Management of sediments dredged in ports and harbours in Greece

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Port Sediment Management in Greece

Presentation outline:

- Basic data regarding major Greek ports
  - Brief review of major dredging Works & Projects completed / ongoing / planned
    - General port dredging sediments’ management practices
  - Challenges
Ports and harbours in Greece - Basic Data:

- 140 Passenger and Commercial ports
- 12 International Gateway Ports
- 19 marinas

Works & Projects:

- **1995-2010:**
  - Significant works executed in the 12 biggest co-financed by the EU & the Greek State, among others (Piraeus, Thessaloniki, Igoumenitsa, Alexandroupoli, Lavrion, Mykonos etc) and other local ports
- **2010-2025:**
  - Significant works planned at the aforementioned ports
  - Maintenance works for access channels and port basins (Igoumenitsa, Alexandroupoli, Patra, etc)
  - 20 additional marinas (some already under construction)
Indicative dredging projects:

**Piraeus** (completed works)
- central basin maintenance dredging (2008/9):
  - Sedimentation from storm water collectors
  - 150,000m³
  - Mechanical dredging with silt curtain
  - Heavy Metals - toxicity above EPA acute limits
  - Confined Disposal in caissons used for the enlargement of Piers I & III

*Information given by Piraeus Port Authority*
Indicative dredging projects:

**Alexandroupoli** (Completed works)
- Central Port and 4.5km access channel:
  - 5,600,000m$^3$ of dredged material
  - Cutter Suction Dredger & Hopper Dredger
  - Sediments’ management
    1. Land reclamation for port piers
    2. Egnatia Highway earthfill
    3. Disposal of unsuitable material for land reclamation under special licence for a specified area at depths<50m. (materials dredged for the access channel)

*Information given by Alexandroupolis Port Authority*
Indicative dredging projects:

Alexandroupoli* (planned works- according to the Master Plan of the Port )

- Multipurpose port (draft to be extended from -12m to -15.5m)
- Access Channel (draft to be extended from -12 to -16m)
  - 1,500,000m³ of dredged material
  - Cutter Suction and hopper dredger
  - Use for land reclamation
  - Disposal at depths -50m or less under special licence.
- Access Channel annual maintenance
  - Required dredged material annually depending on various parameters (extreme meteo events, quantities of suspended solids by river Evros, etc)

Sedimentation and Erosion Control is a major issue!
Need for sediment management when future projects will start

*Information given by Alexandroupolis Port Authority
Alexandroupoli

Sedimentation and Erosion Control is a major issue!

Need for sediment management

Evros River: annual sediment yield: 4,000,000 tons

Currents:
- Coriolis
- Prevailing Wind/wave induced currents

Beaches suffering from severe erosion due to port access channel
Indicative dredging projects:

**Igoumenitsa** (Completed - yellow)
- Dredging of port basin and access channel 300,000m³
  - Cutter Suction with hopper
  - 33% disposal at depths -50m.
  - 67% use as earthfill for land reclamation in piers

**Igoumenitsa** (Planned according to the Master Plan of the Port - green and pink)
- Access channel to be enlarged (from 90m to 180m)
- Dredging 300,000m³
  - Cutter Suction with hopper
  - disposal at depths -50m

*Information given by Department of Large Scale Works for West Greece, Ministry of Infrastructure, Transportation, Networks

**Erosion Control is a major issue!**
Need for sediment management when future projects will start, here as well!
Igoumenitsa

Erosion Control is a major issue!

Need for sediment management here as well!
Indicative dredging projects:

**Thessaloniki** (Planned: Enlargement of Pier 6):
- 1,200,000 m$^3$ of dredged material for land reclamation
- Mechanical dredging with silt curtain
- 2m layer @ depths ranging from -13m to -22m over 60ha.
- Low toxicity
- Environmental concerns for borrow site:
  - Poseidonia prairies close-by,
  - vicinity with the Epanomi Wetland = Natura 2000 site.
Indicative dredging projects:

**Patra *(Completed 2008)*:

- Maintenance dredging
  - 150,000m$^3$
  - Sedimentation due to
    - storm water collectors
    - Morphology altered by ships’ manoeuvres (propellers & bow thrusts)
  - Mechanical dredging with silt curtain and hopper dredger

- Environmental concerns:
  - use of dredged material on land reclamation - deemed not suitable
  - Suction dredging was not allowed
  - Material disposed at depths -50m with strict environmental terms concerning dispersion during disposal due to toxic substances

Information given by Patras Port Authority
General port dredging sediments’ management practices:

- **Quantities:** Modest
  - 1995-2010: ~Above 7,000,000 m³ Quantities given are a rough approximation because on the large number of authorities involved in port works (Commercial, passenger ports - major or local, marinas, fishing harbours etc)
  - 2010-2025: Above ~7,000,000 m³ of which 4,500,000 m³ (?) for the Alexandroupoli port and access channel (estimate depends on financial criteria for the project’s construction and further planning of public works)

- **Goals:** Maintenance dredging due to sedimentation from
  - Currents
  - Storm water collectors outflowing into the port basins
  - Extreme meteorological events

- **Technology:**
  - Mechanical dredging in most cases
  - Suction systems for big projects, not as frequent, in general

- **Sediment management practices:**
  - Re-use as earthfill for land reclamation
  - Disposal at depths over -50m and at distance >2km from the shore, when not polluted and when they cannot be used for land reclamation
  - Confined Disposal Facility (caissons), when polluted
  - Far from poseidonia prairies and environmentally sensitive areas
  - Beach nourishment applied rarely after request from local stakeholders

- **Sediments are state property**
- **Strict environmental terms specific to each project**
Challenges:

1. Sedimentation problems

   Characteristic cases with acute problems requiring maintenance dredging:
   - Ports (8, 9)
   - Navigation / Access channels (1, 2, 3, 4, 6, 7)

   In most cases, closely related to coastal erosion of neighbouring beaches!

   Major Marine safety & Environmental concerns!
Challenges:

2. Legal framework:
   - Not specifically designed for dredging activities
   - Environmental licence obligatory at the phase of Planning of port works and strict environmental terms specific to each project
   - Dredged sediments are considered as “waste”
   - Does not give standardized procedures
   - Beneficial uses are not always considered - ICZM
   - Outdated and not optimized disposal practices (disposal at -50m and >2km from the shore in most cases)
   - When designing new ports or enlarging existing ones, a coastal engineering study is required

3. Study of environmental impacts & side effects:
   - Erosion in beaches within a morphodynamically closed system (sedimentary cell)
   - Polluted sediments within port basins.

4. More efficient sediment management practices in the future:
   - ICZM to be considered when planning port & marine works
   - Non-polluted sediments to be treated as a natural resource, not as waste
   - Sediment re-use potential
THANK YOU!

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Data supplied by:

- Greek Ministry of Infrastructure, Transportation and Networks
  General Direction Port Works - D4
- Port Authorities of:
  • Piraeus,
  • Patra,
  • Thessaloniki,
  • Igoumenitsa,
  • Alexandroupoli
- Greek National Tourism Association