“Vibration pollution”
Environmental Geotechnics Education

  – Monitoring
  – Contaminant migration
  – Waste stability, Landfills
  – Contaminated land reclamation
  – Assessment of geoenvironmental hazards of dredging materials and non-traditional geotechnical construction materials

• Emerging topics: XV ECSMGE, 2011
  – Geothermal energy
  – Vibration pollution

Diversification of Environmental Geotechnics: Opportunities for Geotechnical Curricula

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XV ECSMGE, Athens 2011, Sept. 15, Session 6.1: Geoenvironmental Issues
Classification of Geoenvironmental topics

• Environmental Geotechnics
  – Uses “traditional” geotechnics to address geotechnical aspects of environmental problems (e.g. waste disposal)

• Geoenvironmental Engineering [2]
  – Requires additional training
    • Contaminant transport
    • Heat transport

A content view of geoenvironmental courses

• Thermo-hydro-bio-mechanical behavior of soils

• Landfills & containment systems

• Contaminated land (characterization & remediation)
An applications view of geoenvironmental material

- Soil dynamics
  → vibration pollution
- Landfills (leaching tests)
  → reuse of byproducts & “compromised” earth materials
- Contaminated land (contaminant transport & mass transfer)
  → disposal & reuse of dredged sediments
Opportunity in an Environmental Geotechnics course

- The overarching goal of the course is to develop environmental thinking related to:
  - assessing the severity of a contaminant release in the subsurface
  - recognizing the physical-chemical-biological mechanisms that affect the fate and transport of the released contaminant
  - selecting appropriate remedial measures and/or technologies

Opportunity in an Environmental Geotechnics course

• The overarching goal of the course is to develop environmental thinking related to
  – assessing the severity of a contaminant release in the subsurface or from sediments
  – recognizing the physical-chemical-biological mechanisms that affect the fate and transport of the released contaminant
  – selecting appropriate remedial measures and/or technologies

Dredged sediments in Greece

13780 km coastline
83 big and medium harbors
1250 regional and small harbors & marinas

- public limited company (Greek law)
- international port (EC law)
- PLC & international port

Need:
screening tools for disposal options
Decision framework for dredged sediment disposal – Tier I

Decision framework for dredged sediment disposal – Tier II

CLD = confined land disposal, CAD = confined aqueous disposal

CLD upland disposal

CAD capping

CAD geotubes

no free liquid or dewatering

free liquid test (only for landfill option)

chemical characterization of leachate

leachate characterization

chemical characterization of sediment or pore water

impact 4a on water column requires buffering layer

minimal impact 4a on water column

adequate dilution or no toxicity

inert waste landfill

non hazardous waste landfill

hazardous waste landfill

3 comparison with leaching test limits
4 comparison with ambient water limits: 4a chronic exposure, 4b acute exposure

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Opportunities for Geotechnical Curricula

• Keep an eye on institutions leading the way on emerging topics in environmental geotechnics
• Build the knowledge base & consolidate knowledge base in key textbooks
• Teach the knowledge base in dedicated courses
• Expand application repertoire of students by enriching existing geotechnical courses
References