Management of dredged material: small-scale dredging

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DHV Consulting and Engineering

- Worldwide presence
- Approx. 5,500 employees
- Annual turnover 2008: ca. € 470 million

Relevant in-house expertise:
- Dredging & Land Reclamation
- Ports & Waterways
- Civil & Maritime Infrastructure
- Waterfront Development & Marinas
- Flood Management & Coastal Protection

www.dredging.org

DHV Dredging services and expertise

Provide consultancy from start:
- Feasibility studies on dredging projects
- Environmental Impact Assessments (EIA)
- Analysis of equipment requirements
- Cost/benefit analysis of dredging operations
- Advise on capital and maintenance dredging
- Preliminary and final design
- Preparation of international tender documents
- Contract management and supervision
- Etc.

To supervision and Technical Assistance

www.dredging.org
Management of Dredged Material: small-scale dredging

**Definition**: an effective and efficient dredging process, usually carried out in confined, difficultly accessible channels and lakes whilst adhering to pre-defined environmental standards, laws and regulations.

This can be translated to:

“Small-scale dredging needs tailor-made solutions, each project is unique!”

Purpose of dredging

1. Water discharge (e.g. floodwaters)
2. Navigation (commercial and recreation)
3. Water quality enhancement (°C, O₂)
4. Remediation of pollution (sediment)
5. Recreation and residential (floating houses)
6. Sand-, gravel- or clay-mining and/or disposal
7. Nature creation (deepening lakes, biodiversity), environmentally friendly embankments

**Maintenance- and capital dredging**
Critical factors in small-scale dredging

- Accessibility along and in channels and lakes
- Logistics and transport of material in populated areas (traffic)
- Limited space for disposal of sediment and waste
- Sensitive project environment: hinder to surroundings, highly visible, public opinion and interest
- (Old) embankments, low bridges, etc
- Household waste & objects
- Unexploded ordinance

Recreation

Waste and large objects

Difficult access

Traffic congestion
Sensitive Project Environment: Hinder

Urban / industrial hinder:
1. Noise, light and air emissions
2. Transport of dredged material (low bridges, road congestion)
3. Hinder for navigation and recreation / tourism
4. Public opinion and participation

Rural hinder:
5. Natural Protected Areas (fish, protected birds and animals)
Mitigation measures for Hinder

Urban / industrial:
1. Work during restricted hours and seasons
2. Create nearby temporary disposal sites and transport at night
3. Confer with residents and stakeholders
4. Communication (explain necessity) and create positive project image

Rural
5. Work outside of breeding seasons
6. Building with Nature (e.g. re-use)

www.dredging.org

Project phases

Management of dredged material in small-scale projects starts at the beginning of the project:
- Plan work and carry out surveys
- Choice of dredging equipment
- Choice of transport method
- Choice of disposal method

*Start dredging, but be prepared for the unexpected!!*

www.dredging.org
Plan Work: Functional Design -> strategy

Plan Work: Dredging Process

<table>
<thead>
<tr>
<th>Dredging location</th>
<th>Equipment</th>
<th>Transport</th>
<th>Placement in CDF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small-scale Urban</td>
<td>Mechanical Dredging</td>
<td>Road transport</td>
<td>Crane over dike</td>
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<tr>
<td>Drainage channel Canal</td>
<td>Grab dredger</td>
<td>(Split) Barges</td>
<td>Sail into CDF</td>
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<td>Lake</td>
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<td>Hydraulic pipe</td>
<td>Diffuser/pontoon</td>
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<td>Combination</td>
<td>Combination</td>
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<td></td>
<td>Bucket dredger</td>
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<table>
<thead>
<tr>
<th>Parameters</th>
<th>Numbers</th>
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<tbody>
<tr>
<td>Dredging production rates</td>
<td>25 - 150 m³/hour</td>
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<tr>
<td>Water depth</td>
<td>1 - 2 m</td>
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Plan Work: Dredging Process

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<td>Hydraulic Dredging</td>
<td>- Hydraulic pipe</td>
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<tr>
<td>Urban</td>
<td>Cutter dredger, Suction dredger, Pumps, Auger Dredger</td>
<td>- Split barges</td>
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<tr>
<td>Drainage channel</td>
<td></td>
<td>- Combination</td>
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### Parameters

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<tbody>
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<td>100 - 200 m³/hour</td>
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<tr>
<td>Water depth</td>
<td>1 - 5 m</td>
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</table>

Start with surveying

Profile and sediment volume

Search for objects

Sediment quality
Survey status project area

Examine transport route

Examine state of embankments

Lower water level for underwater survey

Dredging techniques: mechanical

Grab and small low barges

Closed environmental grabs
Dredging techniques: mechanical

Amphibious dredger

Low-lying specialized bucket dredger

Low-lying silt pusher (floating bulldozer)

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Dredging techniques: rural areas

Placement of dredged material on adjacent land

Simple dredging in rural areas

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Transport techniques: mechanical

Transport with small vehicles

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Transport techniques: hydraulic

Cutter suction dredger

Small cutter suction dredger that can pass under bridges

www.dredging.org
Transport techniques: hydraulic

Environmentally friendly cutter dredger

Mechanical dredging, hydraulic transport

Disposal techniques

1) Dumping
2) Land farming
3) Sand separation
4) Dewatering
5) Thermal immobilization

Disposal site

Techniques can be used for the following material:
1. Silt, pollution mix
2. Silty-sand pollution mix
3. Silty-sand, PAW/cells

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Disposal techniques

Temporary basin

Temporary disposal sites

Transfer to disposal site
Case Study: Jakarta dredging

**Situation:** Drainage channels and retention basins are full of sediment and waste

**Result:** Insufficient drainage capacity. Flooding in residential areas endangering peoples lives and creating economic losses, unhygienic conditions

**Measures:** (Regular) Maintenance dredging, waste management and new channels & retention basins increasing capacity

**Aim:** Reduce flood risk to acceptable level, create safe living and working areas

www.dredging.org
Case Study: Jakarta dredging

**Project content:**
- Find range of [optimal small-scale dredging techniques](#) for Jakarta situation
- Go through [entire dredging process](#) from start (preparation) to finish including logistics
- [Procurement](#) of dredging equipment
- [Train](#) local staff for replication and operation and maintenance after project ends (continuation)
- [Boost public image](#) of dredging through ‘visible’ project
- Facilitate public information and [community participation](#)
- [Carry out Pilot: dredging, transport and separation of sediment and waste](#)

[www.dredging.org](http://www.dredging.org)
Case Study: Jakarta dredging

Separation of sediment and waste for re-use

Rotating drum separator

Case Study: Jakarta dredging

Reuse of dredged material

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Thank you!!
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