

Chairman's report on the 23rd EMSAGG members' meeting

The 23rd EMSAGG members' meeting was held at the Frentani Conference Centre in Rome, Italy, on 6 May 2009. We had a full agenda for the day, discussing industry news, the bulletin and especially the EMSAGG conference, which took place the following day.

This special conference issue of the EMSAGG bulletin offers the reader an insight into the informative papers delivered at the 2009 EMSAGG conference *A wave of opportunities for the marine aggregates industry*. The conference successfully provided the full spectrum of subjects that EMSAGG covers on marine sand and gravel across European policy, environment, aggregates, coastal management, measurement and monitoring and also construction projects. The day represented the different European countries, opening with a Ministerial statement from the host nation highlighting the importance of marine resources in Italy. The conference also showed the innovation, developments and challenges across Europe.



Figure 1 The EMSAGG steering committee

In this issue

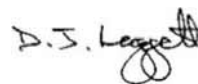
- Short abstracts from the four sessions of the 2009 Conference
- Session 1: Legislation and policy
- Session 2: Exploration and exploitation of marine sediments
- Session 3: Sustainable beach nourishment
- Session 4: Security of marine aggregate supply

On behalf of the EMSAGG steering committee I would like to express my thanks to Arenaria Srl for hosting the conference and assisting with the local arrangements, Boskalis International for their sponsorship and luncheon, CTG Italcementi Group for their sponsorship and the drinks reception and also Gardline Environmental Limited (MES) and the International Council for Exploration of the Sea for sponsoring the event. I would like to extend my thanks to Land Services for exhibiting alongside the sponsors and also to British Geological Survey, Provincie Noord-Brabant and to CIRIA for their support and secretariat work.

All conference proceedings are now available for download from the EMSAGG website: www.ciria.org/emsagg. Also, a survey has been set up should you wish to offer your feedback on the conference. Information on this can also be found at the website.

I hope you will find the bulletin of interest. Should you have any ideas for future articles and/or questions, please contact the EMSAGG secretariat at: emsagg@ciria.org

Regards,



Daniel Leggett
Chairman, EMSAGG

EMSAGG's third conference A wave of opportunities for the marine aggregates industry

The third EMSAGG conference A wave of opportunities for the marine aggregates industry was held on 7 May 2009 at the Frentani Conference Centre in Rome, Italy. Daniel Leggett, Dredging International Ltd, UK, and chairman of EMSAGG, chaired the conference, which was attended by over a hundred delegates from across Europe. The conference was opened with a chairman's welcome to the exciting programme with presentations from leading European figures, and provided an effective means of gaining information and contacts.

The first session, Legislation and policy, was chaired by Daniel Leggett and a key note speech was offered by Diego Paltrinieri, chief executive, Arenaria Srl. Diego Paltrinieri welcomed all delegates to Italy on behalf of Arenaria Srl and also presented a statement from the Ministero dell Ambiente e della Tutela del Territorio del Mare. This showed that marine resources are becoming increasingly important in flood and coastal defence and construction activities, and also that marine resources are an emerging market compared to the terrestrial resources.

The session continued by exploring the development of an integrated approach to maritime policy in Europe through integrated sectoral planning. This highlighted where those working on marine sand and gravel need to feed into the marine planning process. The session also looked at coastal zone management and underlined the importance of planning ahead for the use of resources and integration of dredging, recreation, and coastal protection needs in the face of climate change. Two papers were given in this session:

- *The integrated EU maritime policy and maritime spatial planning – the way ahead*, Nicole Schaefer, European Commission, DG Mare, Belgium
- *Sediment management and integrated coastal zone management*, Sergio Cappucci, ENEA, Italy.

The second session, Exploration and exploitation of marine sediments, was chaired by EMSAGG steering committee member Marit Brommer from Royal Haskoning, UK. The session examined several relevant issues including the importance of digital information, measurements and modelling in the marine environment.

It also outlined the very topical and highly interesting Maasvlakte 2 project in the context of environment impact assessment and an innovative cobble beach concept developed by the leading contractor consortium, PUMA.



Figure 2 Sergio Cappucci (courtesy ENEA)

Four papers were delivered:

- *Digital geological information and competition for space in the marine environment: the rise of marine spatial planning*, Robert Gatliff, British Geological Survey, United Kingdom
- *Volumetric evolution of the Flemish sandbanks: measurement and numerical modelling*, Dries Van den Eynde, the Management Unit of the North Sea Mathematical Models, Belgium
- *Maasvlakte 2 project: sand extraction licensing, with an EMSAGG focus on the environmental impact assessment conducted by the Port of Rotterdam*, Ad Stolk, Ministry of Transport, Public Works and Water Management, Rijkswaterstaat North Sea Directorate, The Netherlands
- *Maasvlakte 2 project: the winning DCM bid with an EMSAGG focus on the innovative cobble beach concept as sea defence*, Gerard Loman, PUMA (joint project venture of Boskalis and Van Oord for the extension on the Port of Rotterdam), The Netherlands.

The third session, Sustainable beach nourishment, was chaired by another EMSAGG steering committee member, Brigitte Lauwaert, Management Unit of the North Sea Mathematical Models, Belgium. This session saw an interesting mix of papers covering several sustainable and environment topics, such as ecological landscaping, environmentally friendly dredging concepts as well as innovative approaches including the Pevensy Bay Coastal Defence project – a public private partnership.

This first afternoon session also included four papers, namely:

- *Building with nature: mega nourishments and ecological landscaping of extraction areas*, Jan van Dalssen, TNO Imares, The Netherlands
- *Faunal friendly dredging*, Ray Drabble, APBMer, UK
- *Pevensey Bay sea defence PFI: a unique approach to sea defences*, Ian Thomas Pevensey Coastal Defence Ltd, UK
- *Quality and quantity of sand deposits on the Adriatic continental shelf*, Antonio Cattaneo, ISMAR-CNR, Italy.

The fourth and final session, Security of marine aggregates supply, was chaired by the vice-chair of EMSAGG, Cees Laban, Deltares, the Netherlands. The session offered an overview of security of supply and associated issues in France, Germany and Italy.

This session included three papers:

- *Marine aggregates in France: current production, materials, constraints expected and experienced and future development*, David Clavelaeu, Eurovia, France
- *Experiences on permitting planning for gravel dredging in the German North Sea sector*, Volker Patzold, Büro Dr. Ing. V. Patzold, Germany
- *Security of marine aggregate supply in Italy*, Anna Bortolussi, Arenaria Srl, Italy.

Day one of the conference concluded with the EMSAGG chairman's closing remarks and a drinks reception where the noise level was a testament to the interest, value and enthusiasm of the attendees and the opportunity to make contacts and discuss, with peers, matters across different countries and disciplines.

EMSAGG would also like to thank all speakers and delegates for their valuable contribution to an interesting and successful conference. The conference proceedings can be found on the EMSAGG website: www.ciria.org/emsagg



Figure 3 Networking



Figure 4 Ad Stolk, Ministry of Transport, Public Works and Water Management, Rijkswaterstaat North Sea, The Netherlands



Figure 5 Anna Bortolussi, Arenaria Srl, Italy

Short abstracts from papers

Session 1: Legislation and policy

Paper 1 The integrated EU Maritime Policy and maritime spatial planning – the way ahead

Schäfer, N, European Commission, DG Maritime Affairs and Fisheries (MARE), Belgium

On 25 November 2008 the European Commission adopted the Communication roadmap on maritime spatial planning: achieving common principles in the EU. Maritime spatial planning (MSP) is a key tool to implement the new integrated EU maritime policy. It is a holistic process that builds on the ecosystem-based approach and aims to secure sustainable development, which balances economic, social and environmental objectives.

MSP seeks to integrate all relevant maritime sectors and human activities and aims to allocate marine space in a rational manner. It should be implemented to manage ongoing activities as well as future development in maritime regions.

MSP provides a reliable planning framework that creates certainty and predictability for investments in maritime sectors, eg the dredging industry. Due to its objective-led set up MSP offers an appropriate way to arbitrate between conflicting sectoral interests and thus reduce their impact on the marine environment.

Paper 2 Sediment management and ICZM: an Italian case study

Cappucci, S, Scarcella, D, Taramelli, A, Mafucci, M, Rossi, L and Giaime, F, ENEA, Italy

Sediment management is becoming a critical issue around the world, particularly where the conflicts between ports development, conservation of coastal environments and tourism have to deal with the sustainable use of sediment resources within an integrated coastal zone management policy. New technical approaches to dredged harbour material management needs to be considered.

Through analysis of information contained in the Italian Ministry of the Environment Acts related to Carrara Port dredging works authorisations, it has been possible:

- to determine the sediment volume dredged throughout years
- to estimate an annual rate of material dredged from the harbour mouth

- to determine the material management options in relation to the level of contamination.

The present study provides a detailed reference frame to determine the sedimentary budget along coasts that are suffering of erosion downdrift from ports or other infrastructures.

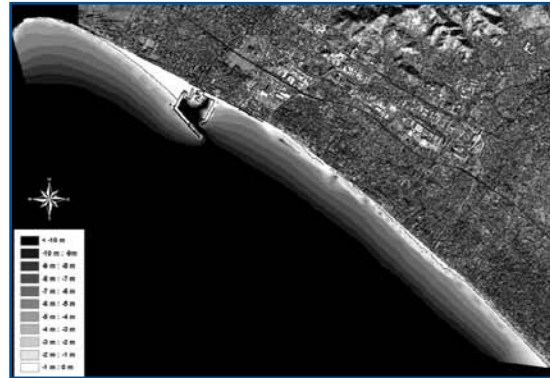


Figure 6 Bathymetric 3D image of the submerged beach around the Harbour of Marina di Carrara down to 10 m depth. Each darker grey colour corresponds to an increment of 1 m increase in water depth (courtesy ENEA)

Session 2: Exploration and exploitation of marine sediments

Paper 3 Digital geological information and competition for space in the marine environment: the rise of marine spatial planning

Gatliff, R, British Geological Survey, UK

Managing European seas without a sound knowledge of the seabed environment and the processes that shape the seabed characteristics makes it difficult to develop our marine resources in an economic, efficient and sustainable way, and simultaneously to conserve key areas and maintain biodiversity.

Geological mapping in European seas began in the 1960s after the discovery of hydrocarbons in the North Sea. Several countries initiated mapping programmes and gradually more geological information has become available.

Geological maps were based on seismic data, seabed samples and cores, and in places with oil industry interest the maps benefited from detailed subsurface data. Collaboration between geologists and hydrographic surveyors was variable, but where available, bathymetric data could provide geomorphological evidence to enhance the interpretation. Links between biologists and geologists were relatively poor and sampling for geology and biology were often parallel and unrelated activities.

The advent of multi-beam systems has provided a new approach to seabed mapping and has provided a technological means of bringing geologists, biologists, archaeologists, engineers and hydrographers together through common data collection and interpretation techniques. This has the potential to revolutionise our understanding of the seabed and for the first time provide the data necessary to underpin marine spatial planning.

Paper 4 Modelling the effect of sand extraction on the Kwinte Bank

Van den Eynde, D and Norro, A, Management Unit of the North Sea Mathematical Models, Belgium

In recent years, the exploitation of marine aggregates has been increasing. In Belgium coastal waters, especially the Kwinte Bank, is under severe pressure. During the last decade, a “depression” of 5 m developed, due to intense extraction of sand. Norro et al (2003, 2006a, 2006b and 2009) showed that during the period 1991–1998 the volume of the sand bank decreased significantly.

The influence of these bathymetric changes on the sedimentation and deposition patterns have been studied by numerical modelling, to obtain a first impression of the ability of the sand bank to recuperate from this intense sand extraction. A three-dimensional hydrodynamic model, a wave model and a local total load sediment transport model are presented, which are used investigate the sedimentation and deposition patterns.

The sediment transport model results are subject to uncertainties but the results are in general agreement with observations. The numerical model results show that apart from the extensive extraction of marine aggregates, the Kwinte Bank also is subject to a natural erosion of the top of the sand bank. The predicted erosion of the sand bank is of the same order of magnitude as the difference between the calculated volumetric decrease of the top of the sand bank and the estimated amount of extracted aggregates.

The study therefore seems to confirm that the sand bank is not recuperating from the extraction of sand, but that by natural processes, the sand bank is further being eroded. This clearly raises the question of the sustainability with regard to the extraction of marine aggregates and suggests that the authority should define maximum exploitable quota preventing any irreversible damage.

Paper 5 Sand extraction Maasvlakte 2 project: license, environmental impact assessment and monitoring

Stolk, A and Dijkshoorn, C, Ministry of Transport, Public Works and Water Management, Rijkswaterstaat North Sea, the Netherlands

In September 2009, the construction of Maasvlakte 2, an enlargement of Rotterdam harbour with 20 km², started. For the first phase of the project an amount of 290 million m³ of marine sand is needed, about fifteen times the presently yearly amount of marine sand extraction in the Netherlands. This largest extraction of marine sand in North Western Europe will take place outside the 20 m depth contour off the Dutch coast.

The construction of Maasvlakte2 and the sand extraction is a large project that requires extensive and careful communication with all stakeholders involved. An environmental impact assessment (EIA) study has been undertaken which describes the influence of the construction and sand extraction on nature and other uses of the sea. Monitoring on benthic fauna, suspended matter and underwater noise is started to examine the effects of this large scale (15 km²) and deep (10–20 m below sea bed) marine sand extraction.



Figure 7 Maasvlakte 2 Artist impression (courtesy Harbour Company, Rotterdam)

Paper 6 Maasvlakte 2 project: the winning DCM bid with an EMSAGG focus on the innovative cobble sea defense

Loman, G J A, PUMA – a joint venture of Boskalis and Van Oord for the extension of the Port of Rotterdam, the Netherlands

Early in 2008, the design, construct and maintenance (DCM) contract of the first phase of Maasvlakte 2 (the seaward extension of the Port of Rotterdam) was awarded to the joint venture of Boskalis and Van Oord.

This mega marine reclamation work encompasses an approximately 11 km sea defence, protecting around 2000 hectares of new port area.

This paper focuses on an innovative sea defence concept, which formed part of the winning bid: a dynamic quarry cobble shore which will be recharged annually. This dynamic cobble shore forms

the transition between the southern wide-footed sand shore and the northern small-footed hard shore. A determining factor of this concept is its ingenious simplicity in working with nature in a tailored way, thereby meeting the specific sea defence requirements.

The paper demonstrates that functional requirements with the given design freedom can lead to a win-win situation: the lowest total cost of ownership with a sustainable “green shore solution”.

Session 3: Sustainable beach nourishment

Paper 7 Building with nature: mega nourishments and ecological landscaping of extraction areas

A van Dalftsen, J, IMARES, and Stefan G.J. Aarninkhof, Royal Boskalis Westminster nv, the Netherlands

Coastal management in the Netherlands is based on sand nourishment. Large scale nourishments as a new strategy is currently discussed. The focus of coastal development and protection, including sand extraction, is on technical designs and are mainly assessed for ecological threats.

The Dutch programme Building with nature is an innovative research program aimed at developing new design concepts for the layout and sustainable exploitation of river, coastal and delta areas. Opportunities to use natural processes are identified and integrated into the planning and designs balancing natural ecosystems and human intervention and tested in four real-world projects initiatives.

A mega nourishment plan called Sand engine is initiated by the Province of South-Holland. The Building with nature project will use this initiative as a pilot developing knowledge regarding the essential processes and their consequences for ecological development. The opportunities for landscaping extraction areas will be studied in a second pilot project.

Paper 9 Pevensey Bay PFI: an example of best practice in provision of sea defence services

Thomas, I, Pevensey Coastal Defence Ltd, and Peter Amies, Environment Agency, UK

In June 2000, the British Government awarded the first – and only – private finance initiative (PFI) sea defence contract worldwide. A

consortium, formed by Westminster Dredging, became responsible for the improvement of a rapidly failing shingle embankment sea defence in East Sussex, England, and its subsequent maintenance until 2025.

Although the contract specifies the standard of defence required, the design and operation has been left entirely to the contractor. It is flexible enough to take advantage of refined techniques that have resulted from regular monitoring of beach behaviour under a variety of storm conditions, and actively encourages innovation.

The contract is monitored by the Environment Agency. Nine years on, both client and contractor believe that the PFI procurement process has ensured delivery of a high quality service and represents best practice in provision of sea defence services.



Figure 8 Typical erosion before improvement works (courtesy Pevensey Coastal Defence Ltd/Environment Agency)

Paper 10 Quality and quantity of sand deposits on Adriatic Continental shelf

Cattaneo, A, ISMAR-CNR – pending

Since the 1980's the Adriatic shelf has been studied to identify potential sand deposits available for extraction to monitor the amount and the quality of sand available on the shelf.

The modern Adriatic Sea is a narrow epi-continental basin with a low longitudinal topographic gradient (ca 0.02 degrees), whereas the maximum shelf gradient along the central Adriatic is on the order of 0.5 degrees. During the late Pleistocene/Holocene relative sea level rise (between ca 17 and 5.5 kyr BP) a wide portion of the northern and central Adriatic alluvial plain of the glacial time has been progressively drowned, with concurrent widening of the continental shelf area of the Adriatic.

Across the low-gradient northern shelf, the stepwise, high-amplitude relative sea-level rise favoured the deposition and in-place drowning of different generations of transgressive

barrier–lagoon systems. Along the western side of the Adriatic shelf and seaward of the modern shoreline, the late-Holocene mud wedge, a continuous belt of deltaic and shallow-marine deposits, overlies the available transgressive sand deposits to a confined area in the central portion of the basin.

The limited sand resources for the Adriatic basin and the increasing number of beach nourishment projects impose an effort to better understand sediment dispersal pathways within the shore face and identify other potential sand reservoirs in paleo alluvial submerged environments.

Session 4: Security of marine aggregate supply

Paper 11 Marine aggregates in France: current production, materials, constraints experienced and expected and future development

Claveleau, D, GIE Graves de Mer, Eurovia, and Desprez, M, Continental and Coastal Morphodynamic Lab, France

France, with a 450 million tons aggregates production, is one the greatest producer in Europe. However, marine aggregates contribute only a minor part of the French production (about 8 million tons in 2007) representing just 2 per cent of the national production.

France is characterised by a highly developed land-use quarry activity located homogeneously in the country. Thus, along the French coastline, land-use quarries produce low price aggregates that can be easily competitive if they are close to wharves and treatment installations of marine aggregates. The different extraction sites are located along the eastern Channel and Atlantic coasts mainly downstream the estuaries' mouths (Loire and Seine rivers) or on sand and gravel banks. No extraction is registered along the French Mediterranean coast (except limited beach replenishment projects).

This paper outlines the marine aggregates uses France by describing the different uses in the Eastern Channel, the Seine River, in Brittany and also in the Loire and Charente regions. The paper sets out how scientific projects have been carried out to gain an overview of the impact of dredging activity on the local marine environment and the main results are presented, highlighting the strong relationship between the dredging intensity, benthic and fish species behaviour and re-colonisation rate at different time scales.

Paper 12 Experiences on permitting planning for gravel dredging in the German North Sea sector

Dr-Ing Volker Patzold, Ingenieurburo Dr-Ing V Patzold, Germany

The North German onshore gravel-sand resources rarely have more than 20 per cent of gravel of 2–63 mm grain size. Deposits formed at a glacier gate should be noted as an exemption. Since the early 1950s until the 1970s, gravel was therefore dredged by stick hopper dredgers in the German Baltic Sector, for example, at the mouth of River Trave or at Gedser Reef.

The winning by stick hopper dredgers are no longer allowed due to the impact on ecology from the resulting morphology after dredging. Craters remaining have formed traps, which have been filled with silt and clay. To avoid this in the future, dredging in layers is only permitted.

In the 1970s, Dutch dredging contractors started an exploration campaign to search for gravel deposits. Gravel deposits were explored near the island of Helgoland, at Borkum Reef respectively along the German-Danish border. As the deposits were either located in protected areas or were of limited thickness, the Dutch dredging contractor did not follow up further exploitation of gravel from the German North Sea sector.

In the mid 1990s, German and British contractors again started a more detailed exploration campaign. The results showed two types of deposits: on one hand up to 100 m deep and relatively narrow channels filled with clay, sand and gravel and on the other hand areas with sand, gravel, stone and boulder deposits of little importance.



Figure 9 Map of on and offshore gravels and resources in Northern Germany (courtesy Dr-Ing Volker Patzold, Berater Ingenieur VBI)

Paper 13 Security of marine aggregate supply in Italy

Ing. Bortolussi, A, Arenaria Srl, Italy

Arenaria, founded in 2005 by the international company Officine Maccaferri SpA and the Italian company Eurobuilding, is the first Italian company having an official licence to exploit a sub-marine deposit at the bottom of Adriatic Sea; the extraction potential of this deposit is more than 100 million of cubic metres of sand.

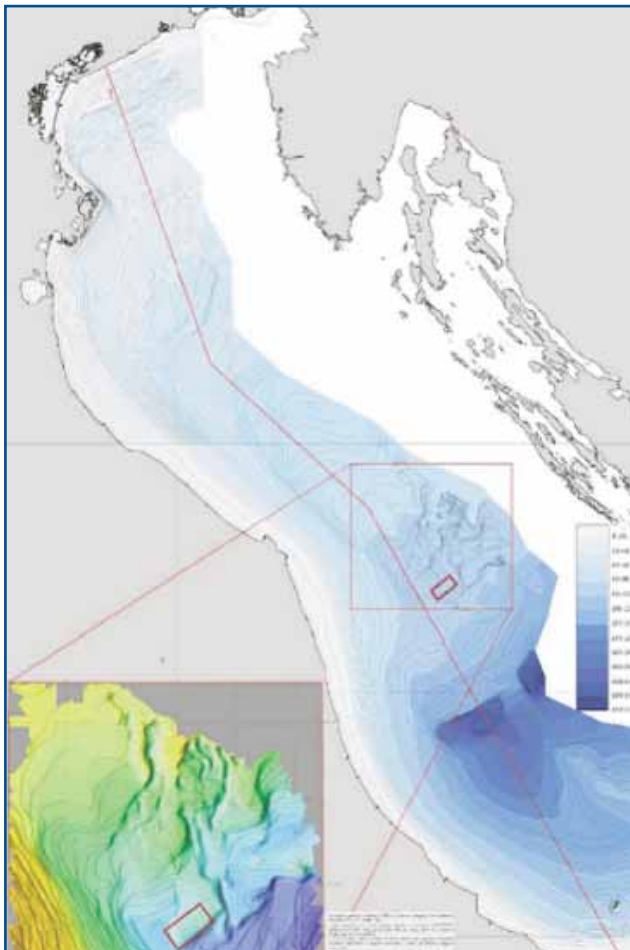


Figure 10 Properties found at particular geomorphological locations of the seabed in front of Civitanova Marche (Marche Region) (courtesy CNR-ISMAR)

A survey of the actual marine deposit in the Adriatic seabed started in the 2001, with a bibliographic research on the relict Po River Dunes System. Following this, several seismic surveys and many campaigns sampling sand from the bottom of the sea took place.

The preliminary test conducted on the samples indicated:

- the sand is a medium-fine sand, with low content in finest material
- the sand colour is grey
- there are no organic, polluted or toxic substances.

In detail, all the results of the test are illustrated in this paper, showing that the marine sand is completely similar, for physical and chemical characteristic and for strength behaviour in conglomerates, to land-quarried sand.

The final result of the experimentation is that the marine aggregates are a real alternative to land-quarried resources, also considering economical and environmental aspects.

The proceedings from the 2009 EMSAGG conference, including full papers and presentations are available to download from: www.ciria.org/emsagg