Beneficial Use of Marine Sand & Gravel
The Turkish Perspective

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Boğaziçi University

EMSAGG Seminar – Gdansk, 22 April 2016
in memory of Prof Robert G. Dean
(1931-2015)

"Whose Theories on Sand Saved Beaches"

EMSAGG Seminar, Istanbul May 13, 2011

New York Times
Beneficial Use of Marine Sand & Gravel - Beach Nourishment

(Dean, 2011)
Marine Sand and Gravel Roadmap for Sustainable Use

- Environmental Regulations
- Resource Mapping (SBP & Vibracore)
- Marine Spatial Planning
- Extraction Licensing

EXTRACTION
Beach Nourishment - Construction Stages

- dredging
- storing
- pumping ashore
- nourishing
- leveling
DREDGERS (most popular ones)

- Suction dredgers
- Bucket dredgers
- Floating cranes and backhoe dredgers
Nourished Beaches in USA

**ATLANTIC COAST**
- Ocean City, Maryland
- Virginia Beach, Virginia
- Cape Hatteras, North Carolina
- Myrtle Beach, South Carolina

**New York & New Jersey**
- Atlantic City, NJ
- Lido Beach, NY
- Coney Island, NY
- Staten Island, NY

**FLORIDA**
- Miami Beach
- Palm Beach
- Fort Lauderdale
- Key West
- Key Biscayne
- Cape Canaveral

**HAWAII**
- Waikiki Beach, Oahu

**CALIFORNIA**
- Venice Beach, Los Angeles
- St. Peters burg Beach
- Perdido Key
- Panama City
- Jacksonville Beach
- Boca Raton

**HAWAII**
- Waikiki Beach, Oahu

**CALIFORNIA**
- Venice Beach, Los Angeles
- St. Peters burg Beach
- Perdido Key
- Panama City
- Jacksonville Beach
- Boca Raton
Beach Nourishment Projects in USA

(Rosati et al., 2013)
Miami Beach, Florida

(Dean, 2011)
Miami Beach, Florida

BEFORE

AFTER

(Dean, 2011)
Perdido Key, Pensacola - Florida

(OTay, 1994)
Beach Nourishment in Palm Beach, FL
Maasvlakte-2, Rotterdam, NETHERLANDS
240 million m³ dredged material
by Van Oord & Boskalis (PUMA)

- Trailing Suction Hopper Dredgers (TSHD)
- Cutter-Suction Dredgers (CSD)
- Back-Hoes (BHD)
- Side Stone Dumping Vessels
- Support Vessels, Dry Earth Moving Equip.
Palm Jumeirah & Jebel Ali, DUBAI
The New Suez Canal, EGYPT

- 37 km canal
- 250 million m³
- 45 dredgers
- 12 months

- Consortium of 6 companies: NMDC (Abu Dhabi), Royal Boskalis Westminster N.V. (Papendrecht), Van Oord (Rotterdam), and Jan de Nul (Belgium)
Panama Canal Expansion

- $3.2 billion contract
- Grupo Unidos por el Canal SA, consortium formed by Sacyr Vallehermoso SA (Spain)
- Impregilo SpA (Italy)
- Jan de Nul n.v. (Belgium)
- Constructora Urbana, S.A. (Panama)
Marine Dredging in Turkey:

EMSAGG member: Istanbul Dredgers Cooperative

- Est. 1983 (members active in dredging since 1950’s)
- 92 members (ship owners) with 46 related maritime & aggregate companies
- Annual aggregate production 1-2 million m³
- Main activities include:
  - Dredging for marine aggregates
  - Concrete plants
  - Port services
## Marine Dredging in EU and Turkey

### Geographic & Economic Standings (2014)

<table>
<thead>
<tr>
<th>Country</th>
<th>Coastline (km)</th>
<th>Coast/area ratio (m/km²)</th>
<th>Population (millions)</th>
<th>Surface area (1000 sq.km)</th>
<th>Gross national income ($ billions)</th>
<th>Gross domestic product (% growth)</th>
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<td>39</td>
<td>313</td>
<td>500</td>
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<td>11</td>
<td>92</td>
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<td><strong>75</strong></td>
<td><strong>784</strong></td>
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<td>Euro area</td>
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<td>2.693</td>
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Data from World Bank and World Factbook (2014)
## Marine Sand Extractions in 2013

<table>
<thead>
<tr>
<th>Country</th>
<th>A) Construction/Industrial Aggregates $m^3$</th>
<th>B) Beach Nourishment $m^3$</th>
<th>C) Construction Fill/Land Reclamation $m^3$</th>
<th>D) Non-Aggregate $m^3$</th>
<th>E) Total Extraction $m^3$</th>
<th>F) Aggregate Exported $m^3$</th>
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<tbody>
<tr>
<td>Belgium</td>
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<td>1,929,013</td>
<td>0</td>
<td>0</td>
<td>3,989,633</td>
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<td>Denmark (HELCOM)$^{2,9}$</td>
<td>1,800,000</td>
<td>100,000</td>
<td>1,100,000</td>
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<tr>
<td>Denmark (OSPAR)$^{2,9}$</td>
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<td>3,500,000</td>
<td>3,000,000</td>
<td>N/d</td>
<td>7,700,000</td>
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<td>France (OSPAR)$^3$</td>
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<td>N/d</td>
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<td>Germany (HELCOM)</td>
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<td>1,958,610</td>
<td>169,042</td>
<td>27,589,405</td>
<td>2,510,000</td>
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<tr>
<td>Poland$^{10}$</td>
<td>507,237</td>
<td>N/d</td>
<td>N/d</td>
<td>N/d</td>
<td>507,237</td>
<td>N/d</td>
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<tr>
<td>Portugal</td>
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<td>UK$^6$</td>
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<tr>
<td>USA$^7$</td>
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## Licensed Extraction Areas (km$^2$)

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<td>319</td>
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<td>430</td>
<td>789</td>
<td>650</td>
<td>700</td>
<td>N/d</td>
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<tr>
<td>France</td>
<td>73</td>
<td>74</td>
<td>75</td>
<td>68</td>
<td>68</td>
<td>135</td>
<td>168</td>
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<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
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<td>Netherlands</td>
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<td>490</td>
<td>456</td>
<td>439</td>
<td>462</td>
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<tr>
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<td>5767</td>
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<td>536</td>
<td>552</td>
<td>567</td>
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<td>739</td>
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</table>
Dredging Projects in TURKEY

- Marmaray dredging works (1,12 million m³, completed in 2012)
- Rehabilitation of the Golden Horn (5 million m³ between 1995-1998)
- Izmit Bay Coastal Rehabilitation (1 km completed, extension in plan)
- Aggregate production (approx. 1 million m³/yr, ongoing)
- Nationwide maintenance dredging of harbors and navigation channels (ongoing 1-2 million m³/yr)
- “Environmental Management of Dredged Materials” funded by the Ministry of Environment & Construction to be prepared by Marmara Research Center and universities (2014-2016)
- Rehabilitation of Izmir Bay and Harbour (EIA in progress)
- New Ports in Planning: Çandarlı, Agean Sea 84 million t/yr
  Filyos, Western Black Sea, 20 million t/yr
  Rize, Eastern Black Sea, 25 million t/yr
- Canal Istanbul (?)
Lessons Learnt from Past Mistakes

Beach Mining from Turkish Black Sea Coast (late 1980’s)
Coastal Erosion due to Beach Mining

Nov 2004

Mar 2010

Jun. 2011

Sep. 2013
Ministry of Transportation has dredged approx. 14 million m³ during 2000-2009 from Turkish harbours.
Ongoing dredging activities focus on harbour maintenance

(Tolun et al., 2014)
Specialty Project - Marmaray

(Buket, 2011)
Turkish Dredging Equipment (Private Sector)

Backhoe Dredger

Split Hopper Barge (holding capacity 1000 t)
Turkish Dredging Equipment
(Ministry of Transport, Maritime Affairs and Communications)

H. ÇEKİRGE (1974)
Holding Capacity 180 t
Excavation Rate 305 m3/hr

BAHADIR (1976)
Holding Capacity 540 t
Excavating Rate 920 m3/hr
Turkish Dredging Equipment
(Ministry of Transport, Maritime Affairs and Communications)

KAZAR-VI (1992)
Holding Capacity 306 t
Excavation Rate 300 m3/hr

DLH KUM 1 (2008)
Holding Capacity 149 t
Dredging in Turkey for Beach Nourishment: Problems To Be Solved

- Need for Resource Exploration (existing borrow sites are almost fully exploited)

- Need for Marine Spatial Planning of the Turkish EEZ

- Need for new dredging regulations (existing ones are too simple yet extremely restrictive - Marmara Sea completely banned)

- Need to issue new licenses for borrow sites of marine sand to be used in beach nourishment
What’s Next

- Resource Exploration of the Turkish Seas, to be funded by the Turkish Minerals Management Department and the Ministry of Energy with participation of Universities and the dredging industry.

- Comparative study of dredging regulations and licensing standards between Turkey and the EU countries. The aim will be the development of a guide for Turkish-EU adaptation process in Marine Minerals Management.