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Report of the Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem (WGEXT)

14–17 April 2009

New York, USA

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CIEM Conseil International pour l'Exploration de la Mer

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Executive summary

The Working Group on the effects of extraction of marine sediments on the marine ecosystem (WGEXT) met at Stony Brook University, Manhattan, New York, USA, between 14 and 17 April, 2009. The meeting was chaired by Mr Gerry Sutton. Thirteen participants from eight ICES Member Countries were able to supply figures for marine aggregate extraction. Four other ICES countries participated by correspondence and the figures likely account for the majority of the total marine aggregate extracted in 2008 The objective of WGEXT is provide a summary of data on marine sediment extraction, marine resource and habitat mapping, changes to the legal regime, and research projects relevant to the assessment of environmental effects. Representatives of the member countries provided reports for each of the WGEXT terms of reference and reports were also solicited by correspondence from countries not represented in person. A discussion of the reports is provided in the text and details given in the annexes. ICES WGEXT collated available information for member countries on the annual amounts of sand and gravel extraction ICES WGEXT also reviewed and reported programmes of national mapping of the seabed which include not only geological mapping, but also specific efforts to map benthic habitats. WGEXT reviewed and evaluated the use of ICES Extraction guidelines across member countries. In addition, WGEXT reviewed the output of other, relevant ICES working groups and relevant international effort in this sector. Explicit attention was given to the use of Electronic Monitoring Systems and to possible revisions to the 2003 guideline for Marine Sediment extraction.

The majority of the extraction takes place from the North Sea and the English Channel, with additional extractions in the North Atlantic primarily by France. Activity in the Netherlands and the United Kingdom accounted for 75% of the total extractions. The main use for marine aggregates continues to be for construction (41%) and beach recharge (39%), with additional volumes used primarily for land reclamation in the Netherlands. Less than 15% of marine aggregate is exported. Although use of the guidelines continues to be quite variable, most members do refer to the guidelines in national regulatory frameworks, and some make more explicit reference to some or all the provisions in statutory regulations. Few changes to legislative and administrative frameworks were also reviewed and reported.

Reports were reviewed from thirteen (of 21) member countries. Although eight member countries did not provide reports, the available data are thought to provide a representative assessment of the overall total of material extracted from the member states. ICES WGEXT agreed to meet again in April 2010 in Sweden.

ICES WGEXT agreed to meet again in Sweden, from 20–23 April 2010 as guests of Professor. Ingemar Cato. Geological Survey of Sweden, University of Gothenburg.

1 Opening of the meeting

The Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem (WGEXT) was welcomed to New York by Scott Sullivan Director of Stony Brook Manhattan and Henry Bokuniewicz. Dr David Conover, Dean of the School of Marine and Atmospheric Sciences (SoMAS), Stony Brook University, sent his regards and best wishes for a successful meeting of the working group. The Chair of WGEXT thanked Stony Brook University for hosting the annual meeting and all countries for providing national reports. The meeting included an inspection tour of the Upper Bay of New York Harbour at the hospitality of the Port Authority of New York and New Jersey and the New York District of the US Army Corps of Engineers. Meeting support and banquet were provided by the New York Sea Grant Institute and the SoMAS COAST Institute.

The Chair, Mr Sutton, also thanked all WGEXT members who had contributed to the cooperative report throughout the year and those who had provided electronic submissions for the annual report in advance of the meeting. Brigitte Lauwaert, Jan Van Dalfsen, Mike Cowling and others send their regrets. Mr Sutton noted that the Cooperative Research Report was to be published by ICES in June, 2009. It was also noted that there was a new format requested by ICES for reports; this information and other working-group documents are now available on the ICES SharePoint website < http://groupnet.ices.dk/default.aspx >.

2 Adoption of the agenda

2.1 Terms of Reference

The Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem [WGEXT] (Chair: Gerry Sutton, Ireland) was charged to meet in the United States from 14 – 17 April 2009, as guests of the School of Marine and Atmospheric Sciences of Stony Brook University, Manhattan, NY, in order to:

a) provide a summary of data on marine sediment extraction for the OSPAR region that seeks to fulfil the requirements of the OSPAR request for extraction data to be provided by ICES and take into account any feedback or comments from OSPAR on the information submitted by WGEXT 2008;

b) review data on (b.1)marine extraction activities, (b.2) developments in marine resource and habitat mapping taking into account some of the outputs of the ICES WGMHM as appropriate, (b3) information on changes to the legal regime (and associated environmental impact assessment requirements) governing marine aggregate extraction;

c) review scientific programmes and research projects relevant to the assessment of environmental effects of the extraction of marine sediments including interaction with the COST programme;

d) continue work on a new *Cooperative Research Report* to cover the period 2005 to end 2008;

e) continue to review and evaluate the use and application of the ICES WGEXT 2003 Guidelines across member countries;

f) review the outputs from other relevant ICES working groups relevant to the work of WGEXT;

g) continue to review and evaluate the scope and implementation of monitoring programmes instigated in relation to marine sediment extraction activities.

After discussion, the Agenda as shown in Annex 2 was adopted.

3 Provide a summary of data on marine sediment extraction for the OSPAR region that seeks to fulfil the requirements of the OSPAR request for extraction data to be provided by ices and take into account any feedback or comments from OSPAR on the information submitted by WGEXT 2008 (ToR a)

ICES WGEXT have again attempted to provide information for all ICES countries on the annual amounts of sand and gravel extracted but have still found difficulty in obtaining information from countries not regularly represented in person at ICES WGEXT meetings. Available information is included in Table 1 below. It should be noted that Table 1 also lists data from Mediterranean coasts of France and Spain. Although these sections of coast do not border are ICES waters, such information was deemed worthy of inclusion, especially given that beach renourishment seems to be of growing importance. In discussion, it was noted that information on navigational dredging is also compiled by some agencies, like OSPAR. WGEXT delegates should consider such data when assembling their reports, but it was beyond our terms to attempt to comprehensively include these data except where extractions might be used for beneficial uses.

Table 1. Summary Table of National Aggregate Extraction Activities in 2008.

Country	A) Construction/ industrial aggregates (m^3)	B) Beach replenishment (m^3)	C. Construction fill/ land reclamation (m^3)	D) Non-aggregate (m^3)	E) Total Extracted (m3)	F) Aggregate exported (m^3)	New Maps available	New legislation	New Policy	EIA initiated	EIA ongoing	EIA finished	EIA published
Belgium (OSPAR)	1,761,454	506,931		0	2,268,385	283,251	Yes3	No	No	No	No	Yes	Yes
Canada	N/d	N/d	N/d	N/d	N/d	N/d	N/d	No	No	No	No	No	No
Denmark1 (HELCOM)	3,670,000				3,670,000	350,000	No	No	No	N/d	N/d	N/d	N/d
Denmark1 (OSPAR)	2,820,000	2,140,000		0	4,970,000	0	No	No	No	N/d	N/d	N/d	N/d
Estonia (HELCOM)	N/d	N/d		N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d
Finland (HELCOM)	0	0		0	0	0	Yes	No	No	No	Yes	No	No
France (OSPAR)	7,511,5887		0	496,5007	8,008,088	0	Yes	No	No	Yes	Yes	Yes	No
France (Mediterranean)		1,070,0008			1,070,0008								
Germany (HELCOM)	N/d	N/d		N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d
Germany (OSPAR)	N/d	2,086,908		0	2,086,908	0	No	No	No	No	Yes	Yes	No
Greenland and Faroes (OSPAR)	N/d	N/d		N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d
Iceland (OSPAR)	N/d	N/d		N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d
Ireland (OSPAR)	0	0		0	0	0	Yes	No	No	No	No	No	No
Latvia (HELCOM)	N/d	N/d		N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d
Lithuania (HELCOM)	N/d	N/d		N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d
Netherlands (OSPAR)	1,708,381	13,000,583	11,651,410	230,555	26,468,449	3,262,7209	Yes3	No	No	No	Yes	Yes	Yes
Norway (OSPAR)	< 10,000	0	0	<10,000	<20,000	0	No	No	No	N/d	N/d	N/d	N/d
Poland (HELCOM)	N/d	N/d		N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d
Portugal (OSPAR)	N/d	N/d		N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d
Spain (OSPAR)	0	595,073		0	0	0	Yes	Yes	Yes	No	No	Yes	No
Spain (Mediterranean)	0	160,000		0	0	0	Yes	Yes	Yes	No	No	Yes	No
Sweden (OSPAR)	0	0		0	0	0	Yes	No	No	No	No	No	No
Sweden (HELCOM)	0	0		0	0	0	Yes	No	No	No	Yes	No	No
United Kingdom4 (OSPAR)	11,647,382	1,203,688	125,003	0	12,976,019	3,741,989	Yes	No	No	Yes	Yes	Yes	Yes
United States6	982,087	3,246,016		19,114	4,247217	0	No	No	No	No	No	No	No

A. Construction/industrial aggregates - marine sand and/or gravel used as a raw material for the construction industry for building purposes, primarily for use in the manufacture of concrete but also for more general construction products.

B. Beach replenishment/coastal protection – marine sand and/or gravel used to support large-scale soft engineering projects to prevent coastal erosion and to protect coastal communities and infrastructure.

C. Construction fill/land reclamation – marine sediment used to support large-scale civil engineering projects, where large volumes of bulk material are required to fill void spaces prior to construction commencing or to create new land surfaces.

D. Non-aggregates – comprising rock, shell or maerl.

E. Total Extracted – total marine sediment extracted by Member Countries

F. Aggregates Exported - the proportion of the total extracted which has been exported i.e. landed outside the country where it was extracted.

[1]The OSPAR area and the HELCOM area are overlapping in Denmark. The Kattegat area from Skagen to north of Fyn-Sjælland is included in both Conventions. Therefore the figures from the two Convention-areas cannot be added.

[2]Total shell extraction including Western Scheldt and Wadden Sea

[3]Data continually updated and new maps available on demand from database

[4]Conversion from reported tonnes to M[3] achieved using density / specific gravity conversion factor of 1.66

[6] Figures reported for USA pertain to northeastern Seaboard only

[7] Quantity licensed for extraction not necessarily quantity extracted

[8] Known amounts represent the minimum extracted

[9] Quantity estimated based on feedback from licensees

WGEXT will again circulate a copy of the WGEXT 2009 annual report to contact points provided by OSPAR BDC so that the accuracy of the information presented can be assured. As reported last year, it was agreed that the WGEXT annual report should again only consider the extraction of marine sediment which is assessed and licensed for a specific purpose.

Similar to previous years, a number of countries (summarized in the following table) did not provide data to the WGEXT 2009 annual report.

Table 2a. Specific matters highlighted in response to OSPAR request for ICES WGEXT to supply national data.

OSPAR COUNTRIES FOR WHICH DATA HAS NEVER BEEN RECEIVED (As of 2008)	
PORTUGAL ICELAND GREENLAND AND FAROES (DENMARK)	
OSPAR COUNTRIES REPORTING TO ICES WGEXT BUT NOT ANNUALLY IN RECENT YEARS	
GERMANY NORWAY	
DATA ADJUSTMENTS FOR SPECIFIC COUNTRIES NECESSARY TO DISTINGUISH DATA FOR THE OSPAR REGION	
Spain	Atlantic coast activities only (exclude Mediterranean)
France	Atlantic coast and English Channel activities only (exclude Mediterranean)
Germany	North Sea activities only (exclude Baltic)
Finland	Exclude Baltic activities
Sweden	Delineate activities in the Baltic area which fall within the boundaries of the OSPAR 1992
Denmark	As for Sweden

In response to an earlier OSPAR request to provide data on the area dredged compared with the area licensed, table 3 has been updated in 2009. Table 3 summarizes information where available for ICES WGEXT member countries. Although the data are incomplete at this time, it is important to note that the areas in which extraction occurred were much smaller than the areas licensed and, of course, the actual, spatial footprint should be used to assess impacts.

Table 3. Licensed area and actual areas over which extraction occurs.

Country	Licensed Area Km2*			Area in which extraction activities occur Km2		
	2004	2006	2007/08	2004	2006	2007/08
Belgium (Extraction Zone 1)	300	No data	No data/	9	No data	No data
Belgium (Extraction Zone 2)	228	No data	No data	19	No data	No data
Belgium Total	528	No data	No data/2306	28	No data	No data/1006
Denmark1	800	No data	450	30	No data	No data
France5	35.432	73.082	72.97/74.97	N/a	No data	No data
Germany1 (OSPAR)	N/a	No data	No data	N/a	No data	No data
Germany (Non OSPAR) 1	N/a	No data	No data	N/a	No data	No data
Netherlands	484	453	456/585	41	47	384/ 35.3
UK	1,257	1,316	1344	1343	1403	134.7

[1]As reported in ICES WGEXT 2005 Annual Report

[2] Includes 26.59 sand-and-gravel extraction area and 8.84 non-aggregate extraction area in 2004 , and 58.46 sand-and- gravel extraction area and 14.62 non aggregate extraction area in 2006, 51.89 sand-and-gravel extraction area and 21.08 non-aggregate extraction area in 2007, 53.89 sand-and-gravel extraction area and 21.08 non-aggregate extraction area in 2008

[3] 90% of material extracted in UK is taken from 46km^2 (2003) and 43km^2 (2004) and 49.2 km^2 (2006) 49.95 (2007)

[4] 90% of material extracted in the Netherlands is taken from 8.3km^2 (2008).

[5] Not all French dredging vessels are fitted with EMS.

[6] In 2008 extraction in Belgium was allowed in zones 1, 2a, 2c and 3a. The area on which effectively extraction occurs is an approximate value, as not all black box data have yet been processed.

WGEXT again noted that this type of information has to be taken from an analysis of electronic monitoring data and this is not a straightforward task to achieve. WGEXT also noted and welcomed the OSPAR request to continue to provide data on sand and gravel extraction. WGEXT also agreed to forward a copy of the final draft of the ICES Cooperative Report to OSPAR EIHA HOD as soon as it becomes available.

4 Review of national marine aggregate extraction activities (ToR b; i)

Two principal types of extraction operations were considered. The first concerns sediment generated by an extraction activity that is assessed and licensed for a specific purpose including those for construction or reclamation purposes. The second was sediment specifically extracted for beach nourishment. The detailed data and information submitted by individual countries can be found in Annex 3, a summary of which is also given in Table 1.

Extractions in 2008 remained fairly similar to those in both 2006 and 2007. The largest total extraction (13 million m^3) was from the Netherlands, followed by total extractions by the United Kingdom (13.0 million m^3). There were also no extractions reported in Finland and Ireland Sweden, Spain, Ireland, or Finland, although, for Sweden, there seems to be growing interest in marine aggregate mining. Extraction in Sweden had stopped in the 1990's and crushed rock has been used to meet aggregate demands. Reserves of marine sand in the Baltic are almost exclusively relic, glacial material with no replenishment and, therefore capable of only limited recovery of adversely impacted spawning grounds for commercially valuable fish species. However, the growing energy cost for the production of crushed rock may require reconsideration of the proper stewardship of marine deposits.

Although in keeping with the previous year's trend the figures show that material destined for beach replenishment accounted for a smaller proportion of the overall take than material destined for the commercial/construction market, as noted last year (2007), the amounts of extractions used for beach nourishment are significant. The United States recovered 3.2 million m^3, the Netherlands 13.0 million m^3, the UK 1.2 million m^3 and Spain 0.6 million m^3. Beach nourishment appears to be attracting an increasing amount of attention. In the Netherlands, for example, experts have speculated a need for perhaps 80 million m^3/year in future. The Second Delta Commission of the Netherland is concerned with marine sand to 2100. With a sea level rise of 18 cm estimates are that 2.8 billion cubic meters will be needed to maintain the Dutch coast and 11 billion cubic meters if a sea level rise of 100 cm should be realized. This could be four times the usual amount. Discussions have even considered advancing the coast by 1 km with an application of about 40 million cubic meters per year. Any sand for renourishment in the Netherlands would need to be extracted from the seabed beyond the 20-meter depth contour. In deciding the costs and benefits, different stretches of the coast would see different priorities, some would have cost as the determining factor, other, would have stewardship; other conflicting uses and still others, the environment. Sweden is also now considering beach nourishment along the south coast where human impacts, coupled with land subsidence and eustatic sea level rise, is beginning to pose a problem. In addition, members of the working group are aware of the serious concerns of Mediterranean countries over potential, adverse economic impacts because of the loss of recreational beaches. In addition to beach nourishment volumes listed in Table 1, members are also aware of nourishment projects being done in Portugal, but no data were available.

France recovered the largest volumes of non-aggregate material (0.5 million m^3); the Netherlands recovered about half that volume of non-aggregates (0.23 million m^3). There have been unconfirmed reports of marine mining for heavy metals (manganese) being done by Russia in the Gulf of Finland, and of marine mining for amber by

Poland. The United Kingdom exported 3.7 million m^3, and 3.3 million m^3 were exported from the Netherlands.

No reports were received from Canada, Estonia, Iceland, Latvia, Poland, Portugal or Russia. Whilst slightly over half of the ICES countries were able to supply data, this is thought to provide a representative assessment of the overall total of material extracted from the member states. The majority of extraction takes place from the North Sea area, with lesser amounts from the ICES part of the Baltic Sea Area, the English Channel the Irish Sea, and North Atlantic. In keeping with the previous year's trend the figures show that material destined for beach replenishment accounts for a significantly smaller proportion of the overall take than material destined for the commercial/construction market.

Professor Cato informed about a special issue of the German Journal; "Sonderheft ZAG" no 2/2004, which deals with the present knowledge of mineral resources of the Baltic Sea. The Swedish contribution to the issue outlines the former production of marine sand and gravel in Sweden and describes the distribution, composition and Quaternary origins of the most important proven marine sand and gravel resources within Swedish territorial water and Exclusive Economical Zone (EEZ). Dr Cato particularly highlighted recently found, huge, sand layers in the Bothnian Bay. The Bay was affected by three glacial stages during the Weichselian. Two sand beds were formed; a lower older glaciofluvial unit deposited directly upon the till bed, which subsequently underwent glaciotectonic deformation as a result of ice movement; and a younger subglacial unit found in pre-eroded channels and depressions in the substratum. The lower sand unit appears in three large deposits. The northernmost and largest of these covers an area of about 200 km^2 and reaches a thickness of about 70 metres. The volume of this layer has roughly been estimated at 8 billion m^3. The upper sand unit is distributed over a larger area but is more scattered compared to the lower sand unit. This upper unit probably has twice as much sand as the lower unit. Up to now, no application for sand extraction has been given in, but the interest for this is expected to increase.

5 Developments in marine resource and habitat mapping (ToR b; ii)

All members attending the meeting reported continuing mapping activity. Although no new maps were published in Belgium in 2008, the Sand Fund advances the effort on a regular basis. Next to that, several projects are ongoing or have been initiated within other institutes, in which several habitat maps are and will be produced. Annex 4 provides some detail concerning web-based access to maps and instructions for obtaining them. Mapping programmes are being undertaken in Finland by the Geological Survey of Finland and the Finnish Inventory Programme for the Underwater Marine Environment, concerning marine geology and marine biotopes and species. Future focus will be in the Exclusive Economic Zone (EEZ) and the eastern part of the Gulf of Finland. Ifremer and SHOM continue to undertake and publish mapping work for France. The entirety of French seawaters will be surveyed during a SHOM project, with tidal zones and coastal waters becoming a priority. Ifremer is also finalizing a study to define and identify areas for sand and gravel extraction. Ireland continues to make progress on completing the INFOMAR programme (formerly Irish National Seabed Survey). This comprehensive programme is being carried out round the entire coast of Ireland under the joint direction of the Geological Survey of Ireland and the Marine Institute. Mapping in the Netherlands is being carried out currently by the Geological Survey of the Netherlands and the Royal Dutch Navy, Hydrographic Office and covers the entire EEZ. During 2008 this covered two spatial scales; local and the Netherlands continental shelf, with future work mapping more offshore regions. AZTI have now surveyed all the inner continental shelf of the Basque region of Spain between five and 100 m depth. During 2009, soft sediment samples will be taken to calibrate the previously collected survey data. The Geological Survey of Sweden is responsible for mapping the Swedish continental shelf area and in 2008 started a new mapping programme of the southern Bothnian Sea. In Sweden mapping has been ongoing for the past nine years Overviews are obtained on a scale of 1:100,000 in one-kilometre corridors with a 13 km gap between corridors. Detailed mapping then includes sediment type, complete side-scan coverage and stratigraphy. Since 1990, 60 elements and 40 organic contaminants have been measured at selected areas of fine-grained sediment accumulation. No coordinated mapping programme takes place in the UK; however, a number of discrete mapping programmes (Regional Environmental Assessments (REA) and Characterisations (REC)) are taking place. No coordinated mapping takes place in the US; however, regional mapping is carried out by the US Geological Survey.

6 Review of developments in national authorization and administrative framework and procedures (ToR b; iii)

The framework for fishery enforcement in the UK has been overhauled. The Marine Management Organization has been established in Newcastle in 2009 and is responsible for fishery management and access. A single set of regulations is being written covering all marine development

A new national extraction decree (Besluit Ontgrondingen Rijkswateren) came into force in the Netherlands in February 2008, which included amendments on the Extraction Law of 1965, which was earlier amended in 1997. A new water management policy, the National Water Pan, was also published in draft form in 2008. Finally, the results of the DELTA Committee were presented in September 2008. In Spain, a new Law of Evaluation of Environmental Impacts of Projects was approved during 2008. The General Directorate of Coasts has also been working on the development of the technical instruction for the Environmental Management of the Marine Extractions to Obtain Sand, due to be published during 2009. The UK is currently introducing legislation concerning the management and access to the marine and coastal environment (The Marine and Coastal Access Bill). In England a new Marine Management Organisation will take on responsibility for regulation of many activities in the marine environment. In Scotland, Marine Scotland has been set up as the Scottish Marine Management Organisation and plans are being discussed for marine management in Wales.

There have been no developments in national marine aggregate administrative and regulatory regimes in Finland, France, Ireland, Sweden or the United States during 2008.

No reports were received from Canada, Estonia, Iceland, Latvia, Norway, Poland, Portugal or Russia.

7 Review scientific programmes and research projects relevant to the assessment of environmental effects of the extraction of marine sediments including the interaction with the cost programme (ToR c)

An update of the 2002 Cefas Guidelines on Aggregate Ecological Assessment for the conduct of benthic studies at marine extraction sites should be available by the end of next year (20089). The revisions will focus on the marine aggregate regulatory process. It will include new developments in survey design, sampling methods, statistical analyses, the use of photography and acoustics. The guidelines will deal with characterization surveys, monitoring and post-development surveys. Recommendations would be applicable to other development as well, such as offshore wind farms, although probably not completely applicable to maintenance dredging which involves repeated disturbances. The Department for the Environment in the UK has also begun a strategic review associated with large-scale development in the marine environment. The sectors for aggregate extraction and wind farms, for example, share common issues. Standards should be coordinated and sector-specific monitoring done in the context of general guidelines. A similar review is being done in the Netherlands in the hopes of combining activity to be economically and scientifically efficient. Possible connections between this initiative and the MESMA project for spatially managed areas were pointed out.

In 2008 a new EIA was accepted and published in Belgium, largely based on the initial EIA of 2004, and expanded with the summary of the 3-yearly workshop on sand and gravel extraction on the Belgian continental shelf, which was organized in October 2008 as a legislative obligation by the three institutes involved (See Annex). The monitoring programmes by these institutes (FSE, MUMM and ILVO) are ongoing on a continuous basis.

Finland reported on ongoing EIAs in the Bay of Bothnia, to be completed in 2009, whilst France commented on the ongoing EIA project in the Baie de Seine, which is due to be completed in 2011. Both of these projects have previously been commented upon during the 2008 ICES WGEXT report. In addition, France has currently undertaking a one-year study measuring the response of international indicators to the differing impacts of extraction activities.

In Ireland various ancillary research projects are ongoing or planned under the INFOMAR programme, some of which will contribute to improved understanding of seabed dynamics, and a technical synthesis document summarizing the outputs of the Irish Sea Marine Aggregates Initiative project has been published.

The Netherlands procedure for EIAs is described in the 2007 WGEXT report. During the past year, two EIAs were approved. In addition, the Netherlands commenced the Building with Nature programme in 2008; a long-term research project aimed at developing new design concepts for the layout and sustainable exploitation of river, coastal and delta areas. The programme will also investigate the use of natural processes in design and management of coastal projects, allowing natural ecosystems and human activities to reinforce each other. The Programme is also carrying out two pilot experiments; Sand Engine and Landscaping for Ecological Enhancement.

In the UK, EIA is the responsibility of the operator; therefore no national EIA programmes are undertaken. However, the Aggregate Levy Sustainability Fund continues to support research into the environmental effects of aggregate extraction, with a

further round of funding approved until March 2011, worth £13.5 million. The UK aggregate industry also continues to fund research. In preparation for a large number of licence and renewal application, the industry have commissioned a series of Regional Environmental Assessments (REAs) to investigate regional scale and in-combination effects of aggregate extraction. The British marine aggregate industry trade association (BMAPA) continues to develop it's sustainable development strategy and BMAPA together with the Crown Estate are currently preparing a 10 year review report to examine the trends and changes in the area of seabed licensed and dredged for marine aggregates in UK waters.

In the United States, continuing research is taking place concerning the possible deflation of shoal features, and the possible adverse effects on the physical and biological environment should the shoal morphology be drastically altered.

No additional research activities took place in Spain, Sweden or the United States during 2008.

No reports were received from Canada, Estonia, Iceland, Latvia, Norway, Poland, Portugal or Russia.

8 Ctd: Cost 638 Maggnet (ToR c)

WGEXT reviewed the preliminary work of the MAGGNET EU COST Action. Details of this program can be found at < www.maggnet.info/show.php?p=231>. WGEXT emphasized the long term and continuing nature of its responsibility for providing considered expert advice to both ICES and OSPAR and recognized the potential added value of the network of researchers with mutual interest in marine aggregates envisaged within MAGGNET, to compliment some areas of the work of WGEXT. MAGGNET will have its next Working Group and Management Committee meeting in Bologna, 4–5 May 2009. The meeting will be hosted by Dr Edi Valpreda (valpreda@enea.it; valpreda@bologna.enea.it) at ENEA Research Centre, Bologna, Italy.

The Marine Strategy Framework was started last year in the EU and ICES working groups are now engaged in interpreting the eleven descriptors specified to indicate the environmental status. Descriptor #6 requires that seabed integrity is kept at a level that ensures that the structure and function of the ecosystem are safeguarded. Because marine aggregate extraction necessarily alters the physical structure of the seabed, guidance in the careful such descriptors is needed.

WGEXT discussed the implications of the EU Marine Strategy Framework Directive with regard to the extraction of marine sediment. Of the MSFD descriptors ICES have been requested to advise upon, the following are considered of relevance to the work of WGEXT.

a) Sea floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.

b) Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

WGEXT suggest that direct changes to the function and structure of ecosystems, particularly physical parameters, will occur as a result of the extraction of marine sediments. However, the group are content that provided rigorous environmental assessment of each proposal to extract sediment is undertaken, taking account of the 2003 ICES WGEXT recommendations including appropriate extraction site location, mitigation and monitoring programmes are implemented, these impacts can be considered to be within environmentally acceptable limits and therefore not adverse. WGEXT suggest that in defining “adverse” it should be accepted that direct changes from this sector will result. Defining “adverse” as being no environmental change from existing (pre-dredge) conditions would, in the opinion of the group, be inappropriate and detrimental to the continued ability of member countries to extract marine sediments from their seabed.

9 Status of the Cooperative Research Report and preliminary scoping for the next Cooperative Research Report (ToR d)

The report titled "Effects of Extraction of Marine Sediments on the Marine Ecosystem" will be published in June, 2009 in the *ICES Cooperative Research Report* series. The estimated number of pages is 150. The next Cooperative Research Report will cover the period 2005 to 2009. The group is aiming to submit the final version to ICES within 6 months of the annual meeting in April 2011.

Chapter 1. Gerry Sutton.

Chapter 2. Mark Russell (Chris Dijkshoorn, Carlos Hernandez)

Chapter 3. Ingemar Cato (Henry Bokuniewicz, Ad Stolk)

Chapter 4. David Carlin (Kris Hostens, Simone Pfeifer, Jouko Rissanen, Michel Desprez)

Chapter 5. Ad Stolk (Gerry Sutton, Brigitte Lauwaert, David Carlin)

Chapter 6 Gerry Sutton

Chapter 7 Carlos Hernandez

10 Review and evaluate the use and application of the ICES WGEXT 2003 guidelines across member countries (ToR e)

Most WGEXT countries present at the 2008 annual meeting reported using the WGEXT guidelines as a checklist to assess the quality of EIA's submitted in support of applications to extract marine aggregates or include them in guidance for the production of EIAs.

In 2009, WGEXT reviewed the 2003 Guidelines on the occasion of their fifth anniversary, in light of the past five years' experience in the member countries. Suggested revisions to the text are documented in Annex 10.

The group felt more complete information was required to allow them to comment with authority in relation to the application of the ICES guidelines across member countries. To this end it was agreed to solicit further information by means of a template, a copy of which is attached (Annex 11).

11 Consider the scope and implementation of monitoring programmes instigated in relation to marine sediment extraction activities (ToR f)

There was discussion of the use of Electronic Monitoring Systems (EMSs, also known as "black boxes") in marine extractions. In the UK, EMSs have been mandatory since 1993 and upgraded in 2006. Although the regulations were initiated by the Crown Estate in the UK regulation is now under the authority of the Marine and Fisheries Agency (MFA) and the Welsh Assembly Government (WAG). Data is submitted weekly and monthly. Cefas analysed these data, flags outliers, and interprets the results in terms of dredge activity, such as ballasting, maintenance, extraction, etc., but MFA and WAG are responsible for any enforcement. Operators are requested to report on any extenuating circumstances that may be relevant to recorded violations or illegal dredging. Information is binned as high risk, medium risk, or low risk according to a matrix of parameters like vessel speed, duration, GPS spikes etc. A system is now being developed to use the EMS data in a GIS so that additional information on bathymetry, fish-spawning areas, conservation areas, etc. can be mapped simultaneously.

Equipment and sensors have not been standardized. The Netherlands, Denmark, and Belgium do have the same standards but only because all the instruments are supplied by a single company. Otherwise, there is no mandatory standardization among ICES countries using EMS. In Spain, for example, small, simple GPS and data logger is used and data transferred by modem; this system has the advantage of being inexpensive (4740 euro). Such standardization would be desirable; however, it may be impossible to come up with one system because various commercial units are already in use. However, data format, parameters, units etc. might be standardized to some advantage. In addition, the exchange of data might be encouraged among countries.

To further investigate the applications of EMSs, WGEXT developed a template to collect information on usage (Annex 6), such as what parameters are recorded, who can view the data, whether or not penalties are imposed for violation, and who pays for the equipment.

In the Netherlands, the extraction of marine sand for Maasvlakte 2 (enlargement of Rotterdam Harbour) started in September 2008. The monitoring programme for the extraction of about 300 million m^3 sand will be carried out as described in brief in the Annual Report 2008. It is expected that in the first results can be presented in WGEXT's Annual Report of 2009. In addition, an EIA FOR EXTRACTION OF MARINE SAND FOR COASTAL NOURISHMENT FOR THE YEARS 2008–2012.

EIA for extraction of marine sand for coastal nourishment, for commercial fill on land and for industrial use has been prepared for the years 2008–2017. An important element of the EIA's a monitoring and evaluation programme is the measurements of overflow and its effects on benthos. Disturbance of birds by extraction activities are also studied, and monitoring of underwater noise in relation to marine mammals is planned. An effort is made to combine the measurement and analyses for the several monitoring programmes to learn from each other and to avoid double work.

12 Draft Council Resolution

12.1 Future meeting of WGEXT

2009/2/SSGHIExx. The **Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem** (WGEXT), chaired by Gerry Sutton, Ireland, will meet in Djuronaset, Sweden, 20–23 April 2010:

a) provide a summary of data on marine sediment extraction for the OSPAR region that seeks to fulfil the requirements of the OSPAR request for extraction data to be provided by ICES and take into account any feedback or comments from OSPAR on the information submitted by WGEXT 2009;

b) review data on (b.1)marine extraction activities, (b.2) developments in marine resource and habitat mapping taking into account some of the outputs of the ICES WGMHM as appropriate, (b3) information on changes to the legal regime (and associated environmental impact assessment requirements) governing marine aggregate extraction including a review of the use of the use of black boxes by member countries;

c) review and report on scientific programmes and research projects relevant to the assessment of environmental effects of the extraction of marine sediments including interaction with the COST programme;

d) continue to review, evaluate and report on the scope and implementation of monitoring programmes instigated in relation to marine sediment extraction activities.

e) continue work on a new *Cooperative Research Report* to cover the period 2005 to 2009 with a view to producing a final draft within six months of the (2011) WGEXT annual meeting;

f) continue to review and evaluate the use and application of the ICES WGEXT 2003 Guidelines across member countries and formulate a draft resolution to ICES regarding the adoption by OSPAR of an amended version of the guidelines;

g) review the outputs from other relevant ICES working groups relevant to the work of WGEXT;

h) election of a Chair of the WGEXT

It was provisionally agreed that the 2011 meeting would be held in the Netherlands anticipating progress of Maasvlakte 2.

Supporting Information

Priority	Current activities are concerned with developing the understanding necessary to ensure that marine sand and gravel extraction is managed in a sustainable manner, and that any ecosystem (and fishery) effects of this activity are better understood so that mitigative measures can be adopted where appropriate. These activities are considered to have a very high priority.
Scientific Justification	(a) This work responds to a request from OSPAR to gather data for the entire OSPAR region on aggregate extraction activities. This information is to be provided and collated in advance of the meeting and reviewed in relation to item (b). We aim to seek the support of existing WGEXT members and participants in an attempt to improve and extend reporting of national data to WGEXT in order

	to satisfy the OSPAR request. (b) and (c) An increasing number of ICES Member Countries undertake sand and gravel extraction activities and others are looking at the potential for future exploitation. Each year relevant developments under these headings are reviewed and summarized. This provides a useful forum for information exchange and discussion. National reports are submitted electronically prior to the meeting. National Reports should be submitted, using the new reporting templates, no later than 16 March 2010. Information on the use of black boxes is now also being considered in recognition of the value that these data has for understanding the true extent and intensity of dredging activities at a high spatial and temporal resolution. (d) An increasing amount of monitoring activity takes place in connection with licensed aggregate extraction across ICES Member Countries. There is considerable variation in the scope and outcomes of this. WGEXT will continue to consider the scientific robustness and rationale behind the design, implementation and effectiveness of monitoring programmes and activities. (e) To synthesis and present in a useful and digestible form scientific advances and examples of best practice that have mainly accrued via the annual meeting reporting process, so that they can be available to inform practice, policy and broader research agendas, and stimulate further relevant scientific research. (f) WGEXT will continue to review the 2003 WGEXT Guidelines to ensure they remain fit for purpose across member countries and take account of developments in the underpinning science. A number of potential amendments were considered that would improve currency and precision of the guidelines in relation to present scientific and overarching statutory contexts. (g) WGEXT will benefit from scientific advances that are being made by other relevant working groups, and can also scope opportunities for cross fertilization and avoid duplication. (h).The current Chair has served a full 3year term.
Relation to Strategic Plan	
Resource Requirements	Most countries collect data and information routinely on aggregate extraction activities. The additional work in presenting these data in a standardized form for the new electronic template is considered small, but in the long-term should result in a reduction in effort. Reviews of research activity are of programmes that are already underway and have resources committed.
Participants	WGEXT is normally attended by 20–25 members and guests.
Secretariat Facilities	-TBC
Financial	No additional financial implications
Linkages to Advisory Committees	ACOM.
Linkages to other Committees or Groups	SCICOM, BEWG, WGMHM, SSGHIE, Science Strategic Initiative on the Coastal Zone
Linkages to other Organisations	Work is of direct interest to OSPAR and HELCOM.

WGEXT will report by 30 June 2010 for the attention of SCICOM and SSGHIE.

13 Close of meeting and adoption of the report

The group adopted the draft report pending addition of agreed material (e.g. an executive summary), and the meeting was formally closed by the Chair Mr Gerry Sutton. He thanked members of WGEXT for attending and again offered thanks to Dr Bokuniewicz and the School of Marine and Atmospheric Sciences. The group also expressed their gratitude to Mr Gerry Sutton for successfully chairing his third ICES WGEXT meeting.

Annex 1: WGEXT List of Participants

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Annex 2: Agenda

THE ICES WORKING GROUP ON THE EFFECTS OF EXTRACTION OF MARINE SEDIMENTS ON THE MARINE ECOSYSTEM (WGEXT)

Tuesday14 April 2009	
09.00 – 09.30	
09.30 – 09.50	Welcome by representative(s) NY Port Authority/US Army Corps of Engineers
	Welcome by WGEXT Chair
	Terms of Reference (see ICES Res. attached)
	Adoption of Agenda (allocate teams/individuals to action items)
10.30 – 10.45	Coffee
11:00-	Terms of reference item (a) – please supply material on disk/e-mail to HB
	Terms of reference item (a) Summary of Extraction Statistics-OSPAR
12.30 – 13.15	Lunch
13.30– 15.00	Complete Terms of reference item (a)
15.00 – 15.15	Coffee
15.15 – 18.00	Terms of reference (b) Review of Activities
	Aim to complete (a) and begin (b) by the end of day 1 (NB gives opportunity to send in any further requests for outstanding data/information
Wednesday 15 April	
09.00 – 10.30	Terms of reference item (b) please supply material on disk/e-mail to HB
10.30 – 10.45	Coffee
10.45 – 12.00	Complete Terms of Reference item (b)
12.00 – 12.45	Lunch
13:30–15.00	Continue TOR item (d)
15.00–15.15	Coffee
15.15–18.00	TOR (e) and (f)
	Aim to complete (b), by the end of day 2
Thursday 16 April	
09.00 – 10.30	Terms of Reference item (c) Research including Maggnet
10.30– 10.45	Coffee
10.45 – 12.45	Terms of Reference item (d)
12.45 – 1800	Field Trip
Evening	Group Meal
Friday 17 April	
09.00 – 10.30	TOR (g) Monitoring with special reference to Maasvlakte 2 Project
10.30 – 10.45	Coffee
10.45 – 12.30	Complete outstanding action items and Recommendations for follow-up work Agree initial text of Working Group Annual Report for 2008.
12:30 – 13:00	Lunch and Close

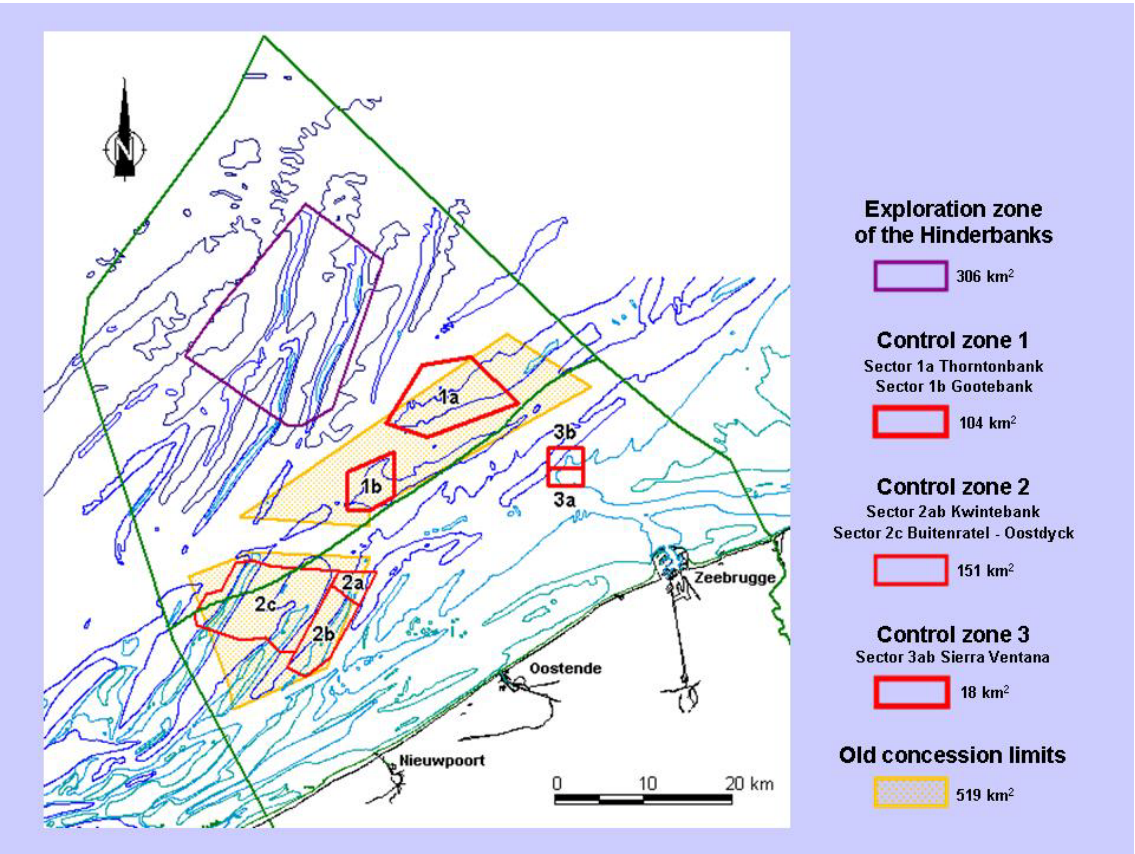
Annex 3: Review of national marine aggregate extraction activities

A detailed breakdown of each country's sediment extraction dredging activities is provided below:

3.1 Belgium

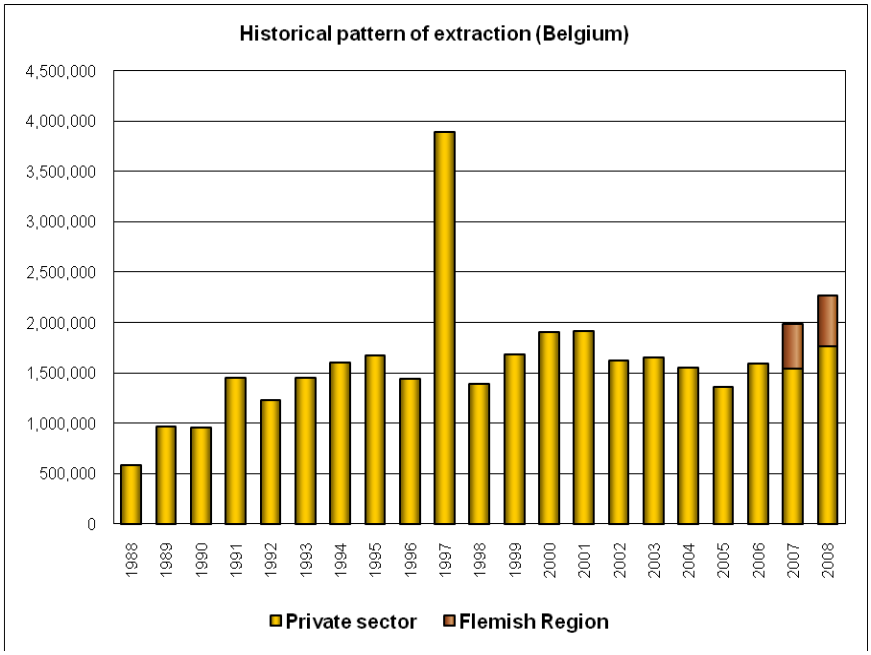
In Belgium the sectors of the Belgian continental Shelf where sand can be extracted are defined and limited by law. In 2008 extraction was granted in sectors 1a, 1b, 2a, 2c and 3a (see map). However, no real extraction took place in 3a, which limits the extraction to zones 1 and 2. Sector 2b is still closed for extraction as was reported in previous years; sector 3b is closed since in that sector dumping of dredged material is still taking place; sector 4 is still in exploration status.

In 2008, 1 750 257 m³ sand and 11 197 m³ gravel was extracted from sectors 1 and 2 by twelve private license holders. This sand is mainly used for industrial purposes. Two licenses were also granted to the Flemish Region, although in 2008 only Afdeling Kust was extracting. The licenses for the Flemish Region have the same conditions (reporting, black-boxes, etc.) as licenses for the private sector with the exception that they are exempted from the fee system. The Flemish Region extracted 506 931 m³ sand, which was used solely for beach nourishment.



Map of permitted extraction areas on the Belgian continental shelf.

The chart below gives a historical pattern of sand extraction on the Belgian continental shelf since 1988. It should be mentioned that extraction started in 1976 and data are available since then. From 2007 onwards the quantities extracted by the Flemish Region are included in the graph. For clarity these quantities have been put in another colour.



The total amount of > 2.2 Mm³ sand (and gravel) extracted in 2008 from the Belgian continental shelf is an increase of 19.5% compared to 2007. Of this volume 65% was allocated for the Belgian market, 22% for coastal defence and 13% was exported to foreign markets (57% to France, 43% to the Netherlands and 0.5% to the United Kingdom).

Almost 94% of the sand allocated to Belgian market was landed in the coastal harbours of Brugge (including the harbour of Zeebrügge), Oostende and Nieuwpoort in West Vlaanderen. The remaining 6% was transported via the Schelde and different canals and landed in Antwerp (2%), Limburg (2%), Oost-Vlaanderen (1%), other parts of West-Vlaanderen (1%) and very small amounts in Vlaams Brabant.

The total area of the sectors where extraction was allowed in 2008 together comprised ca. 230 km². Although not all black box data are processed yet, it can be estimated that most of the sand is extracted from some 100 km². Most of the sand extracted in 2008 came from the Buitenratel in sector 2c (61%), whereas the importance of Kwintebank (sector 2a) and the Oostdyck dropped to 21% and 3% respectively. Also, the importance of the Thorntonbank (sector 1a) further increased to almost 15%.

3.2 Denmark

3.3 Finland. No dredging took place in Finland in 2008.

Table 3.3.1. Historical patterns of marine aggregate extraction (m^3).

EXTRACTION AREA	'96	'97	'98	'99	00	01	02	03	04	05	06	07	08	TOTAL 1996–2006
Gulf of Finland	0	0	0	0	0	0	0	0	1,600,000	2,388,000	2,196,707	0	0	6,184,707

Description of historical extraction activities for 1995–2008

Sand and gravel extraction from Finnish coastal areas between 1996 and 2004 was negligible. The Port of Helsinki extracted 1.6 million m3 off Helsinki (Gulf of Finland) in 2004, 2.4 million m3 in 2005 and 2.2 million m3 in 2006. There were no sand extractions in 2007 or 2008

a) Summary of current licence position and forecasts for future exploitation of marine aggregates

Loviisa Area, eastern part of Gulf of Finland

A permission to extract 8 million m^3 of marine sand from the Loviisa-Mustasaari area was accepted in April 2007 by the Environment Permit Authority to Morenia, Metsähallitus. However there was a complaint against the decision and the case was under hearing of Administrative Court of Vaasa. The decision on 31.12.2008 was favourable for the extraction.

Pori Area, Bothnian Sea

EIA in the Pori area was completed in 2007 by Morenia, Metsähallitus, but the EIA authority required additions to the assessment. These additions are now included to the EIA. The extraction plan was sent to Environment Permit Authority on 7.1.2009.

Bay of Bothnia

Morenia, Metsähallitus has selected four areas in the Bay of Bothnia where EIAs has now been started aiming to exploitation of marine sand resources: Suurhiekka-Pitkämatala (Ii and Simo municipalities), Merikallat (Hailuoto), Tauvo (Siikajoki and Raahe) and Yppäri (Pyhäjoki) http://www.morenia.fi/binary.aspx?Section=239&Item=209 . The EIA procedures will be completed during 2009.

3.4 France

Table 3.4.1. Marine aggregate (sand and gravel) extraction figures for 2007/2008

DREDGING AREA	AMOUNT *
Channel	1,202,588 m^3
Atlantic	5,969,000 m^3
Brittany	340,000 m^3

These Figures are not extracted quantities but quotas ones (maximum permitted).

Table 3.4.2. Non-aggregate (e.g. shell, maerl, boulders etc) extraction figures for 2007/2008.

DREDGING AREA	MATERIAL	AMOUNT *
Brittany	Maerl	265,000 m^3
Brittany	Shelly sand	231,500 m^3

These Figures are not extracted quantities but quotas ones (maximum permitted).

b) There were no exports of marine aggregate from France in 2008.

Table 3.4.3. Amount of material extracted for beach replenishment projects in 2007/2008.

DREDGING AREA	MATERIAL	AMOUNT *
Mediterranean Sea	Sand	1,070,000 m^3

Table 3.4.4. Historical patterns of marine aggregate extraction.

DREDGING AREA	NAME	EXTRACTED VOLUMES (m^3)								
		2000	2001	2002	2003	2004	2005	2006	2007	2008
Atantic	Le Pilier	2124326	2271760	2092038	2163848	2491514	2465909	2358107	2466751	2267000
	Les Charpentiers	149851	199041	1500000	1500000	1500000	1500000	1500000	1500000	1500000
	Sables d'Olonne	No extraction		2349	No extraction	3387	330000	330000	330000	330000
	Chassiron B	Non permitted			330000	330000	330000	330000	330000	330000
	Chassiron C	330000	330000	330000	330000	330000	330000	330000	330000	330000
	Chassiron D	Non permitted			330000	330000	330000	330000	330000	330000
	Chassiron E	Non permitted							482000	482000
	Platin de Grave	117000	143000	174000	103000	400000	400000	400000	400000	400000
Channel	Graves-de-l'estuaire	330000	330000	330000	330000	330000	330000	330000	330000	330000
	Granulats Marins de Dieppe (Graves-de-mer)	179575	193673	167690	314857	161477	165850	347828	471200	470588
	Griz Nez	64287	51266	36260	35746	39388	72000	72000	72000	72000
	Baie de Seine	Non permitted					330000	330000	330000	330000
Brittany	Golfe de Saint-Malo	No extraction								
	Ilot Saint-Michel	78081	76360	76644	75553	76680	68364	56780	75048	74955
	Lost Pic	130000	129625	130598	131346	123654	124077	60300	130515	129329
	Phare de la Croix	15100	12500	11300	12700	11500	11500	11750	12308	10461.5
	La Horaine	76150	68600	86205	75450	76590	71154	76754	75261.5	76558
	La Cormorandière	19066	21454	22322	16067	24370	22259	16126	18885	15308
	Le Paon	No extraction								
	Jaudy		18580	9370	7500	7900	9200	11100		0
	Beg an Fry		15308	22111.5	22231	34446	31400	6440	20100	0
	Les Duons	23031	19825	25465	27801	20271	28940	10732	20913	22807
	Le Petit Minou		21808	21496	19315	22275	19300	22700	2272	20450
	Le Grand Minou									
	Kafarnao	7700	12100	7300	8500	5249	6900	6100	4140	1292
	Les Pourceaux		8050	1700	6385	3000	2600	600	0	300
	Les Glénan	87000	80710	67000	63000	55195	52000	46140	35700	39900
	Aber Benoît	21600	17058				No extraction			
	Aber Ildut	No extraction								
	Plateau des Fourches		1230	667	1500	1000	667	500	0	0
		3752767	4021948	5114515.5	5904799	6377896	7032120	6983957	7767093.5	7562948.5
								TOTAL 2000-2008 :		54 518 045

in red Quotas data, *Amount in m^3*

c) Summary of current licence position and forecasts for future exploitation of marine aggregates

Eleven applications (2 for exploration, 6 on actual extraction area for a new extraction perimeter, 3 on new extraction perimeter) for aggregate extraction are being considered by Environment Ministry (MEEDDAT) and 33 licences (30 for extraction and 3 for exploration) have been issued by local administration (Préfectures).

3.5 Germany: No data

3.6 Ireland: No Extraction in 2008

3.7 The Netherlands

Table 3.7.1. Marine aggregate (sand) extraction figures for 2008.

DREDGING AREA	AMOUNT Mm³
Euro-/Maas access-channel to Rotterdam	1,935,886
IJ-access-channel to Amsterdam	0
Dutch continental shelf	24,424,488
Total	26,360,374

Most of reported quantities are in m3. If reported in tonnes, 1 T = 0.667 m3

Table 3.7.2. Non-aggregate (e.g. shell) extraction figures for 2008.

DREDGING AREA	MATERIAL	AMOUNT m³
Wadden Sea	Shells	64,914
Wadden Sea inlets	Shells	54,686
Western Scheldt	Shells	2,880
Voordelta of the North Sea	Shells	24,930
North Sea	Shells	83,145

Description of non-aggregate extraction activities in 2008:

On basis of the Second National Policy Note and EIA for shell extraction (31 august 2004) there are maximum permissible amounts defined from 2005 until 2008

These permissible amounts (in m³) of shells to be extracted yearly from:

- the Wadden Sea max. 90,000
- (but no more than 50% of the total quantity (The Wadden Sea and Sea Inlets)
- the Sea Inlets between the isles until a distance of 3 miles offshore 110,000 in 2005; 100,000 in 2006 and 90,000 in 2007 up to 2010
- the Voordelta 40,000
- the Western Scheldt 40,000
- the rest of the North Sea until a distance of 50 km offshore unlimited.

DESTINATION/(LANDING)	AMOUNT (M3)*
Belgium	3,300,000
Luxembourg	12,000

*** Approximate figures**

Table 3.7.3. Exports of marine aggregate in 2008.

There is a continuous flow of sand extracted out of the extraction areas in the southern part of the Dutch sector of the North Sea, used for landfill and for concrete and building industries.

DREDGING AREA	MATERIAL	AMOUNT IN MM3
P18F (coast of Zuid-Holland)	sand	1,531
S7U (coast of Zeeland)	sand	0,480
ROOMPOT/HOMPELS (coast of Zeeland)	sand	0,956
S8E (coast of Zeeland)	sand	2,876
Q10G (coast of Noord-Holland)	sand	1,740
Q5F (coast of Noord-Holland)	sand	4,336
Q5G (coast of Noord-Holland)	sand	1,035
Q5D (coast of Noord-Holland)	sand	0,042
Q5C'-noord (coast of Noord-Holland)	sand	0,005
Total	sand	13,001

Amount of material extracted for beach replenishment projects in 2008.

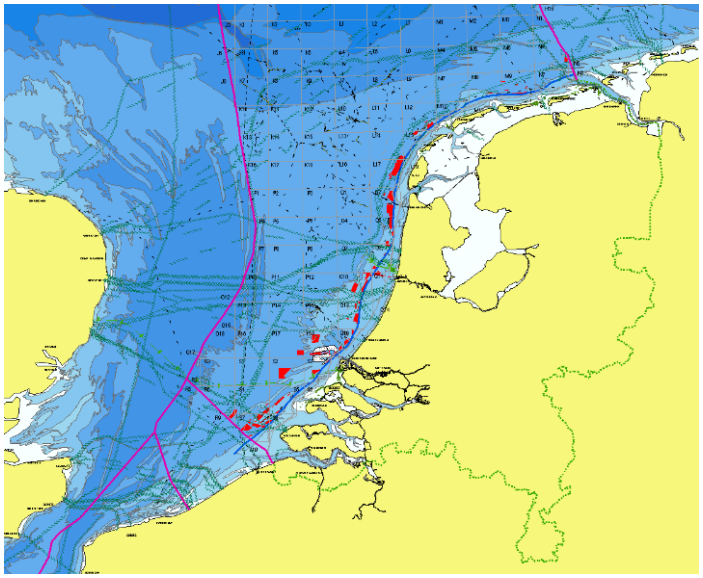


Figure 3.7.1. Licensed sand-extraction areas march 2007.

Table 3.7.4. Historical patterns of marine aggregate extraction in Mm³.

Extraction Area	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Euro-/Maas channel	1,36	6,83	10,32	3,90	2,94	1,23	2,32	0,49	0,65	1,94	31.94
IJ-channel	5,06	4,78	2,31	1,41	0,87	1,06	4,31	0	0	0	19.8
Dutch Continental Shelf	15,99	13,82	23,81	28,53	20,07	21,31	22,13	22,88	28,25	24,53	221.32
Total extracted	**22,41**	**25,43**	**36,44**	**33,84**	**23,88**	**23,59**	**28,76**	**23,37**	**28,90**	**26,47**	**273.06**

Table 3.7.5. Dutch sand extraction 1974–2008.

YEAR	TOTAL EXTRACTED M3
1974	2.787.962
1975	2.230.8891974
1976	1.902.409
1977	757.130
1978	3.353.468
1979	2.709.703
1980	2.864.907
1981	2.372.337
1982	1.456.748
1983	2.252.118
1984	2.666.949
1985	2.724.057
1986	1.955.491
1987	4.346.131
1988	6.954.216
1989	8.426.896
1990	13.356.764
1991	12.769.685
1992	14.795.025
1993	13.019.441
1994	13.554.273
1995	16.832.471
1996	23.149.633
1997	22.751.152
1998	22.506.588
1999	22.396.786
2000	25.419.842
2001	36.445.624
2002	33.834.478
2003	23.887.937
2004	23.589.846
2005	28.757.673
2006	23.366.410
2007	28.790.954
2008	26.360.374

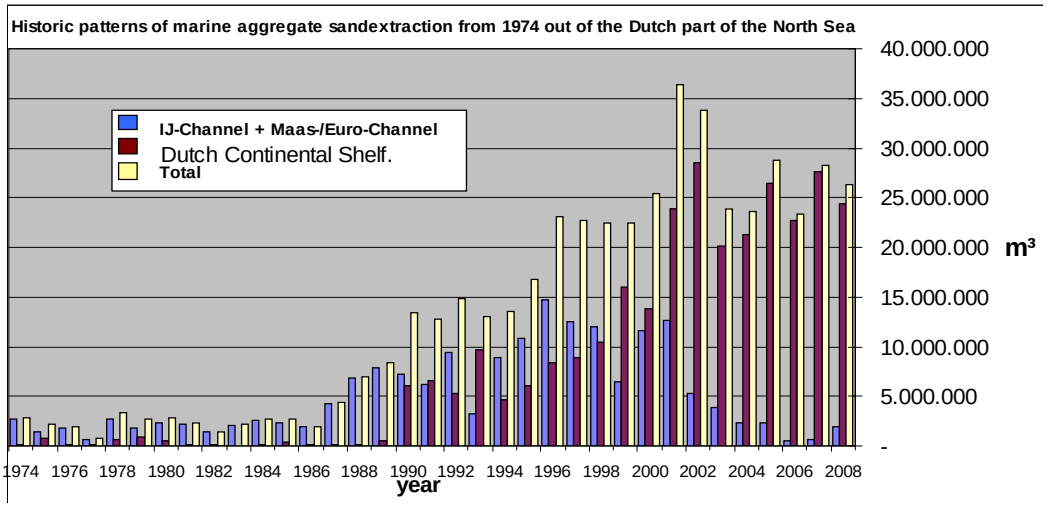


Figure 3.7.2. Historical patterns of marine aggregate extraction in the Netherlands.

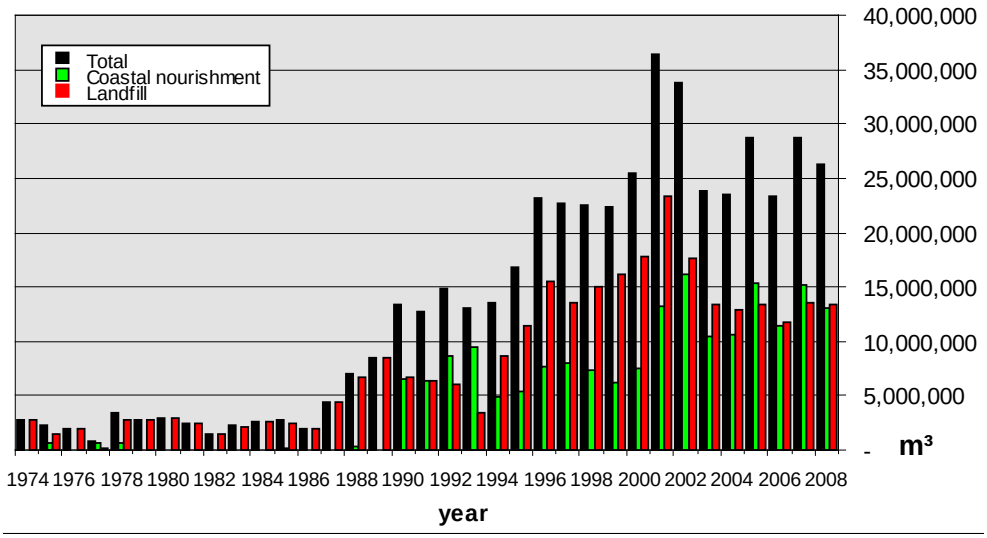


Figure 3.7.3. Historical patterns of marine sand extraction from 1974 from the Dutch part of the North Sea used for Landfill and Coastal nourishment.

Table 3.7.6. Licences considered and issued licences Rijkswaterstaat North Sea.

IN THE YEAR:	AMOUNT
1998	35
1999	*30*
2000	*25*
2001	*25*
2002	*42*
2003	*26*
2004	*20*
2005	*33*
2006	*33*
2007	*24*
2008	*38*

3.8 Norway

Table 3.8.1. Marine aggregate (sand and gravel) extraction figures for 2007/2008.

DREDGING AREA	AMOUNT
Selected deltas in North Norway	Estimated to be few thousand m3, but unreported

Sporadic extraction of sand and gravel from a few deltas in North Norway.

Non-aggregate (e.g. shell, maerl, boulders etc) extraction figures for 2007/2008.

DREDGING AREA	MATERIAL	AMOUNT *
West coast of Norway	Carbonate (shell) sand	A few thousand m^3

Description of non-aggregate extraction activities in 2008

Only in areas licensed for shell sand extraction. Organized by the counties (fylke), but no central reporting.

COUNTRY	LICENSED AREA	AREA IN WHICH EXTRACTION ACTIVITIES OCCUR	AREA IN WHICH OVER 90% OF EXTRACTED MATERIAL IS TAKEN
The Netherlands (data 2008)	585 km^2	35.3 km^2	8.3 km^2
Country	Licensed Area	Area in which extraction activities occur	Area in which over 90%of extracted material is taken
The Netherlands (data 2008)	585 km^2	35.3 km^2	8.3 km^2

Exports of marine aggregate in 2007/2008: None

Amount of material extracted for beach replenishment projects in 2007/2008: None

Shell sand extraction from small areas between the outermost islands and skerries, and marine sand and gravel extraction from deltas has occurred over several years, but only a few thousand m^3/year are extracted.

Spain

No extraction on Atlantic coasts.

3.9 Sweden

No extraction has taken place during 2008. SWEDEN

Extraction of sediment to be used to expand the port in Trelleborg, southern Sweden

Trelleborg's port in southern Sweden intends to expand the port to meet future capacity and environmental requirements. An application has been given in to the Authority. Expansion will take place in two stages. Phase 1 includes construction of new breakwaters and deepening of parts of the new port area in combination with filling up other parts of the port. Stage 2 includes the continued deepening and filling of new port plan. Contaminated surface sediment will be placed on land for dewatering in purpose-built special basins. During Phase 1 it is estimated that 990 000 tfm3 (theoretically solid cubic meters) will be dredged, these included 13 000 tfm3 on public water. During phase 2 it is expected that 440 000 tfm3 will be dredged away, these are approximately 57 000 tfm3 on public water. For the volumes extracted from public water the state takes charge if the volumes will be of use, i.e. in this case for the filling of new port plans.

3.10 United Kingdom

Table3.10.1: Marine aggregate (sand and gravel) extraction figures for 2008 from The Crown Estate ownership ***(Includes aggregate and material for beach replenishment and fill contract)***

DREDGING AREA	AMOUNT (TONNES)
Humber	3,604,058
East Coast	6,759,354
Thames Estuary	2,384,473
East English Channel	2,443,367
South Coast	4,150,040
South West	1,470,719
North West	640,395
Rivers and Miscellaneous	87,787
TOTAL	**21,540,193**

Extraction tonnages for fill contracts and beach replenishment were as follows:

Contract Fill	207,506 tonnes
Beach Replenishment	1,998,123 tonnes

There was no non-aggregate (e.g. shell, maerl, boulders etc.) extraction during 2008 from The Crown Estate ownership.

Table 3.10.2. Exports of marine aggregate in 2008 from The Crown Estate ownership.

PORT (LANDING)	AMOUNT (TONNES)
Amsterdam	1,814,050
Antwerp	512,671
Brugge	423,207
Calais	101,988
Dunkirk	303,924
Fecamp	9,662
Flushing	1,261,544
Gent	34,203
Harlingen	253,546
Honfleur	116,023
Ostend	576,697
Rotterdam	466,364
Zeebrügge	337,824
TOTAL	6,211,703

Table 3.10.3. Amount of material extracted for beach replenishment projects in 2008 from The Crown Estate ownership.

DREDGING AREA	AMOUNT (TONNES)
Bournemouth	121,814
Bulverhythe	8,648
Felixstowe	319,554
Happisburgh	683,455
Hayling Island	41,825
Jaywick	329,778
Lincshore	449,988
Pevensey	17,060
Seaford	16,751
Selsey	9,250
TOTAL	**1,998,123**

Table 3.10.4. Historical patterns of marine aggregate extraction (tonnes) from The Crown Estate ownership.

(Figures exclude beach replenishment and fill contracts)

Extraction Area	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Humber	2,351,233	2,694,977	2,840,261	3,122,080	2,933,623	2,710,881	2,928,366	3,031,699	3,392,015	3,521,737	3,184,814	3,154,070	**34,615,364**
East Coast	9,397,705	8,923,562	9,131,512	9,129,635	9,636,697	9,011,323	8,611,199	8,538,073	7,881,670	8,006,736	7,715,428	6,075,899	**105,290,460**
Thames Estuary	1,125,921	862,834	971,960	854,483	909,141	1,291,103	838,185	758,257	696,012	899,852	977,027	1,735,141	**11,300,372**
East English Channel	1,636,930	2,180,099	1,958,476	1,387,450	875,030	1,163,892	1,212,951	457,102	474,553	323,824	1,961,035	2,443,367	**15,133,090**
South Coast	3,096,895	3,641,602	3,926,856	4,226,088	4,752,978	4,235,188	4,445,311	4,691,857	4,914,793	5,127,989	4,752,843	3,934,692	**51,049,053**
South West	2,048,014	1,886,289	1,719,803	1,602,394	1,549,431	1,467,122	1,515,241	1,633,383	1,591,610	1,545,275	1,769,197	1,470,719	**20,347,064**
North West	284,497	275,590	355,044	316,090	421,068	482,270	470,962	558,398	611,983	608,314	652,303	432,889	**5,323,770**
Rivers and Misc	18,587	6,238	6,273	46,120	73,047	78,597	85,153	99,079	124,506	111,687	109,399	87,787	**780,470**
Yearly Total	**19,959,782**	**20,471,191**	**20,910,185**	**20,684,340**	**21,151,015**	**20,440,376**	**20,107,368**	**19,767,848**	**19,687,142**	**20,145,414**	**21,122,046**	**19,336,572**	**243,839,643**

Table 3.10.5. Summary of current licence position and forecasts for future exploitation of marine aggregates (01/09/08) within The Crown Estate ownership.

TYPE	STATUS	NO.	AMOUNT (TONNES)
Licences	Extraction licences	78	120 million (proven primary reserve aggregate (i))
	Licence awaiting permission to commence	6	(ii) Not available
Applications	New applications	24	(ii) Not available
	Renewal applications	15	(ii) Not available
Prospecting	Prospecting licences (pre-application)	18	(ii) Not available

(i) Primary reserve in South West and North West is sand.

(ii) Tonnage not available due to a new standard method of measurement.

3.11 United States of America

Marine aggregate (sand and gravel) extraction figures for_2008

DREDGING AREA	AMOUNT
New York Harbour	0.982 million m^3 (construction aggregate)
	2.622 million m^3 (cap material)

Description of aggregate extraction activities in 2008 (please add text to supplement table (a) as necessary).

Construction aggregate was recovered by Amboy Aggregates of South Amboy, New Jersey. They have held a license to dredge aggregates since 1985 from the Ambrose Channel, the entrance to New York Harbour. Amboy Aggregates is the only East coast aggregate producer to mine sand from the seabed. The company uses the *Sandy Hook*, a 7,500-ton capacity, trailing suction hopper dredge and is the largest supplier of aggregates to the New York City area. No other vessel of this type operates in the US Mining operations are performed pursuant to permits granted to Amboy by the federal government and the states of New York and New Jersey. Sand is dredged from the outer reaches of the main shipping channel into New York Harbour (the Ambrose Channel), washed and mixed with crush stone, if needed, at a shore side facility.

In 2008, an additional 4.068 million m^3 mixed sand and clay was dredged from the Ambrose Channel as part of a larger project to deepen NY Harbour and from other navigation channels in New York Harbour. 2.622 million m^3 of this material was used to cap an open-water disposal site, six miles offshore referred to as the HARS site. In addition, 19,114 m^3 of rock was extracted and used in the construction of an artificial fishing reef.

Non-aggregate (e.g. shell, maerl, boulders etc) extraction figures for 2008

DREDGING AREA	MATERIAL	AMOUNT
NY Harbour	Rock	19,114 m^3

Exports of marine aggregate in 2008. None.

Amount of material extracted for beach replenishment projects in 2007

DREDGING AREA	MATERIAL	AMOUNT *
Ocean City, NJ	sand	688,726 m^3
Avalon, NJ	sand	172,023 m^3
Cape May, NJ	sand	246,950 m^3
Long Island, NY		
Point Lookout	sand	477,714 m^3
Westhampton	sand	479,373 m^3
Fire Island	sand	558,122 m^3
Long Beach	sand	535,185 m^3
Ocean City, MD	sand	87,923 m^3

Description of beach replenishment schemes in 2008

Altogether 3,246, 016 m^3 were used for beach nourishment in the region.

The majority of beach dredging operations take place in State waters, within the 3-mile territorial jurisdiction, although that is changing as resources in State waters are being depleted. Beach nourishment is the preferred method of coastal protection in the US mainly because it preserves the aesthetic and recreational values of protected beaches by replicating the protective characteristics of natural beach and dune systems.

The amounts tabulated above are for the north US Atlantic coast only (north of 38 degrees 27 minutes N, the starting point of the Mason-Dixon Line). Major renourishment projects continue in New York and south especially along the New Jersey shoreline.

Historical patterns of marine aggregate extraction — Excluding beach nourishment (millions of cubic meters)

Extraction Area	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
NE. Atl	0.2	0.8	0.8	1.5	1.7	1.4	c1.4	c1.4	c.1.3	1.3	1.1	1.3	1.1	1.4	1.6	1.4	1.2	1.2	1.0

3.12 Other Countries

No reports were received from Estonia, Iceland, Latvia, Norway, Poland, Portugal and Russia.

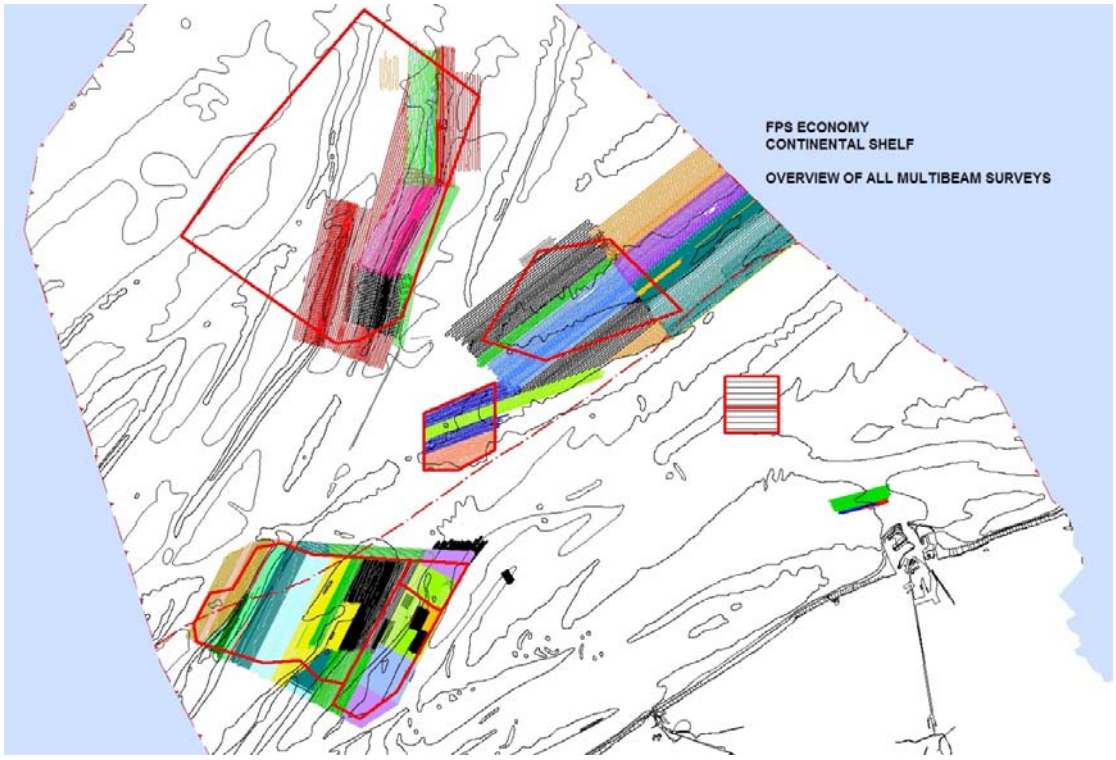
Annex 4: Review of national seabed resource mapping programmes

Belgium.

A. Development of Maps by the Belgian Sand Fund

The Sand Fund of the Ministry of Economic Affairs in the framework of their monitoring program for sand and gravel extraction is producing maps of the extraction areas on a regular basis. In 2008 no new maps have been published.

An overview of all available multi beam data from the Sand Fund is given in the following map.



Overview of Multibeam data of the Sand Fund in extraction and exploration zones on the Belgian continental shelf.

For all marked areas, data on bathymetry, backscatter and acoustic sediment classification are available. The multi beam maps for exploration sector 4 are halfway and should be finished by the end of 2009. A new multi beam system EM3002D was installed on the RV "Belgica" in 2008 and will produce more detailed maps more rapidly.

For more information the Sand Fund can be contacted directly (See address below).

Marc Roche, SERVICE PUBLIC FEDERAL ECONOMIE, P.M.E, CLASSES MOYENNES ET ENERGIE, Qualité et Innovation, Service Plateau Continental- Fonds pour l'Extraction de Sable WTC III - 6 ème Etage - Bureau 31, Avenue Simon Bolivar 30, B-1000 Bruxelles, Belgique Tel: 02 277 77 47, GSM: 0475 73 05 71, Fax : 02 277 54 01, Email: Marc.Roche@economie.fgov.be

B. Developments in marine resource mapping in other institutes in Belgium

Organisation(s) undertaking seabed mapping programmes:

Ghent University, Renard Centre of Marine Geology (UG-RCMG)

Management Unit of the North Sea Mathematical Models (MUMM)

Scope of seabed mapping programmes being undertaken in 2007/2008.

In the framework of the Belgian Science Policy programme QUEST4D (Quantification of Erosion/Sedimentation patterns to Trace the Natural from the Anthropogenically induced Sediment dynamics, http://www.vliz.be/projects/quest4D/), areas were mapped using multibeam and/or sidescan sonar or seismics. The purpose of the mapping is related to (1) the follow-up of time-series of sediment volumes over sand-banks; (2) substrate mapping; and (3) the investigation of the role of biota on seabed stability.

	MULTIBEAM	SIDE-SCAN SONAR	SEISMICS
ST0703b -15–16/02/2007	Flemish Banks (38km) Vlakte van de Raan (84km)		
ST0709 - 16–20/04/2007	Sierra Ventana (70km)		Sierra Ventana (70km)
ST0717 - 16–19/07/2007			Sierra Ventana (10km)
ST0725 -22–26/10/2007	Flemish Banks (150km) Gootebank (225km) Vlakte van de Raan (24km)	Vlakte van de Raan (2.2km)	
ST0728 - 26–30/11/2007	Vlakte van de Raan (410km)	Vlakte van de Raan (22km)	
ST0802 -04–08/02/2008	Vlakte van de Raan		
ST0814 23–25/06/2008	Wandelaar Buiten Ratel		
ST0826 4–7/11/2008	Area north of new dumping site S1 (41km) Kwinte Bank (48km) Buiten Ratel Hinder Banken (196km) Wandelaar Area north of Vlakte van de Raan (time-series along 3 bedform profiles)	Area north of new dumping site S1 (41km)	Kwinte Bank (48km)
ST0828 17–21/11/2008	Vlakte van de Raan – North and South. Reconnaissance survey and detailed imaging of Owenia fusi-formis field (361km) Area north of Vlakte van de Raan (time-series along 3 bedform profiles)		Vlakte van de Raan (46km)

Published seabed resource maps in 2007/2008

Seabed maps on the median grain size, morphology and gravel distribution on the Belgian part of the North Sea were published in 2007, in report form and as GIS shapefiles (DVD GIS@SEA). Multibeam bathymetry and backscatter maps are available for the Sierra Ventana region, area south of the Hinder Banks, Goote Bank and Buiten Ratel.

Reference: *Van Lancker, V., Du Four, I., Verfaillie, E., Deleu, S., Schelfaut, K., Fettweis, M., Van den Eynde, D., Francken, F., Monbaliu, J., Giardino, A., Portilla, J., Lanckneus, J., Moerkerke, G. and Degraer, S. (2007). Management, research and budgeting of aggregates in shelf seas related to end-users (Marebasse). Brussels (B), Belgian Science Policy (D/2007/1191/49), 139 pp. + DVD GIS@SEA + Habitat Signature Catalogue (order at: http://www.belspo.be/belspo/fedra/proj.asp?l=en&COD=EV/18).*

Future marine resource mapping programmes

The Management Unit of the North Sea Mathematical Models (MUMM) will continue the seabed mapping for the Quest4D project. The time-series of sediment volumes over sandbanks will be continued (Flemish Banks, Hinder Banks), as also in the Vlakte van de Raan area. ILVO and MUMM will map the spatial distribution of the typical habitat of Ensis directus, the most important invasive species on the Belgian part of the North Sea. UG-RCMG together with MUMM will map the foreshore of the area of Oostende in the view of optimally integrating acoustical and optical data to map the morphological continuum from the foreshore up to the dunes.

Denmark (awaiting)

Finland

Organisation(s) undertaking seabed mapping programmes:

Geological Survey of Finland (GTK)

Scope of seabed mapping programmes being undertaken in 2008

A study of marine geology by the Geological Survey of Finland (GTK) concerning late-Quaternary deposits on the seabed is being conducted using acoustic and seismic methods: echosounders, single-channel seismic and sidescan sonar. Investigations are supplemented with seabed sampling and visual observations. The basic scope of the study is to acquire data on the distribution and thickness of various types of sediments and information on stratigraphy, mineralogy and geochemistry of the deposits. New methods of sounding and sampling as well as data processing and analyses of samples are also developed and tested.

The aim of the study is also to increase knowledge of the physical properties and the geochemical variations in seabed sediments induced by both nature and human activity. Also the demand of various practical and scientific needs arising in a surrounding community should be met.

In context of the EU project BALANCE (Baltic Sea Management – Nature Conservation and Sustainable Development of the Ecosystem through Spatial Planning), GTK combined the Marine Landscape maps from different bottom quality, depth, etc. datasets.

The Finnish Inventory Programme for the Underwater Marine Environment (VELMU) collects data on the diversity of underwater marine biotopes and species. The inventories are being conducted in the Archipelago Sea, the Quark area, the Gulf of Finland, the Bothnian Bay and the Bothnian Sea. VELMU is a cooperation programme between seven ministries (internal affairs, defence, education, communication, agriculture and forestry, trade and industry and environment) (http://www.ymparisto.fi/default.asp?contentid=210670&lan=fi&clan=en).

Some information on survey methods and data processing can be found from

http://en.gtk.fi/mapping/marine.html

Published seabed resource maps in 2008

In the year of 2008 about 150 km^2 was surveyed in the southern part of Bothnian Sea. Geological seabed maps published 2008 covered about 380 km^2 in the Bothnia Bay, Archipelago Sea and Gulf of Finland (off Helsinki). The mapping situation is shown in the index map (Figure xx) available in the address http://en.gtk.fi/mapping/marinemap.html.

Future marine resource mapping programmes (*please provide details of any planned seabed resource mapping initiatives*).

The annual goal of seabed survey is 500–700 km². In the year 2009 the main focus areas are exclusive economical zone and the eastern part of the Gulf of Finland.

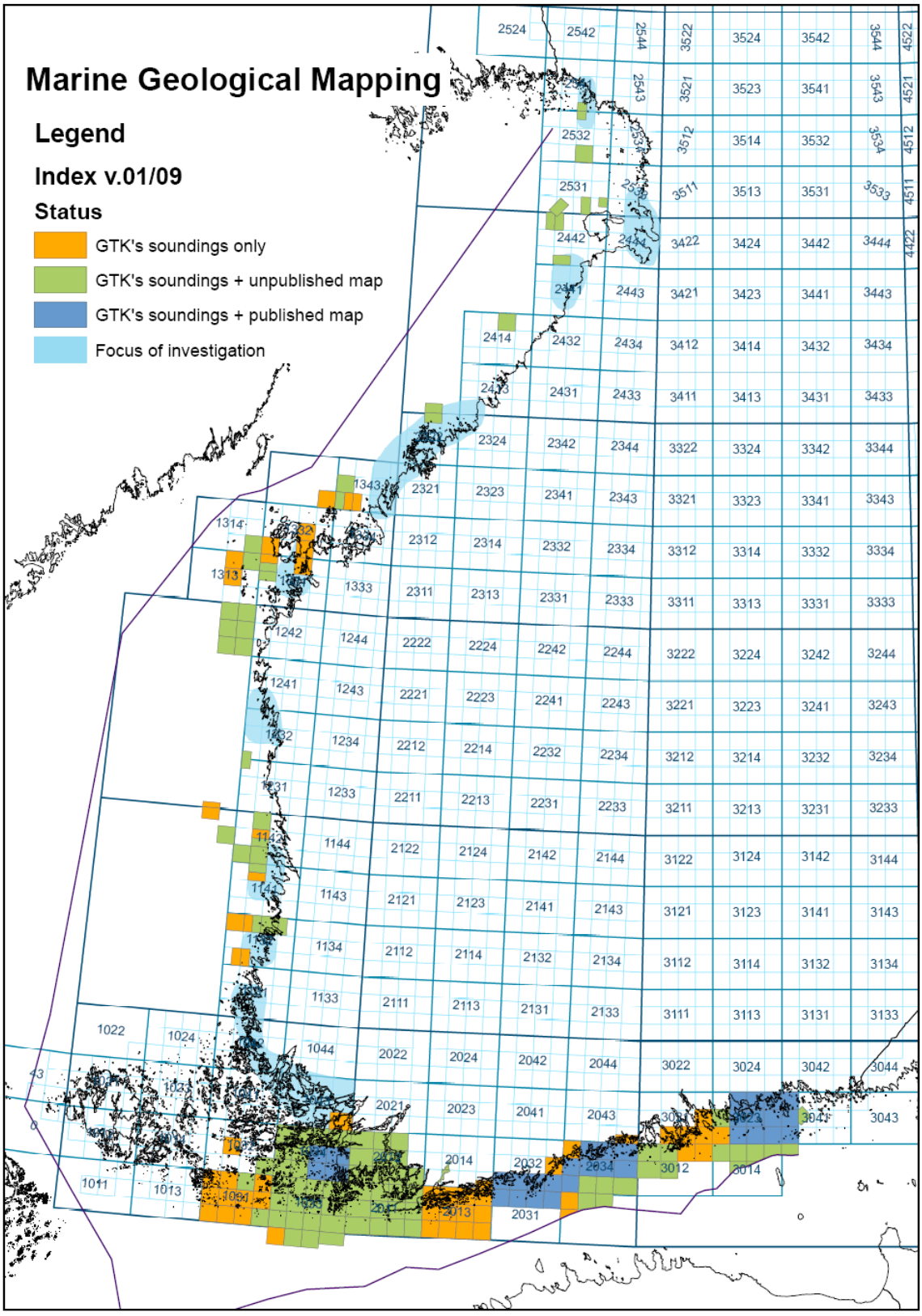


Figure 4.4.1. Situation in relation to geological mapping at the end of 2008.

France

Developments in marine resource mapping

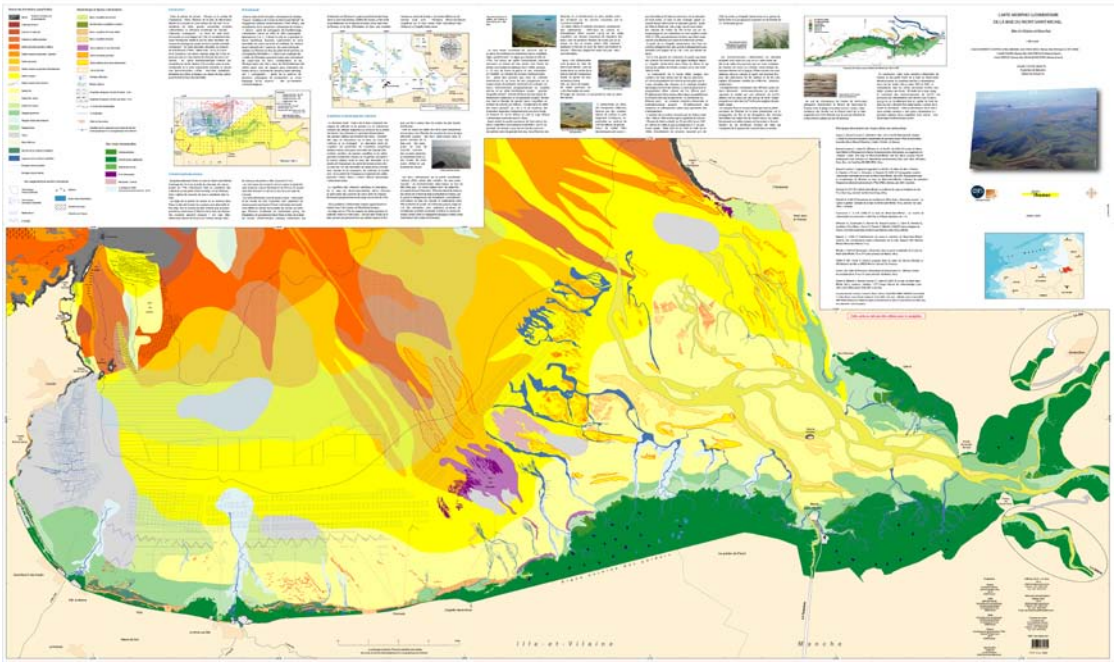
Organisation(s) undertaking seabed mapping programmes: Ifremer, SHOM, Universities, AAMP (Agence des Aires Marines Protégées).

Scope of seabed mapping programmes being undertaken in 2007/2008

SHOM and Ifremer are actually working on 100 meters grid spacing DTM for Channel, Atlantic and Mediterranean Sea. This model, based on geostatistical analysis, is built with depth data's measured during SHOM and Ifremer Surveys.

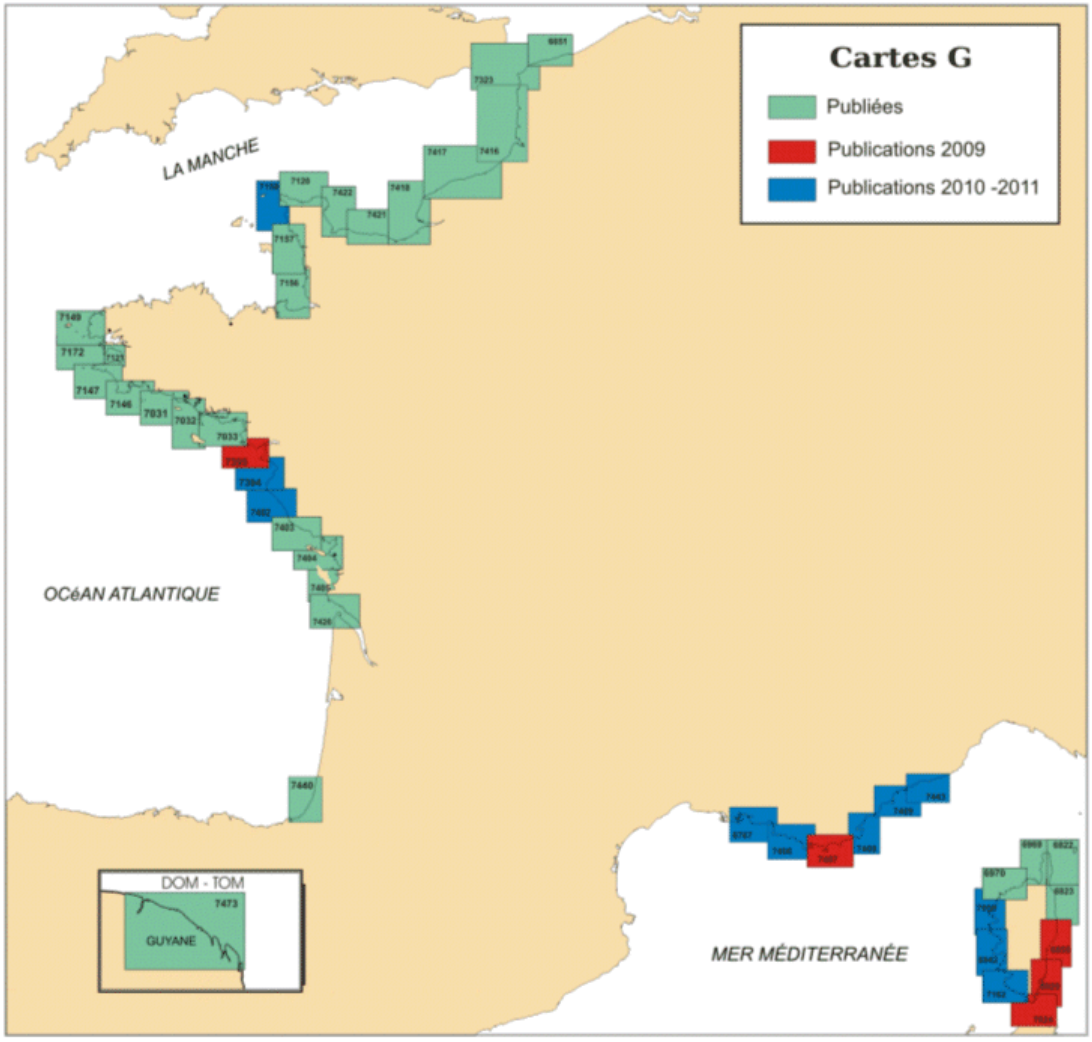
Published seabed resource maps in 2007/2008 (*please provide details of any seabed resource maps, which have been published in 2007/2008).*

Bonnot C. *et al.*, 2008 - Carte morpho-sédimentaire de la baie du Mont Saint-Michel (1/25000).



Morphology and sediments nature map of the Mont Saint-Michel Bay.

SHOM publishes sedimentological maps (scale of 1/50000) of seabed usable on charts. It is generally made by compilation of existing data (Tallow lead samples (95% of continental shelf samples), grab samples, cores, sidescan sonar, multibeam reflectivity, aerial photography) and with universities collaboration.



« G maps » published or in project by the SHOM

- The REBENT project aims to collect and format data relating to seabed habitats and associated benthic biocenosis living along the coasts, in order to give scientists, marine environment management bodies and the general public, relevant and coherent data which will improve our knowledge the current resources and detect spatio-temporal evolutions. The entire French seawaters are likely to be concerned by the project. But regarding the new acquisitions tidal zones and coastal waters have been singled out as priority areas, in the framework of the Water Directive, thus concentrating as much attention as possible on the protected marine reserves. These are one of the maps produced between 2006 and 2008:

Carte des habitats benthiques du secteur de Saint-Brieuc (multisource Rebent, 2006);

Carte d'habitats benthiques du secteur Trégor-Goëlo (Rebent, 2007) - Echelle: 1 / 5 000 à 1 / 25 000 ;

Carte des peuplements benthiques du secteur de Concarneau (Source A. Ehrhold, A. Blanchet, D. Hamon, 2007) - Echelle: 1 / 2 000 à 1 / 10 000;

Carte des habitats benthiques du secteur de l'Archipel des Glénan (multisource Rebent - Natura 2000, 2006) - Echelle: 1 / 5 000 à 1 / 10 000;

Carte des habitats benthiques du secteur Vilaine (Source A. Ehrhold, A. Blanchet, D. Hamon, 2008) - Echelle: 1 / 2 000 à 1 / 10 000;

Future marine resource mapping programmes (please provide details of any planned seabed resource mapping initiatives).

Other information (please add any further information which you would like to be included in this review).

Ifremer is actually finalizing a study, commissioned by French Environment Ministry, whose aim was to define and identify areas for sand and gravel extraction with minimal constraints for environment. Two large areas were selected during this project: the Eastern English Channel and the part of the Atlantic coast located between the Loire and the Gironde estuaries, from the coast to the 50 m depth line. All the study was based on existing and available data. Three synthetic maps are going to be provided:

- Marine aggregate resources presenting acknowledged deposits and zones of potential interest;
- Benthic communities sensibility;
- Fishery sensibilities taking in account both resources (spawning areas, nurseries, habitats…) and activities (fishing areas, production and landings, fishing fleets…).

Germany (awaiting results of contact)

Ireland

Organisation(s) undertaking seabed mapping programmes:

National Organisations:

Marine Institute and Geological Survey of Ireland.

Other Organisations: National University of Ireland Cork and Galway.

Maps are produced on a continuous basis as demand requires from data held in a central database for licensing monitoring and prospecting purposes.

The INFOMAR (Integrated Mapping for the Sustainable Development of Ireland's Marine Resource) – programme continues to operate a comprehensive mapping programme in the inshore and near shore shelf zone around Ireland. It operates under a strategic partnership between the Geological Survey of Ireland and the Marine Institute, and represents the second phase of the groundbreaking Irish National Seabed Survey (INSS). Funded under the National Development Plan c.€4m p.a. (2006–2016), INFOMAR aims to map the remaining 13% of the Irish territorial seabed, concentrating on specific areas of interest such as priority bays and areas of biological interest. Further information can be obtained from (http://www.marine.ie/home/services/surveys/seabed/).

Overview

Details of the INFOMAR programme are available at www.infomar.ie. Since 2007 online facilities are available for viewing seabed maps and for downloading. INFOMAR offshore and GSI onshore digital data. Data is accessible (free of charge) via the Interactive Web Data Delivery System (IWDDS).

Summary of 2008 Operations

Marine resource mapping programmes and INFOMAR research projects.

The Joint Irish Bathymetric Survey Project (JIBS), in which the Marine Institute of Ireland as project partner was completed in July 2008. The objective of the JIBS Project was to promote joint action to survey the seabed in such a way as to satisfy the needs of many organizations.

The Joint Irish Bathymetric Survey Project (JIBS) commenced on 10 April 2007 and was completed on 31 October 2008. This project was lead by the Maritime and Coastguard Agency (MCA) with the Marine Institute of Ireland as project partner funded through the INTERREG IIIA programme. Priority areas of a 3nm coastal strip between Inishowen Head and Melmore Head were surveyed on the RV "Celtic Voyager" totalling 420 km2 (Figure 4)/ The Marine Institute in partnership with Geological Survey of Ireland coordinated the development and delivery of the JIBS Project Web Data Delivery Service and Web GIS interface. The JIBS dataset is being utilized by research groups. It has been utilized as the basis of a successful marine archaeology project (INSTAR) run by the University of Ulster with support from the Marine Institute.

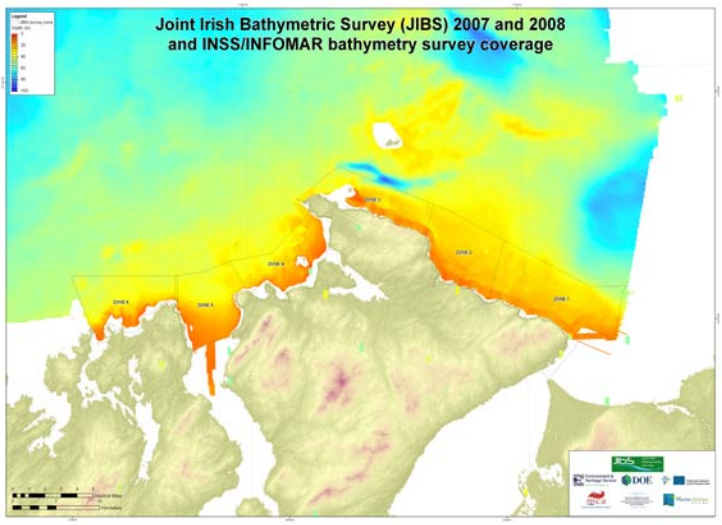


Figure 4.6.1. JIBS survey coverage integrated with INFOMAR and INSS data.

INFOMAR Survey Operations during 2008 included data acquisition in Galway, Sligo, Donegal, and Blacksod Bays as well as the South Coast Priority Area between Kinsale and Youghal on the RV "Celtic Voyager". Additionally LiDAR survey operations were undertaken in Donegal, Sligo, Blacksod, Galway, and Tralee Bays, as well as Lough Foyle.

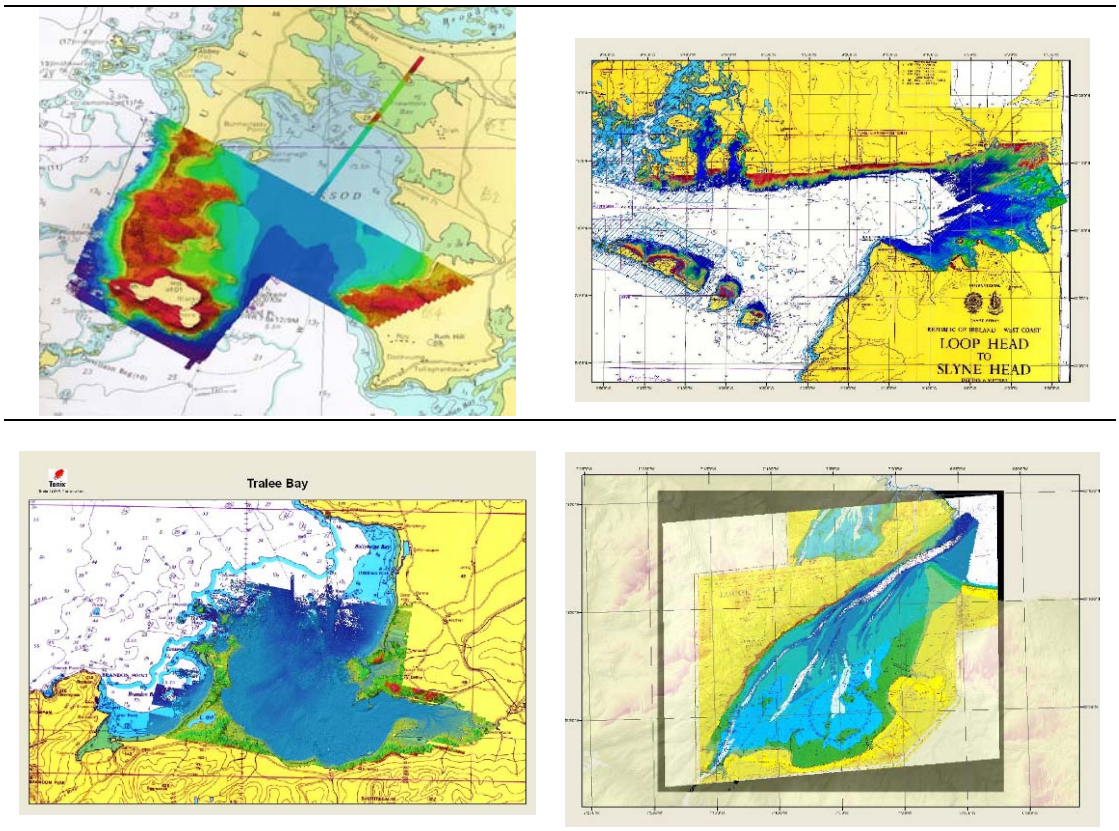


Figure 4.6.2. LiDAR Coverage in Blacksod, Galway, Tralee, Lough Foyle.

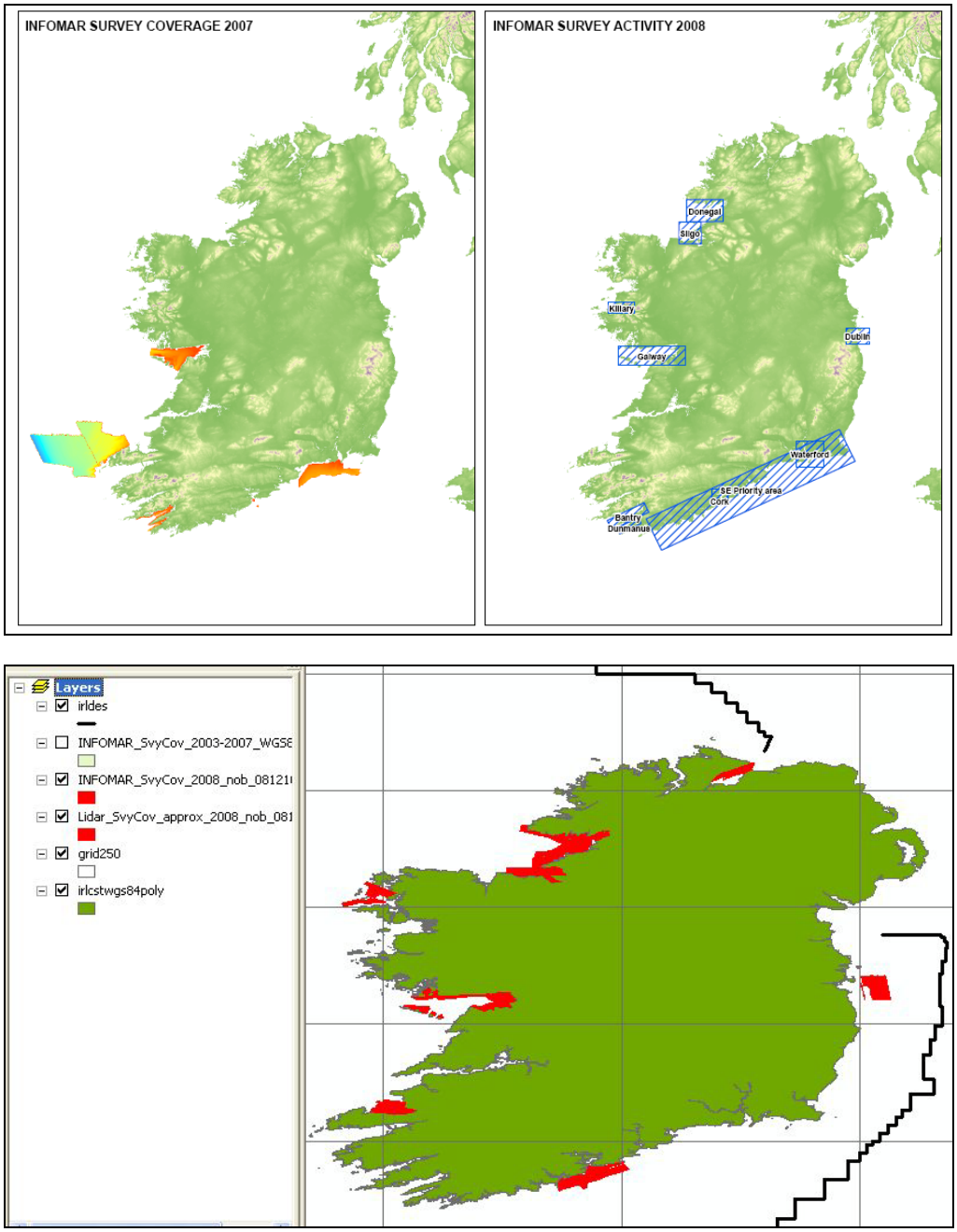


Figure 4.6.3. Shows (top left) areas surveyed during 2007, (top right, and bottom) priority areas and actual mapping coverage generated during 2008.

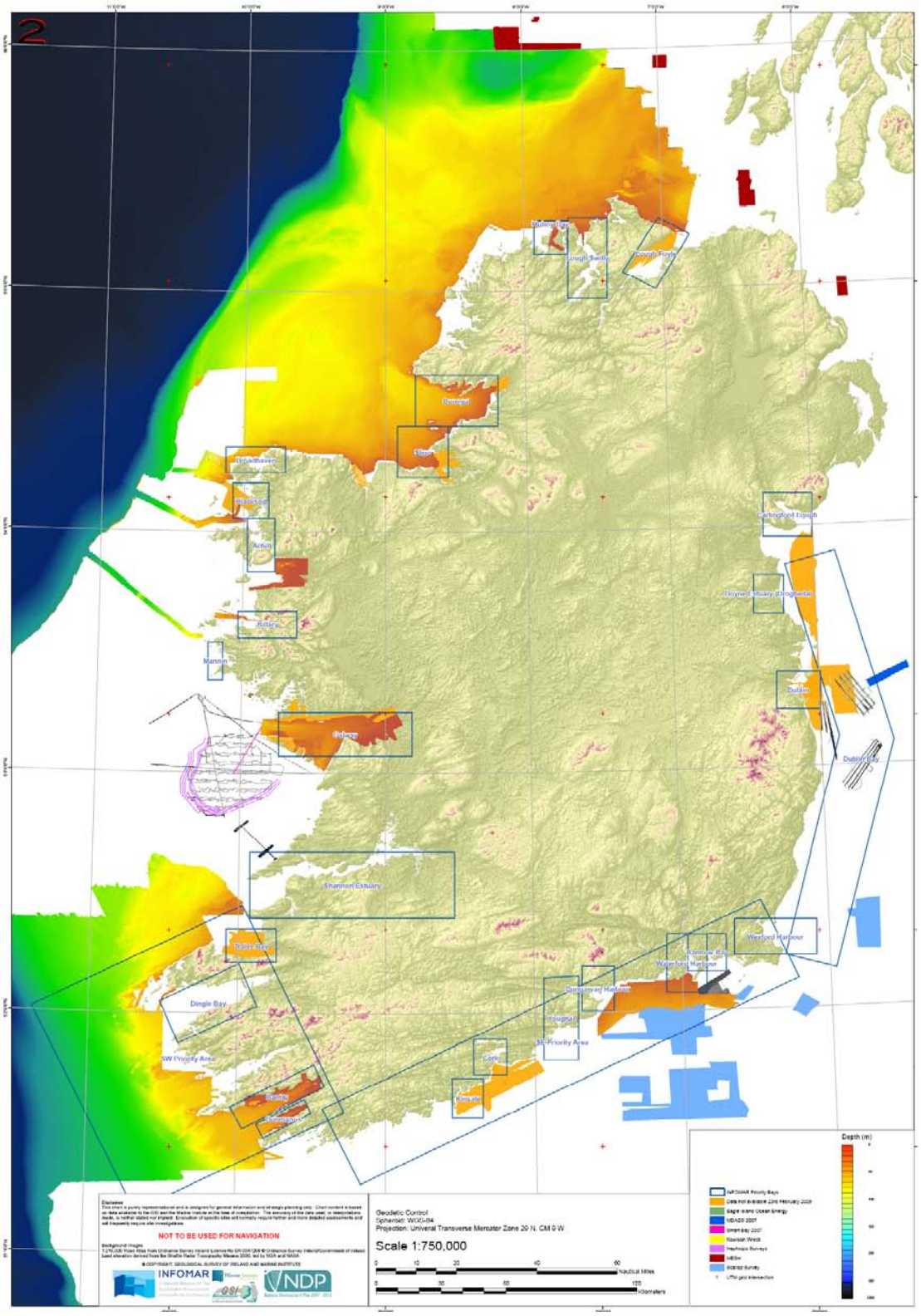


Figure 4.6.4. Overview of survey coverage and areas mapped up to 2008 under Irish National Seabed Survey (INSS) and INFOMAR programmes.

A programme of discrete one year research projects operates under the INFOMAR programme. Summary details for the current round are given in Table 4.6.5.

Table 4.6.5. Listing of projects being undertaken as part of the INFOMAR programme.

Project Description	Theme	Coordinator
Evaluating Irish Marine Palaeoclimate Records (EIMeR)	**CLIMATE CHANGE**	Dr Stephen McCarron, NUI Maynooth
Holocene climate change on the western Irish seaboard employing foraminiferal analysis of sediment cores from Galway Bay	**CLIMATE CHANGE**	Professor D. Michael Williams, NUI Galway
Palaeoceanographic records of abrupt climate change: a preliminary investigation	**CLIMATE CHANGE**	Dr Robin Edwards, TCD
Development of standard operating procedures for video analysis and classification, GIS integration, video visualization and image data archiving	**ENVIRONMENTAL STUDIES/SEABED MAPPING**	Dr Anthony Grehan, NUI Galway
Environmental, biological and geochemical studies in Dunmanus Bays and associated inner shelf areas	**ENVIRONMENTAL STUDIES/SEABED MAPPING**	Dr Brendan O'Connor, Aquafact Ltd.
Prototype toolset for evaluating automated image processing of sub-sea video data	**ENVIRONMENTAL STUDIES/SEABED MAPPING**	Dr Tim McCarthy, NUI Maynooth
Application of improved single beam echosounder classification and characterization methods to multifrequency INFOMAR data	**SEABED CLASSIFICATION**	Professor Ross Chapman (UVIC)/Mr Xavier Monteys, GSI
Multibeam seabed mapping: correlating acoustic backscatter returns to ground-truthing using statistical tools. Developing a bio-geological classification scheme derived from existing INFOMAR-INSS databases.	**SEABED CLASSIFICATION**	Dr Maxim Kozachenko, UCC (CMRC)
GIS integration of Irish onshore and offshore LiDAR datasets to create new value-added geospatial datasets	**LiDAR**	Dr Seamus Coveney, NUI Maynooth

Other information

A web based GIS system containing information and outputs including seabed resource maps from the Irish Sea Marine Aggregates Project can be accessed at http://imagin.ucc.ie/. A new inshore/shelf survey vessel the RV "Keary" was acquired in late 2008. The vessel is a 15m purpose built, aluminium catamaran designed for the survey of shallow waters, with a draft of only 1.7m.

Netherlands

Maps are produced on a continuous basis as demand requires from data held in a central database for licensing monitoring and prospecting purposes.

Resource mapping is the responsibility of the Geological Survey of the Netherlands. The Survey is a component body of Deltares, a new institute that joins the forces of Delft Hydraulics, GeoDelft, Subsurface and Groundwater unit of TNO and parts of Rijkswaterstaat.

The present mapping programme for the Dutch part of the North Sea covers the entire Netherlands EEZ and the territorial sea. The Geological Survey of the Netherlands and the Royal Dutch Navy, Hydrographic Office collects the data. The data comprise general and detailed digital bathymetric maps, sidescan sonar images, cores and grab samples. Additional data are collected from the Ministry of Public Work, Transport and Water Management and commercial companies. The maps are only available in digital formats or printouts.

The following maps are available:

- Bathymetry
- Seabed sediments
- Folk classification map
- Holocene formations at seabed
- Thickness of the Holocene deposits
- Depth of the top of the Pleistocene

Lithostratigraphy of the top of the Pleistocene

In 2008, resource mapping has been conducted on two spatial scales: local and NCS (Netherlands continental shelf)-wide. Local mapping concerned the planned source areas for the new extension to Rotterdam Harbour: Maasvlakte 2. A combination of core and seismic data were used to delineate peat and mud units with great accuracy (Figure 1), so that they can be avoided during sand extraction. Such units are unsuitable as building material and, when extracted, may cause plumes of suspended particulate matter that impact the environment.

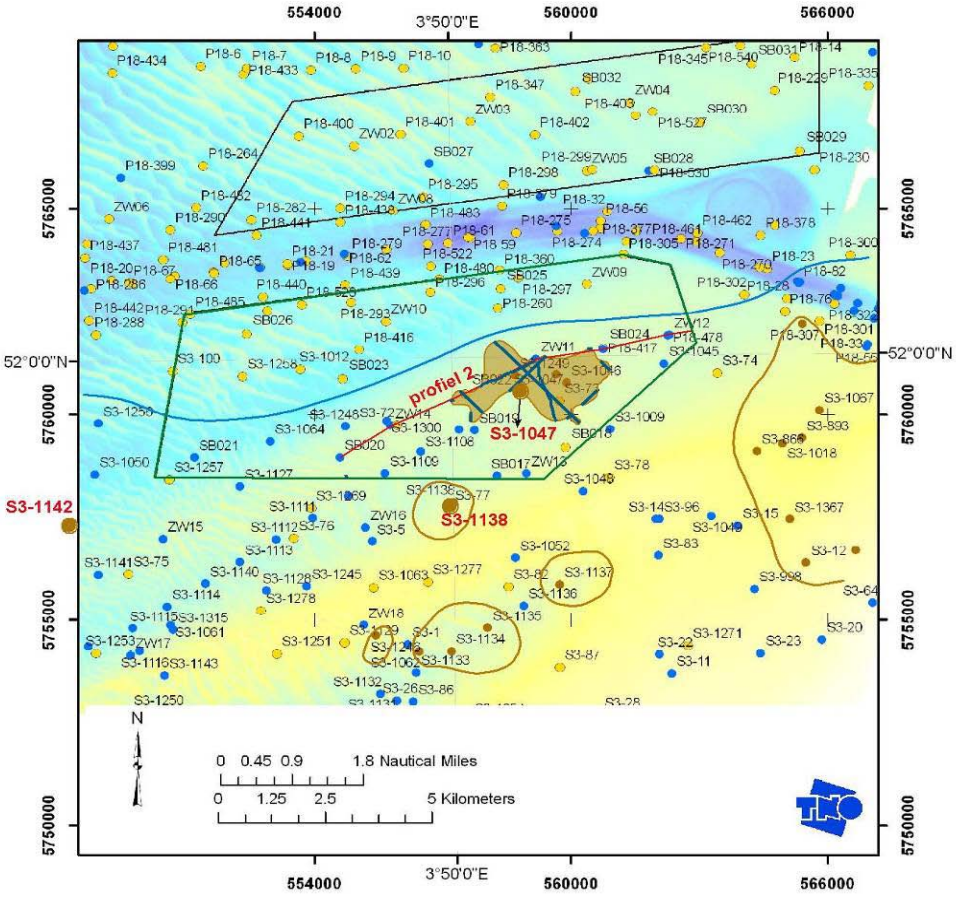


Figure 4.7.1. Delineation of a peat and mud layer in the planned area of sand extraction for the Rotterdam harbour extension.

On an NCS-wide scale, all core data and grain size analyses of the NCS were queried and further analysed to calculate volumes of extractable sand for a set values of thickness of covering units unsuitable as resources. These calculations showed regional variability of thickness (Figure 2) and sand quality (median grain size and mud content), aiding in the pre-selection of suitable resource areas.

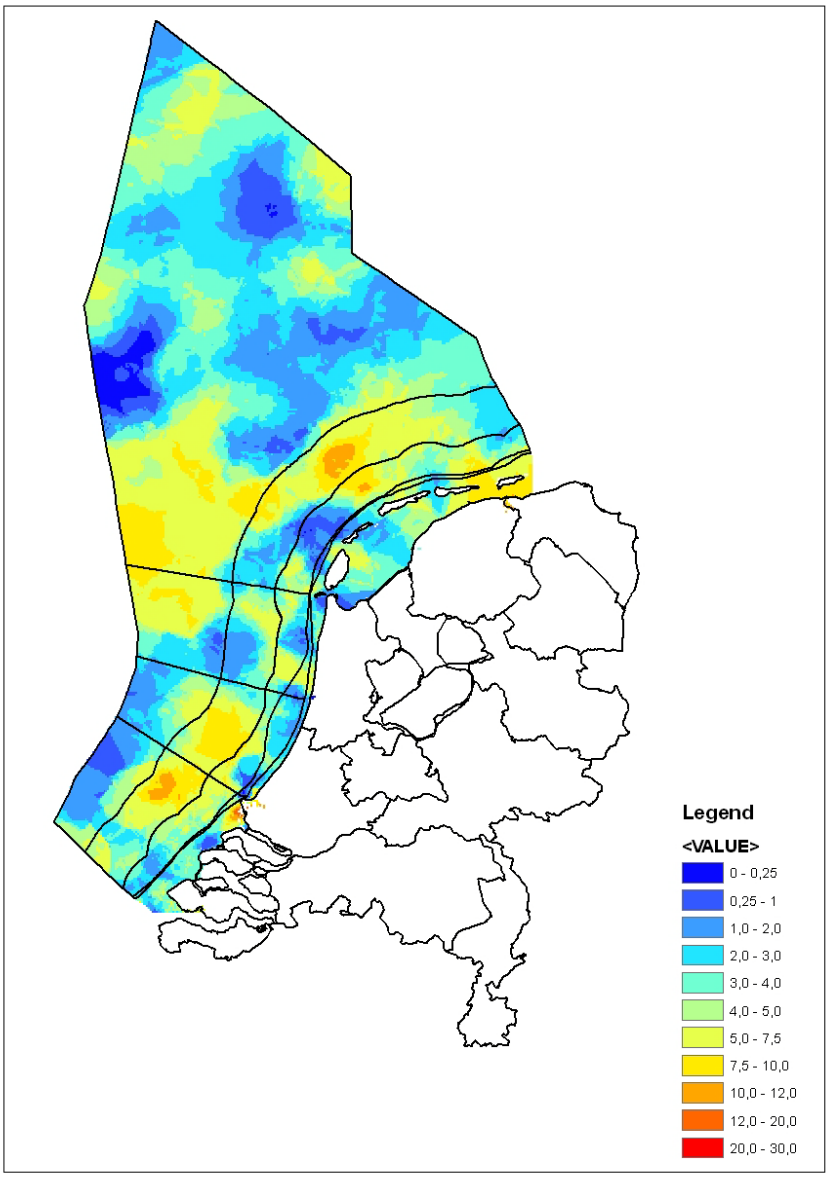


Figure 4.7.2. Minimum thickness (in m) of sand resources on the NCS.

In recent years, a new resource-mapping approach has been developed for the on land part of the Netherlands. It focuses on flexibility and specifically on the production of tailor-made grids. In this digital 2.5D approach, resources can be assessed for different values of parameters such as median grain size, mud content, and thickness of covering units unsuitable as resources. Settings can be varied online by end users and decision-makers, so that they can make their own grids from the database that feeds the system. This system for on land resources will now be extended to the offshore.

As part of seabed-habitat mapping, articles were written on separating bathymetric data representing multi-scale rhythmic bedforms (sand waves) for mobility assessments, acoustic habitat and shellfish mapping and monitoring in shallow coastal waters (sidescan sonar) and macrobenthic assemblages of the NCS (marine-landscape mapping).

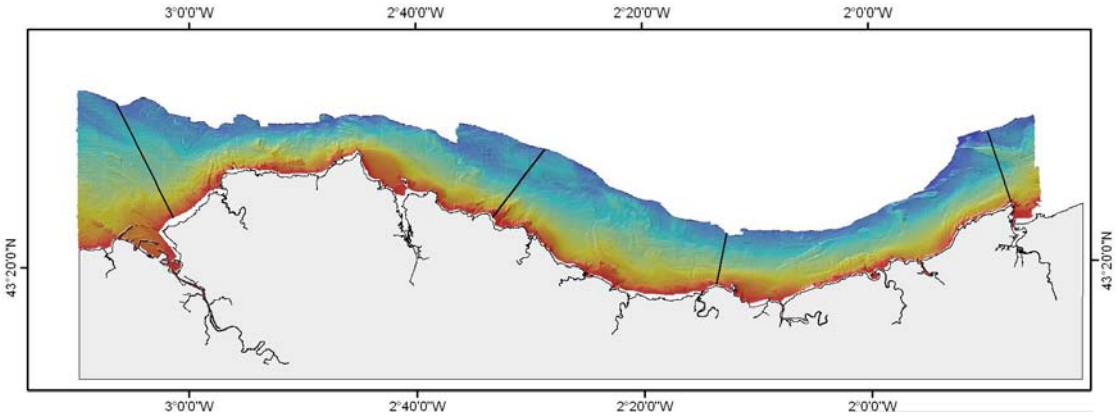
Spain

Organization undertaking mapping programmes:

AZTI for the biodiversity Directorate of the Basque Government

Scope of seabed mapping programmes being undertaken in 2008

All the inner continental shelf of the Basque continental shelf between 5 and 100 m depth has been already mapped with multibeam sonar (HABITATS PROJECT).



The final product is 1m resolution seabed Digital Terrain Model integrated into a GIS environment.

Future marine resource mapping programmes

During 2009 the aim is to take soft sediment samples and images from the different identified bionomics unit, with the intention of calibrate the available multibeam data.

Sweden

Marine geological mapping of the Swedish continental shelf area including the EEZ is the responsibility of the Geological Survey of Sweden (SGU). The Geological Survey is the national authority, under the auspices of the Ministry of Industry and Commerce, responsible for matters concerning Sweden`s geological character and the handling of minerals.

The mapping of the Swedish seabed started in a small scale in the early 1970s´, but grows fast from 1989 and onwards. Up to the end of 2000 the mapping carried out was aimed for presentation in the scale 1:100,000, which meant measurements with full coverage of the seabed with sidescan sonar and with the central runline also covered simultaneously with sub-bottom profiler and shallow seismic. The geophysical surveys were followed up with ground-truth surveys (Figure 4.9.1). In addition to these surveys the superficial bottom sediments in specially selected deposition areas were sampled and analysed on c. 60 elements and c. 50 organic micropollutants. The geochemical database of the Swedish continental shelf (c. 80 000 analyses from c. 550 sites) forms the base of the adapted Swedish Environmental Quality Criteria of marine sediments.

According to the 1999–2006 mapping plan of SGU the investigations were oriented towards an overview mapping aimed for the scale 1:500,000. This type of mapping was carried out in mainly east-westerly corridors, 1 km wide, and spaced 11–13 km apart. The corridors run from the mainland all the way out to the outer border of the EEZ (Figure 4.9.1). The seabed in the corridors was mapped in the same way as the more detailed mapping mentioned above. In 2006, when the overview mapping was finished, the mapping program changed back to the first type of mapping aimed for presentation in the scale 1:100,000. The new mapping program will be carried out in all waters inside a boarder that runs parallel with and one nautical mile off the baseline.

In 2008 the new mapping program continued with surveys in the coastal area of the southern Bothnian Sea (Figure 4.9.1). Part of this area is planned to be established as the second Marine National Park in Sweden. A conversion/transformation of Swedish seabed map information into EUNIS nomenclature was launched in 2007 and has continued during 2008. Furthermore, in 2008 and based on survey data produced in 1993–1994, the map production continued of the area south of Scania, southern Sweden (Figure 4.9.1).

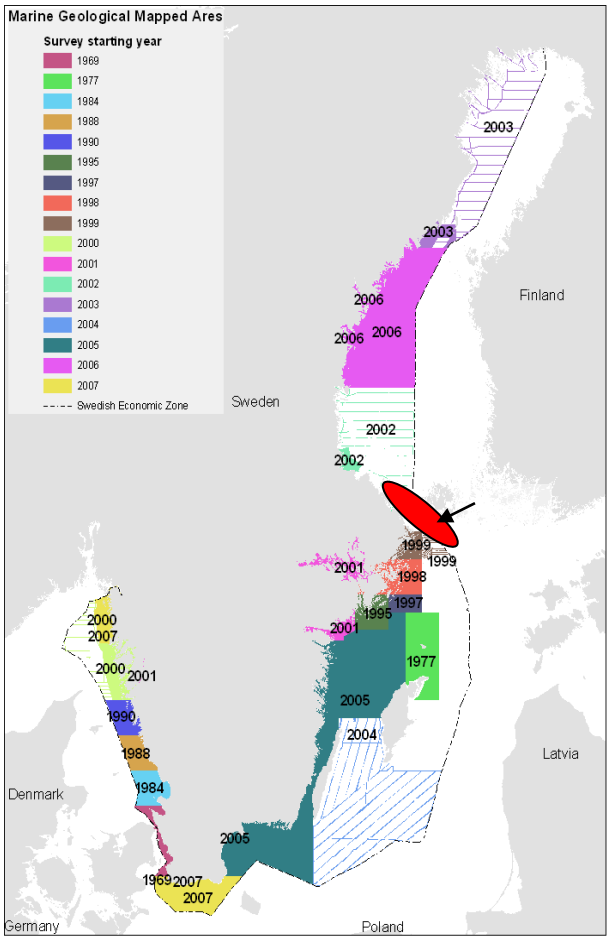


Figure 4.9.1. Mapped areas of the Swedish continental shelf that have been mapped regarding geology and geochemistry. The figures refer to the start years. The blue lines mark the corridors that were mapped in the overview mapping programme run between 1999–2006. In 2008 the coastal area of the southern Bothnian Sea was mapped in the scale 1:100,000).

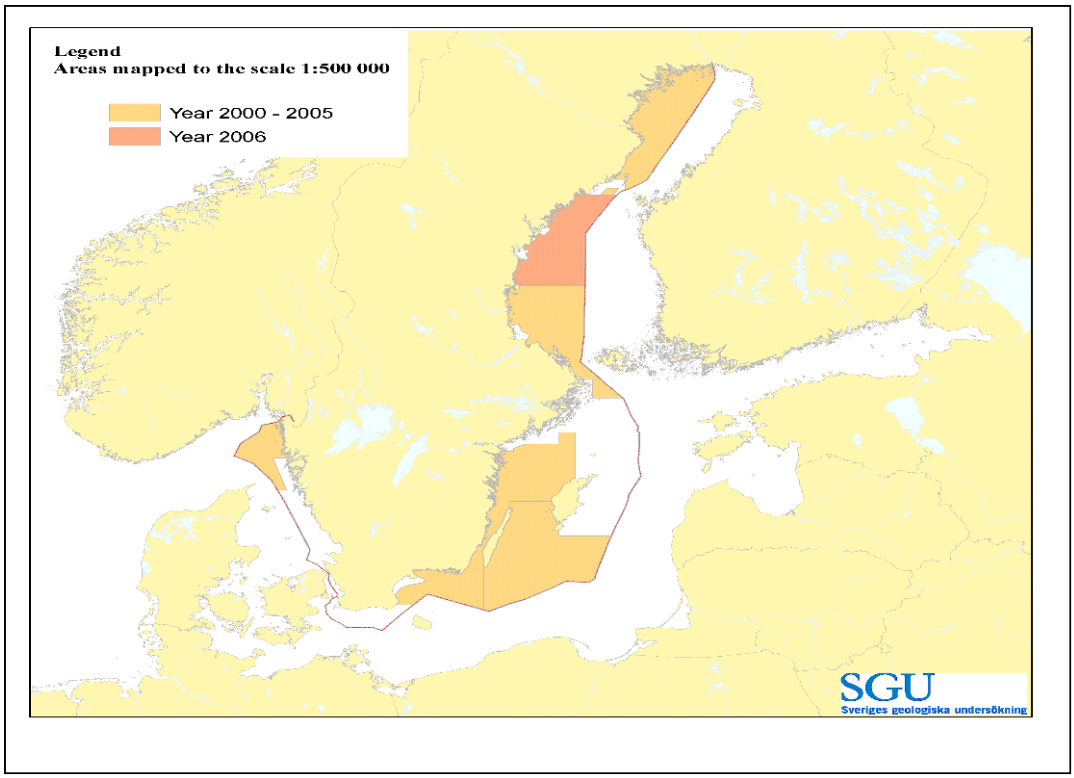


Figure 4.9.2. Mapped areas of the Swedish continental shelf that have been mapped regarding geology and geochemistry to a scale of 1:500, 000.

United Kingdom

Aggregate companies undertake their own prospecting surveys, under licence, as appropriate to identify new resources. However, at present, there are no coordinated national mapping programmes taking place on the UK continental shelf.

A number of discrete habitat mapping programmes associated with aggregate extraction were commissioned during 2008 as a result of stand-alone research initiatives. Progress with and outputs from these programmes are available from www.alsf-mepf.org.uk.

Two Regional Environmental Characterisation (REC) data collection surveys commissioned through the Marine Aggregate Levy Sustainability Fund (MALSF) to augment aggregate industry-led Regional Environmental Assessments (REA) for the Thames Estuary and Isle of Wight regions were undertaken during summer / autumn 2007. Follow-on projects to interpret and report the data gathered were commissioned during 2008, with the Thames Estuary REC to report in the first half of 2009 and the South coast REC to report towards the end of 2009.

The purpose of the REC surveys is to provide industry, regulators and stakeholders in general with a document which provides a regional environmental context for those areas of the sea where marine aggregate extraction is focused. In conjunction with industry led REA's, the REC's will help to identify key issues which need to be addressed within site-specific Environmental Impact Assessments to support specific applications to extract marine aggregate.

An extension to the MALSF programme was announced in June 2008, which extended the programme for a further three years and increased the funding to £4.5m

per annum (£13.5m total). Under the new programme, two further REC projects were commissioned during 2008 to provide regional characterization data for the Humber and East coast regions, which will again augment industry-led REAs planned across the regions.

Work was commissioned during early 2008 to generate digital regional bathymetric surfaces from existing single beam hydrographic chart data across all four REC regions; South coast (English Channel), Thames Estuary, East coast (off Norfolk) and the Humber. The outputs from these have been used to help survey planning and data interpretation associated with the REC programme.

The data and outputs from the REC programme are to be made publicly available through a web-based information portal which is being expanded to host, manage and archive the various datasets and reports – www.marinealsf.org.uk

United States

Regional mapping is carried out by the US Geological Survey, Woods Hole (MA) Science Center

< http://woodshole.er.usgs.gov/project>

and an overview of the The Marine Aggregates (Sand and Gravel Assessment) Project can be found at

http://woodshole.er.usgs.gov/project-pages/aggregates/index.htm.

Continuing efforts between the US Geological Survey and the Minerals Management Service can be found at:

http://geology.usgs.gov/connections/mms/landscapes/sand_gravel.htm

In 2008, publications in the region, included:

Butman, B., Dalyander, P.S., Bothner, M.H., and Lang, W.N. 2008. Time-series photographs of the sea floor in western Massachusetts Bay, Version 2, 1989 - 1996: US Geological Survey Data Series 265, Version 2.0, DVD-ROM ONLINE. http://woodshole.er.usgs.gov/pubs/ds-265V2/

Butman, B., Dalyander, P.S., Bothner, M.H., and Lange, W.N. 2008. Time-series photographs of the sea floor in western Massachusetts Bay, 1996 - 2005: US Geological Survey Digital Data Series 266, Version 1.0, DVD-ROM, http://woodshole.er.usgs.gov/pubs/ds-266/

McMullen, K.Y., Poppe, L.J., Twomey, E.R., Danforth, W.W., Haupt, T.A., and Crocker, J.M. 2008. Sidescan-sonar imagery, multibeam bathymetry, and surficial geologic interpretations of the sea floor in eastern Rhode Island Sound, Poster Session [abs.]: Geological Society of America, Northeast Sectional Meeting, Buffalo, N.Y., 27–29 March 2008, Paper No. 33–5.

McMullen, K.Y., Poppe, L.J., Denny, J.F., Haupt, T.A., and Crocker, J.M. 2008. Sidescan-sonar imagery and surficial geologic interpretation of the sea floor in central Rhode Island Sound: US Geological Survey Open-File Report 2007–1366, DVD-ROM http://woodshole.er.usgs.gov/pubs/of2007-1366/

McMullen, K.Y., Poppe, L.J., Haupt, T.A., and Crocker, J.M. 2009, Sidescan-sonar imagery and surficial geologic interpretations of the sea floor in western Rhode Island Sound: US Geological Survey Open-File Report 2008–1181 http://woodshole.er.usgs.gov/pubs/of2008-1181/

Poppe, L.J., Williams, S., Moser, M.S., Forfinski, N.A., Stewart, H.F., and Doran, E.F. 2008. Quaternary geology and sedimentary processes in the vicinity of six mile reef, eastern Long Island Sound: Journal of Coastal Research, v. 24, no. 1, p. 255–266.

Poppe, L.J., McMullen, K.Y., Williams, S.J., Ackerman, S.D., Glomb, K.A., and Forfinski, N.A. 2008. Enhanced sidescan-sonar imagery offshore of southeastern Massachusetts: US Geological Survey Open-File Report 2008–1196 http://pubs.usgs.gov/of/2008/1196/

Poppe, L.J., Ackerman, S.D., Williams, S.J., Moser, M.S., Stewart, H. 2008. Sedimentary environments and processes of Great Round Shoal Channel, offshore Massachusetts [abs.]: American Geophysical Union, Ocean Sciences Meeting, Abstracts, 2–7 March 2008, p. 363–364.

Poppe, L.J., McMullen, K.Y., Foster, D.S., Blackwood, D.S., Williams, S.J., Ackerman, S.D., Barnum, S.R., and Brennan, R.T. 2008. Sea-Floor Character and Sedimentary Processes in the Vicinity of Woods Hole, Massachusetts: US Geological Survey Open-File Report 2008–1004 http://woodshole.er.usgs.gov/pubs/of2008-1004/

Other Countries

No reports were received from Canada, Estonia, Germany, Iceland, Latvia, Norway, Poland, Portugal, and Russia.

Annex 5: Review of developments in national authorization and administrative framework and procedures

Belgium

No major changes to legislation in Belgium. New legislation was already reported in previous reports and entered into force 1 September 2004. So, no major new developments in the authorization and administrative framework and procedures are to be reported for 2008. There will be some minor practical changes in 2009. MUMM is also working at studies and practical applications to force the use of new black boxes, although this is still in an early stage. Also the legal aspects of the black boxes will be reviewed in the coming years

Denmark (awaiting feedback from PEN)

Finland: No changes to report.

France: No changes to report.

Germany *(awaiting feedback)*

Ireland. No changes to report.

The Netherlands

The extraction of sediments from waters under management of the national government is regulated by the 'Besluit Ontgrondingen Rijkswateren' (Decree Extraction in National Waters). This decree is in force from February 2008 onwards. It includes amendments on the on the Extraction Law 1965 earlier amended in 1997.

Most important amendments of the Extraction Law:

- Short procedure (max. 8 weeks) for extraction sites < 10 million m^3 < 500 ha < 2m and not near to each other.
- Also short procedure for lengthening of the licence period maximum with 50%.
- Trial-extractions (dredgers or prospecting) directly by information/mentioning max. 40.000 m^3 or 10 cargo's/tracks.

No change in content is made relating to the policy and regulations that are formulated in the Second Extraction Plan for the North Sea (2004), the National Document on Spatial Planning (2006) and The Integrated Management Plan for the North Sea 2015 (2005) and the policy documents on shell extraction.

In 2008 a first draft of a new policy document on water management, the National Water Plan, is published Changes regarding extraction of marine sand are:

- The zone between the established NAP -20 meter contour and the 12 mile boundary is designated for sand extraction above other uses of the sea.
- For regular extractions (licences of less than 10 million m^3) a depth of more than 2 meter below the seabed is allowed. Extraction can have a larger maximum depth if the EIA advises this. For larger scale extractions this

was already made possible in the Second Extraction Plan for the North Sea (2004).

The DELTA Commission

The Government of the Netherlands requested an independent Committee of State (the Delta Committee) to give its advice on flood protection and flood risk management in the Netherlands for the next century, while keeping the country an attractive place to live, work and invest.

The results of the Delta Committee were presented in September 2008. A summary of the Advice can be found on http://www.deltacommissie.com/. The committee's recommendations laid emphasis on development along with climate change and other ecological processes. Their implementation will allow the Netherlands to better adapt to the effects of climate change and create new opportunities. To prepare the Netherlands to become climate proof, the Delta Committee drafted a Delta Program.

In the advise account was made of a predicted regional sea level rise between 0.65 to 1.3 meters by 2100 and from 2 to 4 meters by 2200 (high-end estimates). Based on these predictions, recommendations were made to take sustainable measurements. The level of flood protection must become at least a factor 10 higher than the present level. In the view of the Committee, the best way to protect the coast from sea flooding is by replenishing the entire coastline, from Zeeland to Den Helder and along the Wadden Sea Islands. The advice includes the use of marine sand for large-scale nourishments to protect the Dutch coast, resulting in a seaward growth of the coastline providing great added value to society. In doing so it is recommended to make greater use of natural processes in sea defences; "Build with nature". However, the implementations of this advice and the scale of the extractions involved needs serious environmental consideration.

The current volume of annual marine sand extraction reaches approximately 23Mm^3, of which between 8 and 12 Mm^3 are annually used for nourishments. Following the advice of the commission the annual volume of sand needed for coastal protection might increase up to a 40 Mm^3. This will result in vast extraction areas needed, possibly affecting the morphology in the coastal zone.

Spain

During 2008 a new Law of Evaluation of Environmental Impact of projects (RDL 1/2008 of the 11th January) was approved.

In the specific case of the marine sand extractions, the EIA procedure will be necessary in the following cases (projects included in Annex I):

- Marine sand extractions with extracting volumes above 3.000.000 cubic meters/year
- Marine sand extractions with extracting volumes not reaching that threshold taking place in specially sensitive zones designed in the Council Directive 79/409/EEC and Council Directive 92/43/EEC or in wetlands included in the Ramsar Convention.
- All the projects included in the Annex II according to the autonomic regulations.

On the other hand, it will have to consult to the environmental competent organ in the following cases (projects included in the Annex II):

- Marine sand extractions (projects not included in the Annex I).
- Any change or extension of the projects that appear in the annexes I and II, already authorized, executed or in process of execution that could have adverse significant effects on the environment.
- The projects not included neither in the Annexe I nor the II when required by the autonomic regulation.

For the projects included in the Annex II, an environmental document must be submit ted with the content established in the RDL 1/2008, to the environmental organ for its assessment and determination of the need or not of submitting the project to an environmental evaluation.

New policies

During the year 2008 the General Directorate of Coasts has been working at the preparation of the fundamentals for the development of the Technical Instruction for the "Environmental Management of the Marine Extractions to Obtain Sand". In this document there is gathered every sectorial existing legislation in the matter as well as the international agreements signed by Spain. The document is pending on approval and it will be ready during the year 2009.

Sweden: No changes to report.

United Kingdom

- ***The Environmental Impact Assessment and Natural Habitats (Extraction of Minerals by Marine Dredging; England and Northern Ireland) Regulations 2007***
- *The Environmental Impact Assessment and Natural Habitats (Extraction of Minerals by Marine Dredging; Wales) Regulations 2007*
- ***The Environmental Impact Assessment and Natural Habitats (Extraction** of **Minerals** by **Marine Dredging;** Scot**land) Regulations 2007***

Regulations were introduced in 2007 by the Department of Communities and Local Government (formerly the Office of the Deputy Prime Minister) to bring marine aggregate extraction under statutory control in the England and Northern Ireland, by the Welsh Assembly Government in Wales and the Scottish Government in Scotland. The regulations are consistent with the requirements of the EIA and Habitats Directives, and compatible with Human Rights legislation. In England, the regulations are accompanied by procedural guidance in "Marine Minerals Guidance Note 2" which supplements the existing "Marine Minerals Guidance Note 1". These documents contain procedural guidance explaining the application process for marine minerals extraction in British waters together with guidance on environmental assessment, mitigation and monitoring criteria.

On introduction of the regulations in English waters, responsibility transferred to the Department for Environment, Food and Rural Affairs who use their Executive Agency, the Marine and Fisheries Agency to enact them on behalf of the Secretary of State. In Wales, the regulations are administered by the Welsh Assembly Government and in Scotland by the Scottish Government, through their Agency Marine Scotland.

Further information on these regulations and the associated procedural guidance for England can be found at www.mfa.gov.uk, for Wales at www.wales.gov.uk and for Scotland at www.scotland.gov.uk/marinescotland.

Marine and Coastal Access Bill

The UK is currently introducing legislation to bring together the management of, and access to the marine and coastal environment. This is being achieved through the UK Marine and Coastal Access Bill to be followed by separate implementation in devolved administrations and secondary legislation.

The key areas of interest of the Bill are:

- Marine Management Organisation
- Marine Planning
- Marine Licensing
- Marine Nature Conservation
- Fisheries Management and Marine Enforcement
- Environmental Data and Information
- Migratory and Freshwater Fisheries
- Coastal Access
- Coastal and Estuary Management

A Marine Management Organisation, taking over the role of the existing Marine and Fisheries Agency, will be established in Tyneside, North East England, during 2009. Marine Scotland was established as the Scottish marine management organization in April 2009. These organizations will take responsibility for managing marine licensing, including marine aggregates, in England and Scotland respectively. Plans for marine management in Wales are currently under consideration.

United States

There is no report of changes in 2008. The legal authority for the issuance of negotiated non-competitive leases for OCS sand and gravel is give by Section 8(k) of the Outer continental shelf Lands Act (OCSLA). Public Law 103–426, enacted in 1994, allows the MMS to convey, on a non-competitive basis, the rights to OCS sand, gravel, or shell resources funded in whole, part, or authorized by the Federal Government.

http://www.mms.gov/sandandgravel/index.htm and

http://www.mms.gov/sandandgravel/MarineMineralProjects.htm>

A summary of US code for submerged lands can be found at: http://www4.law.cornell.edu/uscode/43/ch29.html

Other Countries: No reports were received from Canada, Estonia, Germany, Iceland, Latvia, Poland, Portugal, and Russia.

Annex 6: Review of approaches to environmental impact assessment and related environmental research

Belgium

Continuous monitoring

Since marine sand and gravel extraction started in Belgium (1978), continuous monitoring has been carried out by the public sector itself. The monitoring is funded by the fees which concession holders have to pay per m^3 extracted. The amount of the fee has changed over the years. Three institutes are involved in the monitoring:

- Fund for sand extractions of the Federal Public Service Economy
- Management Unit of the North Sea Mathematical Models (MUMM) of the Belgian federal public planning service Science Policy
- Institute for Agriculture and Fisheries Research (ILVO-Fisheries) of the Flemish Government.

A new EIA was finished and published in 2008. It mainly consists of the initial EIA of 2004, extended with the summary of the 3-yearly workshop on sand and gravel extraction on the Belgian continental shelf organized in October 2008 (see further). This workshop is part of the legislative obligations of the three institutes officially involved in the monitoring programmes.

Five new requests (elongations and extensions of existing licenses) of private concession holders and new request by the Flemish government (Afdeling Kust and Afdeling Maritieme Toegang) were made in early January 2009. The procedures are ongoing and the EIS are being prepared by MUMM.

End of April 2009 a research study of exploration sector 4 (see Figure…) should be finished and will be reported on in the next annual report. This study is carried out by the Sand Fund and paid by Flemish Government – Afdeling Kust, as they will have huge needs of sand in the coming years. As such they want to get a concession in sector 4 as soon as possible.

General conclusions of the 3-yearly workshop on sand and gravel extraction on the Belgian continental shelf, 20 October 2008, Brugge (Belgium)

This 3-yearly workshop presents the work that has been carried out during the previous years by the 3 partner institutes (FZ, MUMM and ILVO) involved in the continuous monitoring programme. Additionally, work from other research institutes and the industry in Belgium (and France) is presented. The presentations included were:

- 40 years of Belgian marine aggregate extraction (Zeegra, representing the industry)
- Important milestones in the management of marine aggregate extraction (FZ)
- The impact of aggregate extraction on the coastal security during storms (Waterbouwkundig laborarotorium)
- Evaluation of the sand reserves in space, depth and time (RCMG, UGent)
- The volumetric evolution of Flemish sandbanks, by means of measurements and numerical models (MUMM)
- Synthesis of the multibeam monitoring results (FZ)

- Sand extraction related to a biological value of the Belgian part of the North Sea (ILVO)
- The importance of a historical approach for the understanding and protection of the ecosystem (RIBNS)
- Impact of extraction on the distribution and diet of demersal fish in a commercially exploited extraction area In Dieppe (Fr, Univ. Rouen).
- International developments and perspectives for sand and gravel exploitation (MUMM)

The presentations (in English) are joined on a CD-Rom, created by the Fund for Sand extraction (FZ). Copies can be requested to:

Marc Roche, SERVICE PUBLIC FEDERAL ECONOMIE, P.M.E, CLASSES MOYENNES ET ENERGIE, Qualité et Innovation, Service Plateau Continental- Fonds pour l'Extraction de Sable

WTC III - 6 ème Etage - Bureau 31, Avenue Simon Bolivar 30, B-1000 Bruxelles , Belgique

Tel: 02 277 77 47, GSM: 0475 73 05 71, Fax: 02 277 54 01, Email: Marc.Roche@economie.fgov.be

The extended papers (in Dutch or French) behind these presentations are combined in the following publication:

Anon. 2008. Sustainable management of sand and gravel extraction on the Belgian continental shelf. Studiedag De evolutie en de innovatie van de extractie van mariene aggregaten op het Belgisch Continentaal Plat (BE), FOD-Economie publicatie (in Dutch and French).

A summary of this workshop (in Dutch) concerning the status of marine sand and gravel extraction on the Belgian continental shelf is reproduced (translated to English) below.

Summary of the workshop on sand and gravel extraction on the Belgian Continental Shelf

Since the start of sand and gravel extraction on the Belgian continental shelf in 1976, important milestones were taken. Not only in the field of administration and legislation in which one aims at simplicity and transparency, but also in the field of control (techniques) and the scientific knowledge concerning the impact of sand extraction.

Concerning the impact of sand extraction in the concession areas on coastal safety, different scenarios have proven there is a negligible direct effect on the coastal safety by storms, in particular by the relative big distance from the sand extraction sites to the coast.

Concerning disturbance of the seabed environment, continuous monitoring and recent impact studies show only local effects. On site data prove that sand extraction has a local non-cumulative impact and that there is no natural potential for restoration. Some models concerning sediment dynamics suggest however a possibility for restoration and the development of an equilibrium. For the investigated locations it seems that on a time-scale of 10 years the extracted sand is not being renewed.

Notwithstanding the superficial extraction of the sands, it is argued that the follow up of sand extraction activities should take into account the availability of sand stocks and avoid areas where the Quaternary cover is minimal. Besides, it is recommended to extract in areas where natural sedimentation of the seabed is being expected and a renewal of sediments is more probable. Based upon an integration of knowledge and

data, criteria were proposed for a more sustainable extraction of the resources and hence minimize the degree of impact.

In the second part of the workshop, the importance of a historical approach of ecosystems has been demonstrated. The investigation of "baseline" situations is important for the knowledge, the management and the protection of ecosystems. On the basis of such baseline studies, areas can be clearly defined where sand extraction should be prohibited.

Tracing the biological value of exploration and exploitation areas is not easy. The determination of the biological value is made more difficult because the areas are situated in different sandbank complexes with their own characteristics, as well as because of the inter annual and the seasonal variability of the different ecosystem components. Extraction area 2, where most extraction is taking place, is situated in an area that is characterized in general by a lower biological value. There is no necessary relation between a lower biological value and the intensive sand extraction in area 2. Because the channels show a more important species richness, it is being recommended that one should take this into account when defining the extraction area 4. The need for reference areas for several impact studies was stressed.

In general it concluded that the sand and gravel extraction activity is a complex matter.

Denmark

Finland

Approaches to environmental impact assessment of the effects of marine sediment extraction

Oulu-Haukipudas area, Bay of Bothnia

Date project commenced:

Duration of project: 2007–2009

Organisation(s) undertaking research project: FCG Suunnittelukeskus

Funding bodies: Morenia, Metsähallitus

Description of research project

Morenia, Metsähallitus has several years studied eight coastal areas in the Bay of Bothnia: Vaasa, Kokkola, Lotaja, Kalajoki, Tauvo, Hailuoto, Haukipudas and Kemi. The aim of these studies is to allow the exploitation of the marine sand resources of these areas. All of these water areas are administered by Metsähallitus (National Board of Forestry) and situate 10–30 km off the coast.

In June 2007 Morenia started EIAs in four of the above-mentioned areas: Suurhiekka-Pitkämatala (Ii and Simo municipalities), Merikallat (Hailuoto), Tauvo (Siikajoki and Raahe) and Yppäri (Pyhäjoki). After that the organization undertaking research project has changed. The program includes studies on birds, fish and fishery and habitat surveys (http://www.morenia.fi/binary.aspx?Section=239&Item=209). The EIA procedure will be completed during 2009.

France

Approaches to environmental impact assessment of the effects of marine sediment extraction. *Experimental site in Baie de Seine (Eastern English Channel)*

Date project commenced: 2006 (Demersal fish baseline survey)

Duration of project: 6 years (2006–2011)

Organisation(s) undertaking research project: GIS "SIEGMA" (Monitoring of impacts of extraction of marine aggregates)

Funding bodies: Ministry of Research, Regional Council of Haute-Normandie, dredging local companies (GMN) and national association (UNICEM), Ifremer and University of Rouen

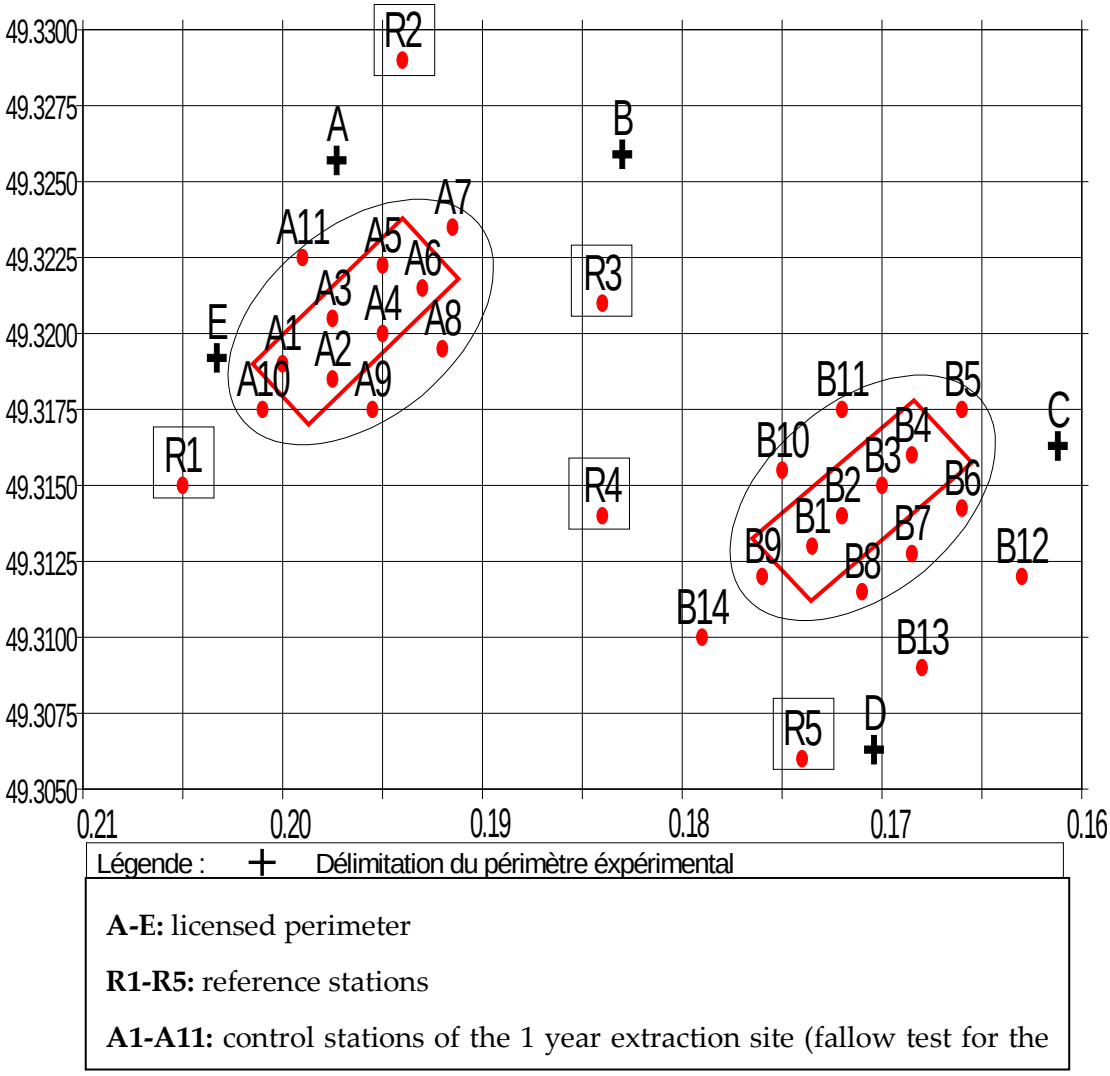
Description of research project

Monitoring of impacts is concerning:

- the dispersion of the turbid plume (ADCP) and the analysis of the deposition area ;
- the seabed topography (multibeam), sediments and associated benthic communities;
- the demersal fish communities ;
- the trophic relationships between fish and benthos (analysis of stomach contents of selected species) ;
- the physical and biological restoration of the site A after the end of dredging activity.

Site A was dredged during a few months (late 2007 and spring 2008) to study the recolonization rate of the local gravel community; levelling of grooves and ridges was done in late 2008 on one third of the first site to test the potential benefit of such a practice on the recolonization rate by benthic macrofauna.

The first steps of the recovery monitoring were done in early 2009 with a multibeam survey of bathymetry and the sampling of sediment and associated macrofauna.



A-E: licensed perimeter

R1-R5: reference stations

A1-A11: control stations of the 1 year extraction site (fallow test for the

Site B will be dredged during three years (2008–2011) to study the spatial impact of pluriannual extraction activity. Baseline survey of benthos and sediment was done in February 2008.

The continuation of the demersal fish communities' survey (4 seasonal campaigns with trawling and fixed nets) gave information on the attractive effect of extraction activity for sole and dab with an immediate, localized and temporary increase in densities of these two flatfish species. The analysis of stomach contents is in progress and will be the opportunity to see the role of trophic relationships in these increased abundances (deposition of crushed benthos with overflow).

Bibliographic review on "Biodiversity and Marine sediment extraction"

Date project commenced: March 2008

Duration of project: 1 year (2008–209)

Organisation(s) undertaking research project: University of Rouen

Funding bodies: French national dredging association (UNICEM)

Description of research project:

This review and our own expertise allowed proposing the following grid of sensitivity, measuring the response of "international" indicators (threatened species, communities and habitats) to the different impacts generated by extraction.

Table 1. Sensitivity to key habitats and species to various levels of impact of marine aggregate extractions [(E) Extraction; (T) Turbidity; (D) Deposition].

SENSITIVITY TO EXTRACTIONS		PRESSURE LEVELS				
Impact indicators		**High**	**Medium**	**Low**	**Negligible**	**Positive**
OSPAR species	Cod	T			D	E
	Rays			E/T	D	
OSPAR habitats	Sabellaria reefs	E			T	D
	Maërl beds	E/T/D				
	Hard substrates with Modiolus	E	D	T		
ICES habitats	Spawning areas	E/T/D				
	Nurseries	E/D			T	
	Shell beds	E/D			T	
NATURA 2000	1110.2 (gravelly sands)		E/T/D			
	1110.3 (medium sands)			E/T	D	

Extraction of marine aggregates will potentially be a serious threat to biodiversity only when exploitation projects will affect gravelly areas either of small size or underrepresentated in the geographical area (loss of habitat), and/or when functional impacts can affect sensible and threatened species (e.g. loss of spawning areas).

This identification of sensitive habitats implies ambitious mapping programmes of biological characteristics of marine habitats at regional scales, much bigger than research permits and extraction areas.

The Working Group for Marine Habitat Mapping (ICES, 2008) points out the importance of this objective in the selection process of extraction areas in order to protect benthic threatened communities and allow a good resources mana

Germany (awaiting feedback)

Ireland: No changes to report.

The Netherlands

Environmental Impact Assessment

The general procedure for Environmental Impact Assessments (EIA) in the Netherlands is described in the Annual Report of 2007.

Actual EIA's

In the Netherlands 2 Environmental Impact Assessments for marine sand extraction are in procedure (see below). In both EIA the alternative to extract to a depth of 6 metres below the seabed instead of the regular 2 metres is studied as an environmental friendly alternative. The conclusion is that an extraction depth of 6 metres gives a decrease in direct disruption of benthic fauna and no increase in other (negative) effects.

EIA for extraction of marine sand for coastal nourishment for the years 2008–2012.

This EIA for extraction of a maximum of 20 million m^3 per year is approved in 2008 and since used for licences for sand extraction for coastal nourishment. The extraction will take place in areas off the coast as close as possible to the location of the coastal nourishment.

EIA for extraction of marine sand for commercial use as fill sand on land and for industrial use for the years 2008–2017

This EIA for the extraction of a maximum of 25 million m^3 per year is made by a Union of several commercial extractors. The initiative is aimed at an extraction of a maximum of 250 million cubic meters in a period of ten years. The extraction will take place in the vicinity of harbours. For the moment an extraction of 15 million cubic meters per year is expected. The EIA is published in April 2008 for public consultation till and approved in 2008. Since then licences for commercial marine sand extraction are granted using this EIA.

Research Programs

a. Building with Nature Program (Ecoshape)

The Dutch national program 'Building with Nature' started in 2008 and is an innovative, long-term research program aimed at developing new design concepts for the layout and sustainable exploitation of river, coastal and delta areas. It is dedicated to research on the role of natural processes in design and management of (coastal) projects. Opportunities to use natural processes or to positively support natural ecosystems are identified and integrated into the planning and designs balancing natural ecosystems and human intervention. The program is focused on infrastructure development in marine, coastal and estuarine environments, although inland construction works in freshwater systems are included as well.

For the implementation of the recommendations of the Delta Committee towards the management of the coastline a research program as Building with Nature will be

essential in order to have a sustainable and integrated coastal zone management, that is science based and social and political acceptable.

Building with Nature is an initiative of Dutch dredging industry. It is a multidisciplinary program in which ecologists, scientists and technical specialists will work, design and create together, with nature as the starting point in the design process, to gain new knowledge of effectively developing and using ecosystems.

Its special feature is known as 'ecodynamic design': the synergy and cooperation that will allow natural ecosystems and human intervention to reinforce each other. This approach lays emphasis on the opportunities natural processes offer in the design and management of (coastal) projects, yet obviously without ignoring infrastructural and economic conditions. Building with Nature aims to provide objective, scientific knowledge and tools, technical and managerial, to help designers, builders and leaders develop areas in such a way that the economic and living environment evolves safely, prosperously and harmoniously in the long term.

The program focuses on:

- identifying, understanding and quantifying natural processes
- Integration of these processes in the design and planning process
- Identification of the way in which they can be addressed in the decision process.

The program has several well-defined work packages each aimed at specific issues. The main work packages are:

- Ecologically Meaningful Criteria
- Natural Dynamics and Cumulative Impacts
- Predictive Modeling and Effective Practice
- Landscaping for Ecological Enhancement

Next to these work packages a number of case studies are executed in which further knowledge will be developed through and tested in practical situations.

The Program is coordinated by EcoShape, a foundation consisting of public and private parties that coordinates the various themes and related projects. More information can be found on www.ecoshape.nl and in Van Raalte *et al.* (2008).

Van Raalte, G., W. Dirks, T. Minns, J. van Dalfsen, P. Erftermeijer, S. Aarninkhof and H. Otter (2008). Building with nature: creating sustainable solutions for marine and inland water constructions. New research initiative towards a Centre of Excellence. Proceedings of the Eighteenth World Dredging Congress (WODCON XVIII), May 27–June 1, 2007. Lake Buena Vista, Florida USA, pp. 637–648.

b. Sand Engine and Landscaping for ecological enhancement

The Province of South-Holland initiated a plan for a mega nourishment of 20 Mm^3 under the name "Sand Engine" as an alternative for long-term nourishment needs in order to protect and develop a part of the South Holland coast. The idea is that natural processes (water and wind) will redistribute the sand along the coast towards the beach and thereby support natural formation of the shallow coastal region and instigate active dune formation in the coming 50 years.

Originating from the Sand Engine initiative the Building with Nature program addressed a case study Holland Coast which aims at increasing knowledge regarding

the essential processes for sustainable protection and their consequences for ecological development.

In this case study two pilot experimental studies are defined: Sand engine and Landscaping for ecological enhancement.

The Sand Engine pilot project aims at gaining a better understanding of the morphological development of a mega nourishment, the growth of beach and dunes due to landward transport of sediment, (temporary) nature development as a result of the interaction between morphology and ecology, and the identification and utilization of ecological potential in the design. At present two desk studies have been conducted in this project.

The Building with Natures project 'Landscaping for ecological enhancement' will investigate in a pilot study the possibilities for landscaping a dredging site. Whereas present extraction policies still aim at quick recovery and restoration of the original habitat the activities in this project will through desk and experimental studies in actual dredging areas explore the possibilities in time and space to enhance both nature and economy by the development of artificially created habitats (landscaping) at dredging sites. Management of the sand extraction process in such a way that the end-result of the dredging operation is an area ecologically more valuable than before, is a new concept which needs a mind shift in the method of approach and will influence the design and construction procedures for a dredging project. Current legislation and policy, however, does not foresee in the exchange of one habitat in to another habitat.

Testing the approach of ecological designing (eco-engineering) as currently practised in land-based sand and gravel extraction operations, in the marine environment may also facilitate social and political acceptance of the future large-scale dredging operations accelerating licensing procedures. The 'Landscaping for ecological enhancement' pilot project aims at improving the prediction of ecological consequences in time and space, and develop concepts and methods to create ecologically valuable habitats through underwater landscaping.

At present negotiations are ongoing with the Rotterdam Harbour Authorities to cooperate research for Ecological landscaping and the necessary monitoring studies related to the second Rotterdam harbour extension Maasvlakte-2 for which approximately 365 Mm^3 sand is needed. The research will be partly conducted within a PhD project.

Contact person for the Case Holland Coast is Stefan Aarninkhof (S.G.Aarninkhof@boskalis.nl).

Spain

Sweden No changes to report

United Kingdom – EIA and Research

EIA remains the responsibility of the operator / developer in the UK. No national programmes of EIA are undertaken in relation to marine aggregates. National and industry specific programmes of research have been commissioned over the course of several years. Of particular note are:

Aggregate Levy Sustainability Fund

A significant amount of marine aggregate related research has been funded through the Aggregates Levy Sustainability Fund (ALSF) since its establishment in 2002. A one year extension to the second round of funding ran from April 2007 to March 2008, representing a total research budget of over £3 million. In June 2008, Defra announced that the Marine component of the ALSF programme would be extended for a third round, over a three year period to March 2011. The funding provision was increased to £4.5m/year ((£13.5m total), and a revised set of priorities were defined, including the need for further regional marine mapping and investigation of socio-economic issues associated with marine aggregate extraction.

To date, a range of new projects have been commissioned including two new Regional Environmental Characterisation surveys in the East coast and Humber regions, investigations of the potential significance of dredging noise, consideration of various regional scale ecosystem pressures (including aggregates and fishery), and a scoping study to benchmark the UK approach to mitigating marine aggregate dredging operations with activities worldwide.

A Marine ALSF science review was published in September 2008 describing the outputs of key studies undertaken during the 2007–08 one year extension, priority themes for future research and projects commissioned under the third round of the marine ALSF programme (2008–2011).

By the end of the fourth round of funding (March 2011), the Marine ALSF programme will have supported over £25 million worth of projects focussing on marine mapping, assessment of environmental impacts, monitoring / mitigation associated with improving the way marine aggregate extraction is planned, assessed and managed.

Details on commissioned projects can be accessed via www.alsf-mepf.org.uk. A meta-database of project outputs for MALSF funded projects is available at www.marinealsf.org.uk

Other Programmes

The UK Department of Environment, Food and Rural Affairs (Defra) continue to fund research programmes focussing on their areas of interest, including the marine environment. Further information on projects can be found at http://randd.defra.gov.uk/

Industry Led Initiatives

Regional Environmental Assessments

To support a forthcoming large number of licence and renewal applications, the UK marine aggregate industry, in conjunction with The Crown Estate, have commissioned a series of Regional Environmental Assessments to address regional scale cumulative and in-combination issues. Four such projects are now underway, with the South coast (Isle of Wight) and Thames Estuary REA's well advanced, and the East coast (Norfolk) and Humber REA's running 12 and 18 months behind. Each is progressing independently of, but in parallel with, the REC projects being funded through the Marine ALSF programme.

Guidance funded jointly by Defra, the Crown Estate and BMAPA, on the content of REA's has been published by the Regulatory Advisors Group (RAG). RAG consists of organizations that provide advice to the regulator on marine aggregate issues, spe-

cifically Cefas, the UK JNCC, Natural England and English Heritage. This information is available from www.cefas.co.uk

The intention is that the outcome of both the REA and REC processes will directly feed into the site-specific environmental impact assessments for individual licence applications and renewals, allowing a more robust and consistent approach to consideration of regional scale cumulative and in-combination effects.

Eastern English Channel Regional Monitoring Programme

A programme of regional monitoring covering aspects of a number of licensed marine aggregate extraction sites in the Eastern English Channel is being undertaken by a number of aggregate companies who have formed the East Channel Association. Further details of this regional programme can be found at www.eastchannel.info

Sustainable development data for the British Marine Aggregate Sector

The British marine aggregate industry published its second annual sustainable development report for the sector in November 2008, through the industry trade association, BMAPA. The second report builds on a sustainable development strategy published in 2006, which defined a range of key performance indicators for the industry to report under the themes of economic growth, social progress, environmental protection and natural resources. Industry data for nearly 90% of total marine aggregate production activity from UK waters was collated for the year 2007, covering 24 of the 25 aggregate dredgers operated by members of the British Marine Aggregate Producers Association. Data included total production; hours spent dredging, kilometres steamed and fuel burned.

With only two years of data it is difficult to identify any meaningful trends, although year on year changes are already being identified. For example between 2006 and 2007 total hours dredged reduced by over 8%, while tonnes landed per hour dredged actually increased – suggesting more efficient operations. This was reflected in small reductions (a.2%) in the fuel used and carbon emitted per tonne of marine aggregate landed. Over time, it is hoped that further trends can be identified.

Both the annual report and the strategy document are available from www.bmapa.org.

Area Dredged – Annual Reporting

Since 1999, BMAPA and The Crown Estate have publicly reported data on the area of seabed licensed for marine aggregate dredging in UK waters and also the area of seabed actually dredged, based on analysis of black box Electronic Monitoring System (EMS) data.

In 2008, the 10th annual 'Area Involved' report was published, providing summary data on licensed and dredged area during 2007 along with production statistics. Annual reports provide not only a national overview, but also data for each of the seven regions where marine aggregate dredging occurs, including charts showing the extent and intensity of dredging operations throughout the year.

The 10th annual report shows that the total area of seabed licensed for marine aggregate dredging at the end of 2007 was 1343.83km^2 (an increase of 28km^2 from 2006) of which 134.67km^2 was actually dredged (representing a reduction of 5.9km^2 from 2006). Of the dredged area, 90% of dredging effort (based on occupancy) was confined to an area of 49.95km^2.

All of the area involved reports are available to be downloaded from the reference section of the BMAPA website http://www.bmapa.org/want_reference01.php and The Crown Estate website http://www.thecrownestate.co.uk/marine_aggregates .

Area Dredged – 10 Year Review

BMAPA and The Crown Estate are currently preparing a 10 year review report, to examine the trends and changes in the area of seabed licensed and dredged for marine aggregates in UK waters. This will include consideration of the cumulative dredged footprint over the period, and also the extent of new area dredged in each year.

While the review is still in preparation, it is possible to identify some key points from the data between 1998 and 2007.

The area of seabed licensed for marine aggregate extraction has decreased in real terms by 387km^2, with 750km^2 of existing licence area surrendered and 362km^2 of new licence area permitted.

The total area of seabed actually dredged between 1998 and 2007 was 462km^2, during which time the area of seabed in any one year has decreased from a maximum of 222km^2 in 1998 to 135km^2 in 2007.

Over the past four years, the average area of new seabed dredged in each year has been 15.7km^2, during which time a number of significant new dredging areas have been permitted.

The final report should be published towards the middle of 2009, and will be available on the website of both BMAPA (www.bmapa.org) and The Crown Estate http://www.thecrownestate.co.uk/marine_aggregates

United States

The US Minerals Management Service Guideline for obtaining offshore sand sources can be found at:

http://www.csc.noaa.gov/beachnourishment/html/human/law/borrow.htm

A continuing issue is the possible deflation of shoal features which may result in adverse changes in sand transport patterns, shoreline erosion, and accretion rates. In addition to possible adverse effects on the physical environment, subsequent habitat changes and effects on local biology could be encountered should the shoal morphology drastically be altered.

6.12 Other Countries

No reports were received from Canada, Estonia, Germany, Iceland, Latvia, Norway, Poland, Portugal, and Russia.

Annex 7: New template for the responses to ToR-(f) in relation to the use of electronic monitoring systems by member states

REVIEW OF IMPLEMENTATION OF BLACK BOX / ELECTRONIC MONITORING SYSTEMS FOR THE MANAGEMENT OF MARINE SEDIMENT EXTRACTION

ICES WGEXT will be considering how Black Box / Electronic Monitoring System (EMS) are implemented across member countries during our 2010 meeting. The group would be extremely grateful if you could provide information as detailed below relating to the use of Black Box / EMS in your country.

COUNTRY:

Approaches to implementation of Black Box / EMS for the management of marine sediment extraction

(please provide details of how your country make use of Black Box / EMS for the management of marine sediment extraction with specific reference to the following questions).

1) Does your country use Black Box / EMS to monitor marine sediment extraction?
2) If so please provide an overview of the requirement for the system which details:
   a) Where the requirement for the system is made (*commercial licence requires its use / legislative requirement for regulation*)?
   b) Who is the responsible body for the system - State or operator and what is the cost for the installation of this system? (*For example the operator may be responsible for installation and maintenance of vessel bound equipment and the state responsible for data collection and interpretation*)
   c) Who owns data generated by the system and how is this managed?
   d) What enforcement provisions are available should data generated by the system identify an irregularity (*e.g. penalties*).
   e) Whether the system is exclusive to sediment extraction or is also used to monitor the disposal of dredged material.
3) If your country operate a system please provide an overview of the system technology which details:
   a) The equipment installed on dredging vessels
   b) The type of signal used to transmit data from the vessel (*GPRS, GSM, Satellite etc.*)
   c) The number and type of sensors installed on a vessel which identify if dredging is taking place *(e.g. sensors mounted in the dredge pipe, vessel pumps etc.)*
   d) The frequency of data collection using dredging sensors (*e.g. data collected every 30 seconds)*
   e) Whether data are encrypted
4) If your country operate a system please provide an overview of how the data generated is interpreted and reported which details:

a) The techniques used to gather and interpret data (*e.g. GIS software) Please include pictures / screen shots where appropriate.*

b) The methods used to determine any irregularities *(e.g. risk based approach)*

c) The procedures for enforcement following the report of an irregularity *(e.g. the process of investigation including consideration of deck logs, masters statements etc).*

Annex 8: OSPAR national contact points for sand and gravel extraction

List of national contact points for reporting on sand and gravel extraction

Belgium

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Management Unit of the North Sea Mathematical Models

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E-mail: B.Lauwaert@mumm.ac.be

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Danish Forest and Nature Agency

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DENMARK

Email: pen@sns.dk

France

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MINEFI/DGEMP

DIERM bureau 4B

61, boulevard Vincent Auriol

Télédoc 133

75703 Paris Cédex 13

FRANCE

Tel: 00 33 1 44 97 05 91

Email: xavier.foata@industrie.gouv.fr

M. Claude Augris

Ifremer

Département Géosciences Marines

Technopôle Brest-Iroise

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Fax: 00 33 2 98 22 45 70

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Germany

Mr Kurt Machetanz

Landesamt für Bergbau, Energie und Geologie (LBEG)

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The Environment and Food Agency

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IS-108 Reykjavik

ICELAND

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E-mail: helgi@ust.is

Ireland

To be confirmed.

The Netherlands

Mr Chris Dijkshoorn

Ministry of Transport, Public Works and Water Management

North Sea Directorate

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THE NETHERLANDS

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Jomar Ragnhildstveit

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Swedish Geological Survey

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United Kingdom

Phillip Stamp

Defra

Sustainable Marine Development and Climate Impacts

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Adrian Judd

Cefas

Senior Marine Advisor

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Suffolk, NR33 0HT,

UK

Tel: 01502 562244

Annex 9: Outputs from other relevant ICES working groups – Benthos Ecology Working Group (BEWG)

The Benthos Ecology Working Group (BEWG) held its 2008 meeting at the International Marine Centre (IMC) in Torregrande, Sardinia, Italy from the 21 – 25 April 2009

The working group completed "the assessment of changes in the distribution and abundance of marine species in the OSPAR maritime area in relation to changes in hydrodynamics and sea temperature". The BEWG followed the lines of the Study Group on Working Hypotheses Regarding Effects of Climate Change (SGWRECC) and identified the major ways that benthic communities could be altered by the effects of climate change. All hypotheses were put into a conceptual model. The BEWG further reviewed the compilation of long-term series of benthic fauna in the OSPAR regions.

The JAMP Eutrophication Monitoring guidelines for benthos and the Epifaunal guidelines were amended. A draft of the guidelines on phytobenthos was presented.

Projects linking benthos with fishery and aquaculture were discussed. These include Ecosystem Approach to Sustainable Aquaculture (ECASA), which is a pan-European study that focused on the response of benthic indicators to fish and mollusc aquaculture activity. FishPact investigates the spatial distribution of potential impacts of bottom trawling on characteristic species of protected habitat types in the North Sea. Sustainable Use and Conservation of Marine Living Resources (SUSUSE) has a main objective for the examination of temporal and spatial mismatch between biological processes and resource exploitation as well as management action. The project is in its final phase and will now integrate the obtained information in order to develop general approaches for sustainable ecosystem management. Other highlights were two long-term studies of the benthos of the northern Spanish coasts; a scuba diver based monitoring project (TaMOs); and studies on habitat mapping (HABMAP) and wind farms (FINO1).

The climate enforced changes in the benthos in the Mediterranean to ICES waters were compared. It appears that the increase in temperature is expected to impact more in northern than in southern seas. The impacts on ecosystems (including benthos) could be stronger for enclosed (Mediterranean, Tyrrhenian, Adriatic, Baltic) than for open seas (Atlantic).

It was recognized that benthic indicators have always been a strong point, linking the work of the group to several other interested parties. The London Symposium (*Environmental Indicators: Utility in Meeting Regulatory Needs*) stressed the importance of incorporating multiple indicators. Yet, the development and selection of the right indicators to use can be a complex process and the need for appropriate frameworks, or paradigms, for organizing and selecting the right combination of indicators must also be considered. The Workshop on Benthos Related Environmental Metrics (WKBEMET) highlighted some recommendations for future research and towards management and better development of assessments. An application has been made to the EU COST initiative which, if successful, will allow the continuation of this Group.

Chair: Steven Degraer Contact: S.Degraer@mumm.ac.be

Working Group on Marine Habitat Management (WGMHM)

The Working Group on Marine Habitat Mapping (WGMHM) convened in Horta, Azores, Portugal from 31 March – 4 April 2008

Two major international marine habitat mapping programmes (both co-funded by EU Interreg) had recently been completed, whilst national programmes continued to indicate the growing importance of habitat mapping to a variety of marine environmental management issues. The BALANCE project developed the first full coverage seabed habitat map for the Baltic Sea, together with pelagic habitat maps of use in fishery management and the application of habitat mapping in spatial planning and marine protected area network design. The MESH project has compiled the first habitat maps and models for northwest Europe in the EUNIS classification system. MESH has developed a framework for international marine habitat mapping through the establishment of standard Data Exchange Formats and guidelines for habitat mapping, together with a bespoke web-based GIS application which provides a means to integrate mapping data at an international level.

The increased importance of marine habitat mapping is reflected in new EU policy mechanisms, such as the Marine Strategy Framework Directive and a proposal for an Atlas of the Oceans in its Maritime Strategy.

WGMHM identified the need for improved coordination of current national and international effort to ensure the resultant maps are fully compatible and readily accessible. This requires further work to develop common or harmonized classification schemes and to make the data from national programmes, including the WGMHM National Status Reports, available via an international web portal.

International Programmes

In addition to the BALANCE and MESH programmes reported above, several other international programmes are underway. Work for the OSPAR Convention to collate data for 16 habitats across the Northeast Atlantic is well advanced; the data are needed to contribute to assessments on the status of these habitats and will be reported in the 2010 Quality Status Report. Reports were received on mapping activities in the FP6 HERMES project (Europe-wide) and the Interreg CHARM project (English Channel), together with details of a proposed North Sea mapping and spatial management project (PLANOR). Continued development of the European EUNIS classification was noted, including advances in the classification of habitats for the Baltic Sea region. WGMHM advocated enhanced development of common classification systems, such as EUNIS.

National Programmes

WGMHM has continued to review national programmes. WGMHM has collated much useful information in its National Status Reports (metadata on mapping programmes).

Mapping strategies and survey techniques

WGMHM reviewed the use and range of marine habitat modelling techniques, recognizing its valuable role in complementing and enhancing the more costly direct habitat mapping approach. A general scheme for developing modelling procedures was proposed, and a network of marine habitat modellers advocated. Other topics

discussed included multibeam calibration using video techniques and the use of bathymetric LIDAR.

Protocols and standards for habitat mapping

A major online set of guidelines for marine habitat mapping had recently been released by the MESH project (www.searchMESH.net/mapping-guide). WGMHM reviewed the important topic of accuracy and confidence assessments in marine habitat maps. Issues about mapping error and its visualization were discussed, together with suggested ways to further improve the MESH assessment tool.

Consistent use of metadata were advocated, as this contributed to understanding the quality of the underlying data and the resultant maps.

Uses of habitat mapping in a management context

Recognizing the importance of habitat mapping to a wide range of marine management and policy contexts (as evidenced by the many programmes reviewed in the international and national reports above) WGMHM provided comments on the draft ICES Science Plan (2009–2014). More effort was needed on fishery-related impacts on the seabed and on deep-sea habitats.

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Working Group on Integrated Coastal Zone Management (WGICZM)

As mineral extraction and associated deposition are activities that can take place within the coastal zone, it is important that WGEXT keep informed of updates to the management of this sector.

The Working Group on Integrated Coastal Zone Management (WGICZM) held its annual meeting on 11–14 March 2008 in Mallorca, Spain, with a workshop on indicators held on the 13 March 2008.

As previously reported, the Integrated Coastal Zone Management (ICZM) process has been initiated in all countries that report to this WG, but different approaches were taken and different stages of the process had been reached. ICZM is perceived as a continuous and iterative process that should be adapted as more information is generated, new sectors developed and new questions are asked. All countries recognize the need for comprehensive coastal management programmes designed to resolve conflicting demands on the use of coastal resources maintain coastal biodiversity and ensure long-term economic sustainability. However, the main driving pressures may differ between countries. All countries are still struggling with implementing ICZM. GIS maps on different resource uses and in some cases on potential resource uses have been drawn up and applied in order to manage or plan activities within local areas, although it is recognized that not all management approaches can be displayed on maps and monitoring is also required.

The country reports did not include information on the integration of management of the coastal zone and it seems that the governance systems in the reporting countries are still largely uncoordinated, fragmented and ad hoc. Common to most countries is this fragmented administrative and management system for the coastal zone, but there is also inefficient collection, communication, dissemination and a lack of compatibility of available datasets. These problems are further compounded by the lack of a legal framework to support ICZM nationally and internationally, and a lack of compatibility among legislation at the national and ecoregion (ICES) levels.

Much effort has been previously put in to formulating objectives for indicators. During the 2008 meeting and associated workshop, WGICZM agreed that standardized lists of indicators might not be applicable or useful at local scales, as ICZM scenarios vary considerably among ICES countries, and therefore it was not feasible to apply a single list of indicators to all monitoring programmes. Nevertheless, it was proposed that coherent and coordinated methods of selecting and implementing indicators and selecting comparable measures whenever applicable were essential. WGICZM believe that while research into developing specific indicators is important, the development of an integrated decision-making framework will facilitate effective implementation of ICZM in ICES countries and considers this to be the main priority of the group's future work.

Other points raised during the 2008 meeting were:

- To consider the catchment-coast fluxes in ICZM management plans. Therefore closer collaboration with LOICZ (Land-Ocean Integrations in the Coastal Zone) was suggested and representatives from LOICZ were to be invited to the next meeting.
- To establish closer links with international organizations such as OSPAR, IOC and EU ICZM Expert Group.

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Working Group for Regional Ecosystem Description (WGRED)

The interest on the work of this group is to provide the characteristics of each of the different ecosystems included in the ICES zones and the impacts affecting each of them.

Last year, WGEXT considered the WGRED report from 2008. No additional report of WGRED is available for inclusion in this report.

Chair: Jake Rice Contact:ricej@dfo-mpo.gc.ca

ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea (WGIAB)

WGIAB held its meeting in 25–29 March 2008 in Öregrund, Sweden. The group provides a forum for developing and combining ecosystem based management efforts in the Baltic Sea region. The approach of WGIAB is to assess the impact of climate, fisheries and eutrophication on the ecosystem, hence not considering these most important external drivers in isolation. WGIAB supports the *ICES Baltic Fisheries Assessment Working Group* (WGBFAS), but also support related HELCOM assessment efforts such as HELCOM BIO and FISH. The group considered new work on Integrated Assessment and undertook work to assess 7 environmental systems using multivariate statistical analyses. It further considered new ecosystem structure and function within the Baltic. WGIAB will concentrate mostly on developing and conducting ecosystem modelling and developed a respective strategy. Some of this will be undertaken through a future Co-operative Research Report.

Chair: Christian Möllmann Contact: christian.moellmann@uni-hamburg.de Co-chairs: Bärbel Müller-Karulis and Juha Flinkman

Annex 10: Suggested revisions of WGEXT (2003) guidelines

(NB: Proposed changes are highlighted in yellow and printed in italics)

Extract from the Summary Record of the OSPAR Commission Meeting held in June 2003 (reference number: 2003–15):

"4.17 OSPAR therefore agreed that:

a) Contracting Parties which are coastal states of the maritime area should take the ICES Guidelines for the Management of Marine Sediment Extraction into account within their procedures for authorizing the extraction of marine sediments (including sand and gravel);

b) the procedures of such Contracting Parties for authorizing the extraction of marine sediments should also take into account the ecosystem-based approach to management of human activities;

c) when and where they consider it appropriate, such Contracting Parties should develop general plans covering the extraction of marine sediments in parts of the maritime area under their jurisdiction, in order to provide a framework for the ICES Guidelines for the management of marine sediment extraction1.

Introduction

In many countries sand and gravel2 dredged from the seabed makes an important contribution to the national demand for aggregates, directly replacing materials extracted from land-based sources. This reduces the pressure to work land of agricultural importance or environmental and hydrological value, and where materials can be landed close to the point of use, there can be additional benefits of avoiding long distance over-land transport. Marine dredged sand and gravel is also increasingly used in flood and coastal defence, fill and land reclamation schemes. For beach replenishment, marine materials are usually preferred from an amenity point of view, and are generally considered to be the most appropriate economically, technically and environmentally.

However, these benefits need to be balanced against the potential negative impacts of aggregate dredging. Aggregate dredging activity, if not carefully controlled, can cause significant damage to the seabed and its associated biota, to commercial fisheries and to the adjacent coastlines, as well as creating conflict with other users of the sea. In addition, current knowledge of the resource indicates that while there are extensive supplies of some types of marine sand, there appear to be more limited resources of gravel suitable, for example, to meet current concrete specifications and for beach nourishment.

Against the background of utilizing a finite resource, with the associated environmental impacts, it is recommended that regulators develop and work within a strate-

1 These guidelines do not relate to navigational dredging (i.e., maintenance or capital dredging).

2 It is recognized that other materials are also extracted from the seabed, such as stone shell and maerl, and similar considerations should apply to them.

gic framework which provides a system for examining and reconciling the conflicting claims on land and at sea. Decisions on individual applications can then be made within the context of the strategic framework.

General principles for the sustainable management of all mineral resources overall include:

- conserving minerals as far as possible, whilst ensuring that there are adequate supplies to meet the demands of society;
- encouraging their efficient use (and where appropriate re-use), minimizing wastage and avoiding the use of higher quality materials where lower grade materials would suffice;
- ensuring that methods of extraction minimize the adverse effects on the environment, and preserve the overall quality of the environment once extraction has ceased;
- the encouragement of an ecosystem approach to the management of extraction activities and identification of areas suitable for extraction;
- protecting sensitive areas and important habitats (such as marine conservation areas) and industries (including fisheries) and the interests of other legitimate uses of the sea;
- preventing unnecessary sterilisation of mineral resources by other forms of development.

The implementation of these principles requires knowledge of the resource, and an understanding of the potential impacts of its extraction and of the extent to which rehabilitation of the seabed is likely to take place. The production of an Environmental Statement, developed along the lines suggested below, should provide a basis for determining the potential effects and identifying possible mitigating measures. There will be cases where the environment is too sensitive to disturbance to justify the extraction of aggregate, and unless the environmental and coastal issues can be satisfactorily resolved, extraction should not normally be allowed.

It should also be recognized that improvements in technology may allow exploitation of marine sediments from areas of the seabed which are not currently commercially viable, while development of technical specifications for concrete, etc., may in future allow lower quality materials to be used for a wider range of applications. In the shorter term, continuation of programmes of resource mapping may also identify additional sources of coarser aggregates.

Scope

It is recognized that sand and gravel extraction, if undertaken in an inappropriate way, may cause significant harm to the marine and coastal environment. There are a number of international and regional initiatives that should be taken into account when developing national frameworks and guidelines. These include the Convention on Biological Diversity (CBD), EU Directives (particularly those on birds, habitats, Environmental Impact Assessment (EIA), and Strategic Environmental Assessment (SEA)—once implemented) and other regional conventions/agreements, in particular the OSPAR and Helsinki Conventions, and initiatives pursued under them. This subject, for example, has recently been included in the Action Plan for Annex V to the 1992 OSPAR Convention on the Protection and Conservation of the Ecosystems and Biological Diversity of the Maritime Area as a human activity requiring assessment. It is also recognized that certain ecologically sensitive areas may not be designated un-

der international, European, or national rules but nonetheless require particular consideration within the assessment procedures described in these Guidelines.

Administrative framework

It is recommended that countries have an appropriate framework for the management of sand and gravel extraction and that they define and implement their own administrative framework with due regard to these guidelines. There should be a designated regulatory authority to:

- issue authorization having fully considered the potential environmental effects;
- be responsible for compliance monitoring;
- develop the framework for monitoring;
- enforce conditions.

Environmental impact assessment

The extraction of sand and gravel from the seabed can have significant physical and biological effects on the marine and coastal environment. The significance and extent of the environmental effects will depend upon a range of factors including the location of the extraction area, the nature of the surface and underlying sediment, coastal processes, the design, method, rate, amount and intensity of extraction, and the sensitivity of habitats and assorted biodiversity, fisheries and other uses in the locality. These factors are considered in more detail below. Particular consideration should be given to sites designated under international, European, national and local legislation, in order to avoid unacceptable disturbance or deterioration of these areas for the habitats, species, and other designated features.

To allow the organization(s) responsible for authorizing extraction to evaluate the nature and scale of the effects and to decide whether a proposal can proceed, it is necessary that an adequate assessment of the environmental effects be carried out. It is important, for example, to determine whether the application is likely to have an effect on the coastline, or have potential impact on fisheries and the marine environment.

The Baltic Marine Environment Protection Commission (Helsinki Commission) adopted HELCOM Recommendation 19/1 on 26 March 1998. This recommends to the Governments of Contracting Parties that an EIA should be undertaken in all cases before an extraction is authorized. For EU member states, the extraction of minerals from the seabed falls within Annex II of the "Directive on the Assessment of the Effects of Certain Public and Private Projects on the Environment" (85/337/EEC) As an Annex II activity, an EIA is required if the Member State takes the view that one is necessary. It is at the discretion of the individual Member States to define the criteria and/or threshold values that need to be met to require an EIA. The Directive was amended in March 1997 by Directive 97/11/EC. Member States *have been* obliged to transpose the requirements of the Directive into national legislation *since* March 1999.

It is recommended that the approach adopted within the EU be followed. Member States should therefore set their own thresholds for deciding whether and when an EIA is required, but it is recommended that an EIA always be undertaken where extraction is proposed in areas designated *as protected* under international, European, or national rules and in other ecologically sensitive areas. For NATURA 2000 sites, Article 6 of the Habitats Directive contains special requirements in this respect. *Where*

additional specific recommendations may apply on a national basis with respect to NATURA 2000 sites, these should also be followed.

Where an EIA is considered appropriate, the level of detail required to identify the potential impacts on the environment should be carefully considered and identified on a site-specific basis. An EIA should normally be prepared for each extraction area, but in cases where multiple operations in the same area are proposed, a single impact assessment for the whole area may be more appropriate, which takes account of the potential for any cumulative impacts. In such cases, consideration should be given to the need for a strategic environmental assessment.

Consultation is central to the EIA process. The framework for the content of the EIA should be established by early consultation with the regulatory authority, statutory consultees, and other interested parties. Where there are potential transboundary issues, it will be important to undertake consultation with the other countries likely to be affected, and the relevant Competent Authorities are encouraged to establish procedures for effective communication.

As a general guide, it is likely that the following topics considered below will need to be addressed.

Description of the physical setting

The proposed extraction area should be identified by geographical location, and described in terms of:

- the bathymetry and topography of the general area;
- the distance from the nearest coastlines;
- the geological history of the deposit;
- the source of the material;
- type of material;
- sediment particle size distribution;
- extent and volume of the deposit;
- the stability and/or natural mobility of the deposit;
- thickness of the deposit and evenness over the proposed extraction area;
- the nature of the underlying deposit, and any overburden;
- local hydrography including tidal and residual water movements;
- wind and wave characteristics;
- average number of storm days per year;
- estimate of bed-load sediment transport (quantity, grain size, direction);
- topography of the seabed, including occurrence of bedforms;
- existence of contaminated sediments and their chemical characteristics;
- natural (background) suspended sediment load under both tidal currents and wave action.

Description of the biological setting

The biological setting of the proposed extraction site and adjacent areas should be described in terms of:

- the flora and fauna within the area likely to be affected by aggregate dredging (e.g. pelagic and benthic community structure), taking into account temporal and spatial variability;
- information on the fishery and shellfishery resources including spawning areas, with particular regard to benthic spawning fish, nursery areas, overwintering grounds for ovigerous crustaceans, and known routes of migration;
- trophic relationships (e.g. between the benthos and demersal fish populations by stomach content investigations);
- presence of any areas of special scientific or biological interest in or adjacent to the proposed extraction area, such as sites designated under local, national or international regulations (e.g. Ramsar sites, the UNEP "Man and the Biosphere" Reserves, World Heritage sites, Marine Protected Areas [MPAs] Marine Nature Reserves, Special Protection Areas [Birds Directive], or the Special Areas of Conservation [Habitats Directive], *Water Framework Directive, Marine Strategy Framework Directive*).

Description of the proposed aggregate dredging activity

The assessment should include, where appropriate, information on:

- the total volume to be extracted;
- proposed maximum annual extraction rates and dredging intensity;
- expected lifetime of the resource and proposed duration of aggregate dredging;
- *type of* aggregate dredging equipment to be used *(including-static or underway);*
- spatial design and configuration of aggregate dredging (i.e. the maximum depth of deposit removal, the shape and area of resulting depression); ICES 2003 WGEXT Report 75
- substrate composition on cessation of aggregate dredging;
- proposals to phase (zone) operations;
- whether on-board screening (i.e. rejection of fine or coarse fractions) will be carried out;
- number of dredgers operating at a time;
- routes to be taken by aggregate dredgers to and from the proposed extraction area;
- time required for aggregate dredgers to complete loading;
- number of days per year on which aggregate dredging will occur;
- whether aggregate dredging will be restricted to particular times of the year or parts of the tidal cycle;
- direction of aggregate dredging (e.g. with or across tide)
- *Velicity of dredging vessel*

It may be appropriate, when known also to include details of the following:

- noise emmission
- energy consumption and gaseous emissions;
- ports for landing materials;

- servicing ports;
- onshore processing and onward movement;
- project-related employment.

Information required for physical impact assessment

To assess the physical impacts, the following should be considered:

- implications of extraction for coastal and offshore processes, including possible effects on beach draw down, changes to sediment supply and transport pathways, changes to wave and tidal climate;
- changes to the seabed topography and sediment type;
- exposure of different substrates;
- changes to the behaviour of bedforms within the extraction and adjacent areas;
- potential risk of release of contaminants by aggregate dredging, and exposure of potentially toxic natural substances;
- transport and settlement of fine sediment disturbed by the aggregate dredging equipment on the seabed, and from hopper overflow or on-board processing and its impact on normal and maximum suspended load;
- the effects on water quality mainly through increases in the amount of fine material in suspension;
- implications for local water circulation resulting from removal or creation of topographic features on the seabed;
- the time-scale for potential physical "recovery" of the seabed.

Information required for biological impact assessment

To assess the biological impact, the following information should be considered:

- changes to the benthic community structure, and to any ecologically sensitive species or habitats that may be particularly vulnerable to extraction operations;
- effects of aggregate dredging on pelagic biota;
- effects on the fishery and shellfishery resources including spawning areas, with particular regard to benthic spawning fish, nursery areas, overwintering grounds for ovigerous crustaceans, and known routes of migration;
- effects on trophic relationships (e.g. between the benthos and demersal fish populations);
- effects on sites designated under local, national or international regulations (see above);
- predicted rate and mode of recolonization, taking into account initial community structure, natural temporal changes, local hydrodynamics, and any predicted change of sediment type;
- effects on marine flora and fauna including seabirds and mammals; 2003 ICES WGEXT Report 76
- effects on the ecology of boulder fields/stone reefs.

Interference with other legitimate uses of the sea

The assessment should consider the following in relation to the proposed programme of extraction:

- commercial fisheries;
- shipping and navigation lanes;
- military exclusion zones;
- offshore oil and gas activities;
- engineering uses of the seabed (e.g. adjacent extraction activities, undersea cables and pipelines including associated safety and exclusion zones);
- areas designated for the disposal of dredged or other materials;
- location in relation to existing or proposed aggregate extraction areas;
- location of wrecks and war-graves in the area and general vicinity;
- wind farms;
- areas of heritage, nature conservation, archaeological and geological importance;
- recreational uses;
- general planning policies for the area (international, national, and local);
- any other legitimate use of the sea.

Evaluation of impacts

When evaluating the overall impact, it is necessary to identify and quantify the marine and coastal environmental consequences of the proposal. The EIA should evaluate the extent to which the proposed extraction operation is likely to affect other interests of acknowledged importance. Consideration should also be given to the assessment of the potential for cumulative impacts on the marine environment. In this context, cumulative impacts might occur as a result of aggregate dredging at a single site over time, from multiple sites in proximity, or in combination with effects from other human activities (e.g. fishing, disposal of harbour dredgings, *offshore renewable energy installations*). It is recommended that a risk assessment be undertaken. This should include consideration of worst-case scenarios, and indicate uncertainties and assumptions used in their evaluation.

The environmental consequences should be summarized as an impact hypothesis. The assessment of some of the potential impacts requires predictive techniques, and it will be necessary to use appropriate mathematical models. Where such models are used, there should be sufficient explanation of the nature of the model, including its data requirements, its limitations and any assumptions made in the calculations, to allow assessment of its suitability for the particular modelling exercise.

Mitigation measures

The impact hypothesis should include consideration of the steps that might be taken to mitigate the effects of extraction activities. These may include:

- the selection of aggregate dredging equipment and timing of aggregate dredging operations to limit impact upon the biota (such as birds, benthic communities, any particularly sensitive species and habitats, and fish resources);

- modification of the depth and design of aggregate dredging operations to limit changes to hydrodynamics and sediment transport and to minimize the effects on fishing;
- spatial and temporal zoning of the area to be authorized for extraction or scheduling extraction to protect sensitive fisheries or to respect access to traditional fisheries;
- preventing on-board screening or minimizing material passing through spillways when outside the dredging area to reduce the spread of the sediment plume;
- agreeing exclusion areas to provide refuges for important habitats or species, or other sensitive areas.

Evaluation of the potential impacts of the aggregate dredging proposal, taking into account any mitigating measures, should enable a decision to be taken on whether or not the application should proceed. In some cases it will be appropriate to monitor certain effects as the aggregate dredging proceeds. The EIA should form the basis for the monitoring plan.

Authorization issue

When an aggregate extraction operation is approved, then an authorization should be issued in advance (which may take the form of a permit, licence or other form of regulatory approval). In granting an authorization, the immediate impact of aggregate extraction occurring within the boundaries of the extraction site, such as alterations to the local physical and biological environment, is accepted by the regulatory authority. Notwithstanding these consequences, the conditions under which an authorization for aggregate extraction is issued should be such that environmental change beyond the boundaries of the extraction site are as far below the limits of allowable environmental change as practicable. The operation should be authorized subject to conditions which further ensure that environmental disturbance and detriment are minimized.

The authorization is an important tool for managing aggregate extraction and will contain the terms and conditions under which aggregate extraction may take place, as well as provide a framework for assessing and ensuring compliance.

Authorization conditions should be drafted in plain and unambiguous language and will be designed to ensure that:

a) the material is only extracted from within the selected extraction site;

b) any mitigation requirements are complied with; and

c) any monitoring requirements are fulfilled and the results reported to the regulatory authority.

Monitoring compliance with conditions attached to the authorization

Monitoring compliance with conditions attached to the authorization is an essential requirement for the effective control of marine aggregate extraction is the monitoring of dredging activities to ensure conformity with the authorization requirements. This has been achieved in several ways, e.g. an Electronic Monitoring System or Black Box.

The information provided will allow the regulatory authority to monitor the activities of aggregate dredging vessels to ensure compliance with particular conditions in the authorization. The information collected and stored will depend on the requirements

of the individual authorities and the regulatory regime under which the permission is granted, e.g. EIA, Habitats, Birds Directives of the EU.

The minimum requirements for the monitoring system should include:

- an automatic record of the date, time and position of all aggregate dredging activity;
- position to be recorded to within a minimum of 100 metres in latitude and longitude or other agreed coordinates using a satellite-based navigation system;
- there should be an appropriate level of security;
- the frequency of recording of position should be appropriate to the status of the vessel, i.e. less frequent records when the vessel is in harbour or in transit to the aggregate dredging area e.g. every 30 minutes, and more frequently when dredging, e.g. every 30 seconds;

The above are considered to be reasonable minimum requirements to enable the regulatory authority to monitor the operation of the authorization in accordance with any conditions attached. Individual countries may require additional information for compliance monitoring at their own discretion.

The records can also be used by the aggregate dredging company to improve utilization of the resources. The information is also an essential input into the design and development of appropriate environmental monitoring programmes and research into the physical and biological effects of aggregate dredging, including combined/cumulative impacts (see section above).

Environmental monitoring

Sand and gravel extraction inevitably disturbs the marine environment. The extent of the disturbance and its environmental significance will depend on a number of factors. In many cases, it will not be possible to predict, in full, the environmental effects at the outset, and a programme of monitoring may be needed to demonstrate the validity of the EIA's predictions, the effectiveness of any conditions imposed on the authorization, and therefore the absence of unacceptable impacts on the marine environment.

The level of monitoring should depend on the relative importance and sensitivity of the surrounding area. Monitoring requirements should be site-specific, and should be based, wherever possible, on the findings of the EIA. To be cost effective, monitoring programmes should have clearly defined objectives derived from the impact hypothesis developed during the EIA process. The results should be reviewed at regular intervals against the stated objectives, and the monitoring exercise should then be continued, revised, or even terminated. It is also important that the baseline and subsequent monitoring surveys take account of natural variability. This can be achieved by comparing the physical and biological status of the areas of interest with suitable reference sites located away from the influence of the aggregate dredging effects, and of other anthropogenic disturbance. Suitable locations should be identified as part of the EIA's impact hypothesis.

A monitoring programme may include assessment of a number of effects. When developing the programme, a number of questions should be addressed, including:

- What are the environmental concerns that the monitoring programme seeks to address?

- What measurements are necessary to identify the significance of a particular effect?
- What are the most appropriate locations at which to take samples or observations for assessment?
- How many measurements are required to produce a statistically sound programme?
- What is the appropriate frequency and duration of monitoring?

The regulatory authority is encouraged to take account of relevant research information in the design and modification of monitoring programmes. The spatial extent of sampling should take account of the area designated for extraction and areas outside which may be affected. In some cases, it may be appropriate to monitor more distant locations where there is some question about a predicted nil effect. The frequency and duration of monitoring may depend upon the scale of the extraction activities and the anticipated period of consequential environmental changes, which may extend beyond the cessation of extraction activities.

Information gained from field monitoring (or related research studies) should be used to amend or revoke the authorization, or refine the basis on which the aggregate extraction operation is assessed and managed. As information on the effects of marine aggregate dredging becomes more available and a better understanding of impacts is gained, it may be possible to revise the monitoring necessary. It is therefore in the interest of all concerned that monitoring data are made widely available. Reports should detail the measurements made, results obtained, their interpretation, and how these data relate to the monitoring objectives.

Reporting Framework

It is recommended that the national statistics on aggregate dredging activity continue to be collated annually by the ICES Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem (WGEXT).

Definitions

In these Guideline, "marine sediment extraction" is intended to refer to the extraction of marine sands and gravels (or "aggregates") from the seabed for use in the construction industry (where they often directly replace materials extracted from land-based sources), and for use in flood and coastal defence, beach replenishment, fill and land reclamation projects.

It is recognized that other materials are also extracted from the seabed, such as stone, shell materials, and maerl, and similar considerations to those set out in the Guidelines should also apply to them. The Guidelines do not apply to navigational dredging (e.g. maintenance or capital dredging operations).

In these Guidelines, the term "authorization" is used in preference to "permit" or "license" and is intended to replace both terms. The legal regime under which marine extraction operations are authorized and regulated differs from country to country, and the terms permit and license may have a specific connotation within national legal regimes, and also under rules of international law. The term "authorization" is thus used to mean any use of permits, licenses, or other forms of regulatory approval.

The ecosystem approach will be elaborated by further work in OSPAR, ICES, *Helcom, and EU*. The following definition has been used elsewhere "the comprehensive integrated management of human activities based on best available scientific knowledge of the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity."

Revision of Guidelines

WGEXT will continue to review any new information, conclusions, and understandings from scientific research projects, any reports from countries on their experiences with the implementation of the Guidelines and, where appropriate, will revise the Guidelines accordingly.

on individual applications, and should carry out strategic environmental assessment (SEA) of those plans;

d) authorizations for the extraction of marine sediments from any ecologically sensitive site (such as a nature reserve, a national park, a NATURA 2000 site, a Ramsar site, etc.). should only be granted after:

i) consideration of an environmental impact assessment (EIA) of the effects of the extraction proposed at that site, in accordance with the ICES Guidelines; and

ii) for such Contracting Parties as are EU Member States, where the site is designated under the EC Habitats Directives[1], the proposal for the extraction of marine sediments has been subject to the procedures laid down in Article 6 of that Directive;

1 Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

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iii) for other such Contracting Parties, where a site is subject to protective measures, but over-riding public interests require the extraction of marine sediments with a consequential significant adverse impact on the site, all necessary steps are taken to avoid adverse impacts on the functioning of the ecosystem of which it forms part and, where the site has been designated as an OSPAR marine protected area, on the coherence of the OSPAR network of marine protected areas."

REVIEW OF IMPLEMENTATION OF ICES GUIDELINES FOR THE MANAGEMENT OF MARINE SEDIMENT EXTRACTION

ICES WGEXT will be considering how the 2003 "ICES Guidelines for the Management of Marine Sediment Extraction" are regarded and used across member countries during our 2010 meeting. The group would be extremely grateful if you could provide information as detailed below relating to the use of these guidelines in your country.

COUNTRY:

Approaches to implementation of ICES guidelines for the management of marine sediment extraction

(please provide details of how your country regard the 2003 ICES Guidelines with specific reference to the following questions).

1) *Has your country adopted the Guidelines?*

2) *If so how are they implemented – as guidelines (informally) or through legislation / policy (formally)?*

3) *Does your country take account of all the recommendations made in the Guidelines?*

4) *If not which sections are not relevant and why?*

5) *Are there any additional guidance your country offers which is in addition to that outlined in the ICES Guidelines?*

6) *If so what is the additional guidance? (A copy can be appended to this report where appropriate)*

7) *Does your country consider the Guidelines to be clear and up to date?*

8) *If not what specific amendments are suggested?*