a geological engineer, I was critical of building with clay (dredged material). I would never have thought that one could build such strong structures with it."

Mrs. I. Deibel, Senior Policy Advisor, Port of Rotterdam.

Groningen, Leiderdorp, Oost-Souburg, Beuningen and Rotterdam

Like sand, ripened dredged material can be used to build mounds and noise barriers. The requirements in terms of composition depend on what it will be used to build. A high moisture and organic content will affect the amount of settling after completion. The design and building methods used can take this into account.

Many dwelling mounds in the Dutch province of Groningen were completely or partially destroyed by digging to obtain fertilizer in the 19th and 20th centuries. On a dwelling mound, many functions come together – farming, living, recreation and burial. Since the mid 90's, the mounds are being heaped up again. Around 85 mounds in Groningen are candidates for this. A very large amount of soil is needed for this. The application of ripened soil from dredged material is a good option. Of the mounds that have been heaped up again, only the Englem mound has made use of dredged material (about 120,000 m³).
Covering of disposal sites
"Today, the use of contaminated dredged material to cover disposal sites seems an obvious solution. At the end of the 90's that was certainly not the case."

Mr J. van der Plicht, Advisor, District water board Rijn en Ijssel
Artificial gravel
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“The range of engineering applications for dredged material is diverse, being limited only by the ingenuity of the designer” (PIANC, 1992)
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**Success factors**

- **Compatibility of** the dredged material and receiving site,
- **Understanding of** sensitive environmental resources *at risk*

- **Selecting a beneficial use option is a case-specific exercise**
  - Other legitimate uses at risk
  - Dredged material characteristics
  - Social benefits to overcome opposition
  - Robust monitoring, record-keeping

*No one option is perfect, but with careful selection methods, the best option can be chosen*
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Science alone is not a panacea

- **Planning** (A large number of stakeholders with an equally large number of interests are trying to reach a consensus particularly in terms of timing and costs)

- **Eliminate the “waste” stigma from dredged material**

Successful implementation of environmentally responsible port development is more likely where a defined policy exists which promotes environmental protection through environmental management and awareness, and positively encourages the beneficial use of dredged material by making it part of the port development project.
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Planning for Environmentally Responsible Port Development

• **Construction phase**
  - Maximum use of dredged material
  - Minimum volume of dredged material that needs disposal
  - Numerical modelling (as little need for maintenance dredging as possible)

• **Operational phase**
  - Port Environmental Management (oil spill deployment measures)
  - Pollution Prevention measures (common sense, regular maintenance, good housekeeping) (sediment management vs beneficial uses of dredged material)
  - Cooperation with local authorities (drains, outfalls)
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Bigger trade flows and Bigger vessels

- Inevitable Land and/sea area take up
- Inevitable loss of habitat
- Irreversible use of non-renewable resources
- Inevitable increase of waste streams

Port expansion is environmentally damaging - Is it?

Eliminate the “waste” stigma from dredged material
Sohar Port, Oman - Phase 3 Marine Works and Harmool village beach nourishment scheme
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