

EMSAGG are pleased to include two articles on marine sand and gravel extraction outside of NW-Europe in this international feature bulletin. The bulletin also includes an update on EMSAGG's recent activities and news of research from the Netherlands, Belgium and a European-wide project.

## EMSAGG meeting, Ministry Of Economic Affairs, Fund for Sand Extraction, Brussels, 22 October 2002

The Ministry Of Economic Affairs, Fund for Sand Extraction in Brussels hosted the tenth bi-annual EMSAGG meeting. Bernard Gossette, Head of the Fund for Sand Extraction, welcomed the group to Belgium and the Ministry. The group enjoyed presentations on the Ministry's work, and the results of work carried out by the department, involving the use of multibeam echosounder backscatter strength values.

The department finances the monitoring of sand extraction effects on the environment and, in particular, the geomorphology. The department also analyses data to produce maps on dredging intensities. For further information see [www.mineco.fgov.be](http://www.mineco.fgov.be)

## EMSAGG meeting, TNO, Delft, 19 February 2003

TNO in Delft hosted the eleventh EMSAGG meeting. EMSAGG discussed ways in which it could take a more active role in identifying the research needs of the industry and how this could be communicated to the relevant stakeholders.

The Netherlands Institute of Applied Geoscience, TNO, National Geological Survey is the central geoscience institute in the Netherlands for information and research to promote the sustainable management and use of the subsurface and its natural resources. For further information see [www.nitg.tno.nl](http://www.nitg.tno.nl)

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Sand coming ashore at Hanson Aggregates, Nederlands NV, Amsterdam.

## Spotlight on The United States

### Marine sand and gravel extraction on the US continental shelf by Barry Drucker and Roger Amato, US Minerals Management Service

In the United States, sand and gravel resources located on the Outer Continental Shelf (OCS) are under the jurisdiction of the Minerals Management Service (MMS), a bureau within the Department of the Interior. The OCS is defined as that part of the seafloor and subsurface lying between the seaward extent of state jurisdiction and the seaward extent of federal jurisdiction. For most states, offshore federal lands begin 5.5 km from shore. The seaward limit of federal jurisdiction is the Exclusive Economic Zone (EEZ).

The legal authority for the regulation of sand and gravel exploration and production comes from the OCS Lands Act, with MMS as the lead agency. MMS has the authority to conduct competitive sales for sand and gravel for use as construction aggregate or industrial minerals and material. In addition, Public Law 103-426 gives MMS the authority to convey, on a non-competitive basis, the rights to OCS



3,900 cubic-meter capacity hopper dredge Sandy Hook

sand, gravel, or shell resources for shore protection, beach or wetlands restoration projects, or for use in construction projects funded or authorized by the Federal Government. There is no fee or royalty associated with the leasing of sand and gravel under the non-competitive provision.

Sand mined on the OCS has been used principally for shoreline protection, beach nourishment, and wetland restoration efforts. There have been no leases issued for commercial sand and gravel operations. It remains to be seen whether or not the US OCS will serve as a viable source of coarse material for construction aggregate in the future, especially as onshore sites become depleted or zoned out due to environmental or local zoning restrictions.

Through 2002, MMS conveyed a total of almost 15 million cubic meters of OCS sand for public works projects off the states of Florida, Maryland, Virginia, South Carolina, and Louisiana. The Agency



Beach nourishment and coastal restoration off the states of Florida

expects these figures to be dwarfed by upcoming requests over the next five years from the same states; requests are also anticipated from New Jersey, Delaware, North Carolina, Alabama, and Texas. Louisiana project requests alone are expected to more than equal those of all other states combined, at an estimated 27 million cubic meters, as the State embarks on a massive barrier island nourishment and restoration effort.

This significant growth in demand for OCS sand for public works projects reflects the combination of several trends, including the

depletion of sand resources in state waters, opposition to the environmental impacts, increased coastal erosion problems and the threat of rising sea level. The OCS is expected to become the principle source of sand for emergency, long-term beach nourishment and coastal restoration along the mid-Atlantic, southeast, and Gulf coast states.

For further information on MMS work contact Barry S Drucker at MMS on [Barry.Drucker@mms.gov](mailto:Barry.Drucker@mms.gov)

## Spotlight on Turkey

### Marine sand extraction industry in Turkey by Emre Otay and Cihangir Bora

Reinforced concrete is the primary construction material in Turkey. In recent years, the demand for concrete aggregates and particularly for construction-quality sand has rapidly grown beyond the existing capacity of land-based sand production facilities. More than 90 per cent of the Turkish marine sand extraction industry is located around the city of Istanbul. Approximately 12 000 people benefit from the marine sand. A sand mining fleet of 22 dredging vessels, equipped with clam-shells, operates from two ports located on either sides of the Bosphorus. Their annual sand extraction over the last 10 years averages 3.6 million m<sup>3</sup>.

Recent earthquakes and economic crises in Turkey have caused major drops in sales of marine sand (see chart below). Another reason is the government ban of sand extraction within three nautical miles off the coast since 1993. Currently, the only exception is a formerly licensed area in the Black Sea north of Istanbul, which is under legal debate between the government and the chamber of shipping.

Currently, almost all of the extracted marine sediments serve as concrete aggregate for the construction industry. Problems associated with the quality and the cost of finding new land-based sand sources have forced producers to look for alternative sources in the marine environment. Today, a growing pressure, led by the sand miners and the concrete industry, is being exercised on local authorities and the government to issue additional permits for marine sand production beyond the legal 3 nautical mile limit.

In Summer 2001, a research project funded by the Turkish National Science Foundation and the Istanbul Dredger's Association, was initiated to quantify the effect of sand mining on nearshore waves and currents, assess the magnitude of any mining-related erosion, and establish guidelines for acceptable mining rates and locations. For the experimental component of the project, a coastal research station has been established on the Black Sea coast of Istanbul. The theoretical component of the project is based on computer simulations. Project



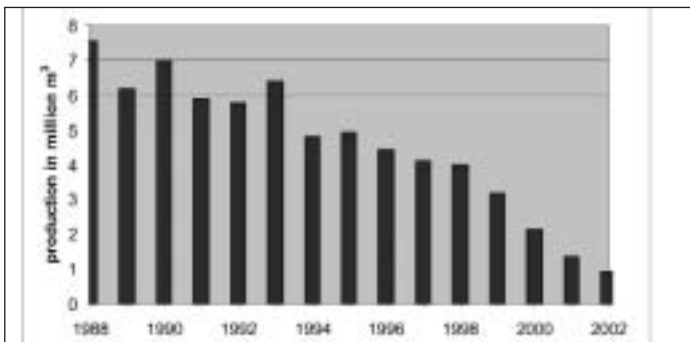
Clam shell dredge boat in Turkish waters

outcome is site-specific, but the methodology can be applied at any coastal site that features primarily non-cohesive sediments.

The results showed that the offshore distance, although indicated in the Turkish regulations, has no direct effect and therefore should not be used as limiting criteria. On the other hand, the shoreline is extremely sensitive to water depth at the dredging location, moderately sensitive to the shore normal width of the dredge pit and almost insensitive to the shore parallel length of the pit. Dredge pits with mild side slopes and dredging at larger depths reduce negative impacts of dredging.

References: Otay, E N, Demir, H, Börekçi, O S, ve Work, P A (2002) "Marine sand exploitation off the Turkish Black Sea coast", Proc. Littoral 2002, Eurocoast/EUCC, Porto, 467-476.

For further information contact Emry Otay at Bogaziçi University on otay@boun.edu.tr



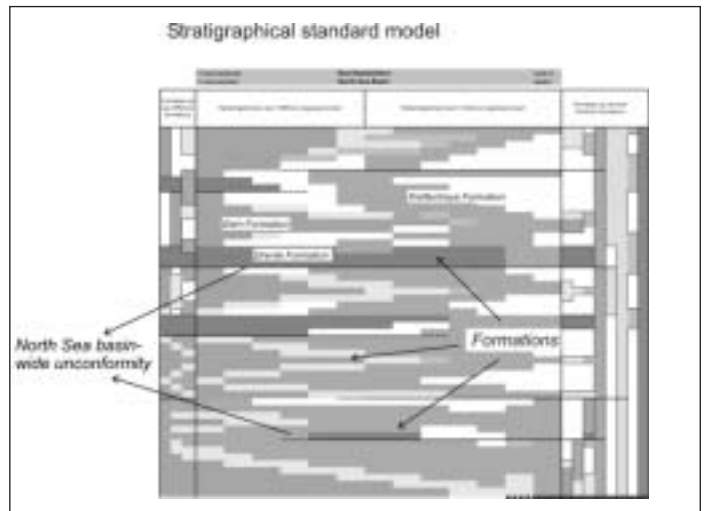
Turkish sand production figures

## Current research

### Integrated stratigraphy of the Netherlands: consequences for the stratigraphical model of the Dutch sector of the North Sea

Reading geological maps is often difficult for users that are searching for specific types of sediments as occurrences of coarse sand or gravel. The Netherlands Institute for Applied Geoscience-TNO has developed a combined land/sea lithostratigraphy showing units on the maps indicating one type of sediment. For instance the Formation of Kreftenheye consists of median to very coarse gravelly sand of fluvial origin, and the Brown Bank Formation of stiff clay of brackish to fresh water origin.

TNO-NITG has integrated the land and sea stratigraphical schemes. In the new approach a formation represents a facies association



Stratigraphical standard model

whereby genetically related lithofacies and seismofacies occurring in the same stratigraphical position, are grouped together. Five categories of facies associations (or sedimentary environments) are recognised: marine, coastal and estuarine, fluvial, glacial and local terrestrial. Ideally, any given formation contains deposits of one sedimentary environment. Within a formation, several members and beds may occur. Formations, members and beds are recognised based on lithological and seismic criteria.

In this new scheme, the seismolithostratigraphical units (middle-, upper pleistocene and holocene) could well be integrated with lithostratigraphical units on land. As a consequence former mainly middle- and upper-pleistocene offshore lithofacies, which were classified as formations, have been down-graded to members or have been grouped as facies associations in formations. Seismostratigraphical units of the lower pleistocene distinguished offshore, cannot be integrated with lithostratigraphical units on land and are correlated with marine formations.

So far, four stratigraphical subgroups in the stratigraphical standard model are distinguished on the presence of North Sea basin-wide extensive unconformities. These unconformities may have formed due to glaciation, tectonic activity in the hinterland, or relative sea level changes. The significance and stratigraphical position of these unconformities is derived from the spatial and stratigraphical distribution of mapped formations.

For further information contact Cees Laban at TNO on [c.laban@nitg.tno.nl](mailto:c.laban@nitg.tno.nl)

## The use of multibeam echosounder backscatter strength values for mapping of gravel fields on the dredging area of the Belgian continental shelf.

In sonar technology, the backscatter strength (BS) is the returning energy or echo of an acoustic pulse (measured in decibels) transmitted in the water column at a certain range and angle over a finite area of the seafloor. BS is a function of the geometry (angle of incidence) and the nature (bulk density, surface roughness - granulometry and volume heterogeneities) of the seafloor.

Since 1999, the Fund for Sand Extraction has used a Kongsberg-Simrad EM1002 multibeam echosounder, installed on board the Belgian federal RV Belgica, for monitoring and mapping of the dredging area on the Belgian continental shelf.

The potential of the BS data to discriminate the aggregates has been evaluated in the framework of a feasibility study on four monitoring areas. A total of 50 grab samples have been collected immediately after the multibeam surveys, allowing an indicative comparison between the acoustic classes, the BS grids and the real nature of the seabed at the time of insonification. The results have shown:

- good qualitative correlation between the acoustic classes and the lithology of the grab samples
- quantitatively, only a broad correlation between the mean grain size and BS
- the Sorting Index shows a better correlation, suggesting a positive relation with roughness
- high BS values in muddy sand facies can be related to strong bioturbation that increase the roughness and volume heterogeneities of the sediment.

Using the calibrated acoustic classes defined during the feasibility study and all the data surveyed in the main dredging area, we can produce a map of the classified seabed with a resolution of 5 m. Despite numerous along track residual artefacts mainly due to an insufficient compensation for the incident angle, both the resulting BS grids and acoustic classified maps can be interpreted to provide valuable information on the seabed lithology.

In GIS, the map of the acoustical classified seabed, the BS grid, the geomorphological features and the bathymetry can be displayed simultaneously to emphasise the gravel fields allowing the drawing of interpreted boundary lines of gravel fields. The validity of these interpreted limits is to be checked and quantified with the full set of grab samples.

For further information contact Dr Marc Roche on [Marc.Roche@mineco.fgov.be](mailto:Marc.Roche@mineco.fgov.be)

## Sand transport and morphology of offshore sand mining pits

In future, massive mining of sand from the middle and lower shoreface (depths of 10 m to 30 m) in large-scale mining and borrow pits/areas will be required in many European countries to nourish beaches and coastal dunes. This is in response to increased coastal erosion due to the expected sea level rise. Furthermore, the large-scale reclamation of land and the construction of large-scale artificial islands in coastal seas, which are presently being considered, will also require huge amounts of sand as building material. The large-scale mining (and dumping) of sand will be one of the most important marine environmental problems of the coming decades.

On 1 April 2002, in the 5th framework of the EU community research, the project SANDPIT started. The objective of the SANDPIT project is to develop reliable prediction techniques and guidelines. This will help to better understand, simulate and predict the morphological behaviour of large-scale sand mining pits/areas and the associated sand transport processes at the middle and lower shoreface and the surrounding coastal zone. The objectives of the SAND PIT project are to:

- research sand transport
- research morphology
- produce practical guidelines.

For further information see <http://sandpit.wldelft.nl>

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