Dredging and remediation of Porto Marghera industrial canals in the context of Italian port dredging needs and practices

Roberto Casarin, Porto Marghera Commissary
Paola Cossettini, Commissary Staff
Emanuele Zanotto, Venice Port Authority
Venice Lagoon and Port Facilities

Channels administrated and managed by Venice Port Authority: 54.62 km²

The lagoon is about 50 Km long and 10 Km wide.

The average depth of the lagoon is about 1 meter being 75% of the lagoon water surface less than 2 meters in depth while canals deeper than 6 m covers no more than 5% of this surface.
Venice Lagoon and Port Facilities

- Surface: 2.045 hectares
- Channels: 16 km2
- 30 km wharves
- 163 operational berthing
- 38’ depth
- 24 cargo terminals
- 70 km internal road
- 205 km of railways network
Venice Port Development Plan (1965)
Pollution of navigational channels

Erosion of contaminated soils and uncontrolled wastewater discharge
## Current Three-Tiered Venetian Sediment Classification Scheme

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Class A</th>
<th>Class B</th>
<th>Class C</th>
</tr>
</thead>
<tbody>
<tr>
<td>As</td>
<td>15</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>Cd</td>
<td>1</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Cr</td>
<td>20</td>
<td>100</td>
<td>500</td>
</tr>
<tr>
<td>Cu</td>
<td>40</td>
<td>50</td>
<td>400</td>
</tr>
<tr>
<td>Hg</td>
<td>0.5</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Ni</td>
<td>45</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>Pb</td>
<td>45</td>
<td>100</td>
<td>500</td>
</tr>
<tr>
<td>Zn</td>
<td>200</td>
<td>400</td>
<td>3000</td>
</tr>
<tr>
<td>Tot. Hydrocarbons</td>
<td>30</td>
<td>500</td>
<td>4000</td>
</tr>
<tr>
<td>Total PAHs</td>
<td>1</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>PCBs</td>
<td>0.01</td>
<td>0.2</td>
<td>2</td>
</tr>
<tr>
<td>Chlor. Pesticides</td>
<td>0.001</td>
<td>0.02</td>
<td>0.5</td>
</tr>
</tbody>
</table>

### DISPOSAL SITES

- **A, B, C**: in lagoon
- **C+**: no contact with lagoon

Lack of disposal generates:
- Interruption of maintenance dredging;
- Draught reduction

---

Protocollo sui Criteri di sicurezza ambientale per gli interventi di escavazione, trasporto e reimpiego dei fanghi estratti dai canali di Venezia. 8 Aprile 1993; (mg/kg d.w.)
March 19th 2004 – Harbor Master Decree #7363: **Draught reduction**
Navigational depth along Malamocco Marghera Channel (access to port area) **reduced to 30’0’’**

December 3rd 2004 – Prime Minister Decree
**Navigational Crisis Declaration**
Social-Economic-Environmental crisis for navigational lagoon Channels due to polluted sediment in port waterways.

December 3rd 2004 – Prime Minister Ordinance # 3383
**Urgent Actions for Managing the Social-Economic-Environmental Crisis.**
Appointment of the “Commissario” Crisis Manager for Navigational Channels of Venice Lagoon contaminated by polluted sediment.
Venice Port Authority had to maintain draught for Venice port accessibility referring to Venice Port Development Plan.

Venice Port Authority is in charge of planning the dredging activity and acting it.

Commissary is in charge of design dredging plans and disposal sites. Commissary is responsible for their approval.
Sediment characterization

Channels quality for dredging

"ISAP - Indagine sui sedimenti e sulle acque dei canali di Porto Marghera e delle aree lagunari antistanti" - MAV/CVN - ICRAM 2005 results
Actions for restoring navigational depth

"ISAP - Indagine sui sedimenti e sulle acque dei canali di Porto Marghera e delle aree lagunari antistanti" - MAV/CVN - ICRAM 2005 calcolo dei volumi

Quantities related to Venice SQGs

<table>
<thead>
<tr>
<th>Sediment quality</th>
<th>Dredging depth (m MSL)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- 10.50</td>
</tr>
<tr>
<td>Class A – Prot. ‘93</td>
<td>100’000</td>
</tr>
<tr>
<td>Class B – Prot. ‘93</td>
<td>1’350’000</td>
</tr>
<tr>
<td>Class C – Prot. ‘93</td>
<td>2’650’000</td>
</tr>
<tr>
<td>Class &gt; C – Prot. ‘93</td>
<td>1’100’000</td>
</tr>
<tr>
<td><strong>Total [m³]</strong></td>
<td><strong>5’200’000</strong></td>
</tr>
</tbody>
</table>
Venice Port Accessibility projects

Malamocco Marghera
- First phase -11.00 (already obtained)
- Second phase -12.00 (summer 2012)

About 4M m$^3$ sediment dredged and disposed

Venice Port Authority investments: 75 M€
**Venice Port Accessibility projects**

**West and South Canals**
- First phase -10.50 (summer 2011)
- Second phase -12.00

About 880,000 m³ sediment dredged and disposed

Venice Port Authority investments: 13M€
Commissary investments: 27 M€
DISPOSAL SITE PROJECTS
DISPOSAL SITE PROJECTS GUIDELINES

• Within Venice Lagoon or Marghera Industrial Area
• Low impact in the Venice Ecosystem
• Integration with other relevant environmental Projects
• Environmental compensation as a project key guideline
ACCORDO MORANZANI - ACTIONS

- Molo Sali
- Flooding water management
  - Bacino Lusore
- Roads
- Urban Parks
- Area 23 ha
- Delocalisation San Marco P.
- Vallone Moranzani and power lines grounding
Invio a caratterizzazione/condizionamento fanghi oltre C Prot. 93
dopo caratterizzazione

Ricollocazione fanghi entro C Prot. 93 da altri canali

Eventuali fanghi risultanti entro C Prot. 93 dopo caratterizzazione

Stoccaggio definitivo fanghi oltre C Prot. 93 dopo caratterizzazione

Refluimento fanghi oltre C Prot. 93 (frazione classificata "non pericolosa")

Ricollocazione fanghi entro C Prot. 93 prevista da Project Financing

Sediment management
Disposal Sites
Sediment Management:

- C Class
- further analysis
B and C Class material (Prot. 93) disposal site

**First phase**
- Increase volume of 2,500,000 m³
- Cost: 11.4 €/m³

**Second Phase**
- 50ha enlargement for 3,000,000 m³
- Cost (including dredging): 12.3 €/m³
Tresse Island enlargement

Disposal site for 3,000,000 m³ B/C Class material from Malamocco Marghera channel navigational dredging (-11 m)
Sediment Management:

• > C Class not hazardous
- **750,000 mc disposal site**
- **5 analysis storing tanks**
- **Drainage water system**
CDF Molo Sali

Sediment analysis facilities

Water Treatment
Sediment Management:

- > C CLASS HAZARDOUS
23 ha treatment plants and Moranzani ladfill
FINANCIAL NEEDS TO BE COVERED BY SEDIMENT DISPOSAL RATE (95 €/m³).
MORE THAN 1/3 IS INVESTED FOR ENVIRONMENTAL COMPENSATION
FUTURE DEVELOPMENT AND SCENARIOS
ACTION FRAMEWORK: AGREEMENT FOR PORTO MARGHERA CHEMISTRY

CONTAMINATED SITES REMEDIATION AND CLEAN-UP

POLLUTED SOIL AND GROUNDWATER ISOLATION FROM LAGOON BY SHEET PILING

DREDGING CONTAMINATED SEDIMENT

SOURCES REDUCTION
AGREEMENT FOR PORTO MARGHERA CHEMISTRY

Once Agreement actions will be concluded:
• no more heavy contamination sources will be present;
• maintenance dredging will manage only light polluted sediment;
• reuse of material for morphological restoration,
DREDGED MATERIAL REUSE SUSTAINABILITY APPROACH

In future maintenance dredging will count on solutions, tested in Venice Lagoon, for:

- light polluted sediment decontamination using "natural" washing technology coupled with bioremediation;
- reuse of dredged material for road basement.

Commissario had already permitted some tests.

In future, once crisis will be closed, Veneto Region will promote these technologies for a sustainable management obtaining all necessary permits.
Thank you for your attention

Contacts:
www.ccpv.it
www.port.venice.it

Commissario Delegato per l’Emergenza Socio Economico Ambientale relativa ai Canali Portuali di Grande Navigazione della Laguna di Venezia

Venice Port Authority