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

11–15 April 2011

Delft, the Netherlands

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Executive summary

The Working Group on the effects of extraction of marine sediments on the marine ecosystem (WGEXT) met at Delft, The Netherlands, 12–15 April 2011. Thirteen participants from seven ICES member countries attended the meeting.

The objective of WGEXT is to 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.

A general pattern of reduced amounts of extracted marine sediments across member countries was identified by WGEXT, likely as a result in the economic climate. Discussion on the tools and policies to control the extraction of marine sediments were discussed but little in the way of change was reported across member countries either in their national control measures or in the use of the WGEXT 2003 Guidelines. A movement to more broad scale/ regional approaches to monitoring the affects of extraction were reported. A rapid movement away from the production of paper maps was identified but data acquisition campaigns are still taking place in a number of countries. Research into the impacts and effects of marine sediment extraction continued across member countries and a mix of national/ regional focussed and multinational programmes exist.

Reports were reviewed from fifteen (of 21) member countries. Although six member countries did not provide reports, the available data is thought to provide a representative assessment of the overall total of material extracted from the member states. Contact was made with Iceland and WGEXT look forward to welcoming representatives from Iceland and other potential new members to the next meeting.

ICES WGEXT agreed to meet again in Rouen in April 2012 as guests of the University of Rouen.

1 Opening of the meeting

The Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem (WGEXT) was welcomed to The Netherlands and to Deltares by the scientific director of Deltares, Professor Huib de Vriend as well as WGEXT members Ad Stolk (Rijkswaterstaat) and Jan van Dalfsen (Deltares) who had organised the meeting in Delft. The chair of WGEXT, David Carlin, thanked Deltares and Rijkswaterstaat for hosting the annual meeting and all countries for providing national reports. The meeting included an inspection tour of Deltares, Maasvlakte 2 and the Sand Engine Project.

Rebecca Walker was welcomed as the rapporteur of the group and the chair thanked all WGEXT members who had data and information for inclusion in the annual report in advance of the meeting.

Brigitte Lauwaert (Belgium), Carlos Hernandez (Spain), Jouko Rissanen (Finland) Poul Eric Neilsen (Denmark), Jochen Krause (Germany), Gerry Sutton (Ireland) and Mark Russell (UK) all sent their apologies for being unable to attend.

2 Adoption of the agenda

The agenda was duly adopted by WGEXT members, together with the addition of presentations from Belgium, France and The Netherlands.

3 Term of Reference (A): Provide a summary of data on marine sediment extraction for the OSPAR Region that seeks to fulfill the requirements of the OSPAR request for extraction data to be provided by ICES and take into account any feedback or comments from OSPAR from the information submitted by WGEXT 2010

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. Again as for the 2010 meeting the Portuguese representative provided data a year behind the reporting year (2009 data), however this has been included in Table 3.1 with an associated footnote. WGEXT members again attempted to contact those countries who were unable to submit data for inclusion in the annual report.

Discussion took place concerning the use of paper maps and whether the section in Table3.1 was still relevant with the development of GIS based systems to provide electronic maps on demand and the decline in printing of paper maps. It was agreed that 'data' should be added to the column to refer to the collection of new data to be used for producing electronic maps.

Available information is included in Table 3.1 below.

Table 3.1. Summary Table of National Aggregate Extraction Activities in 2010.

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/Data available	New legislation	New Policy	EIA initiated	EIA ongoing	EIA finished	EIA published
Belgium (OSPAR)	1,840,651	335,753	0	0	2,176,404	N/d	Yes[1]	No	No	Yes	Yes	Yes	Yes
Canada	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d
Denmark[2] (HELCOM)	1,500,000	100,000	6,400,000	1,000[3]	2,200,000	250,000	Yes	Yes	No	N/d	N/d	N/d	N/d
Denmark[2] (OSPAR)	1,200,000	2,300,000	800,000		4,300,000		Yes	Yes	No	N/d	N/d	N/d	N/d
Estonia [4] (HELCOM)	179,000	N/d	N/d	N/d	179,000	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d
Finland (HELCOM)	0	0	0	0	0	0	Yes	No	No	No	No	Yes	Yes
France [5] (OSPAR)	7,230,588	0	0	481,000	7,711,588	0	No	No	No	No	Yes	No	No
France (Med)	0	N/d	N/d	0	N/d	N/d	No	No	No	No	Yes	No	No
Germany (HELCOM)	1,535,479	986,251	0	N/d	2,521,730	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d
Germany (OSPAR)	60,410	834,000	N/d	N/d	894,710	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d
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	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	N/d
Ireland (OSPAR)	0	0	0	0	0	0	N/d	N/d	N/d	N/d	N/d	N/d	N/d
Latvia (HELCOM)	0	0	0	0	0	0	N/d	N/d	N/d	N/d	N/d	N/d	N/d
Lithuania (HELCOM)	N/d	110,000	N/d	N/d	110,000	N/d	No	N/d	N/d	N/d	N/d	N/d	N/d
Netherlands[6] (OSPAR)	2,799,669	22,049,597	97,683,169	226,671	122,532,435[11]	2,222,000[7]	Yes[1]	No	No	No	No	Yes	Yes
Norway (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	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	N/d
Portugal [8] (OSPAR)	134,021	0	0	0	134,021	0	No	No	No	No	No	No	No
Spain (OSPAR)	0	207,000	0	0	207,000	0	No	Yes	No	No	No	No	No
Spain (Med)	0	964,788	0	0	964,788	0	No	Yes	No	No	No	No	No

Sweden (OSPAR)	0	0	0	0	0	0	Yes	No	No	No	No	No	No
Sweden (HELCOM)	0	0	0	0	0	0	Yes	No	No	No	Yes	Yes	No
United Kingdom (OSPAR)[9]	5,987,325	450,094	135,115	0	9,700,454	3,127,920	Yes	Yes	No	Yes	Yes	Yes	Yes
United States	819,591	4,636,800	230,877	51,225	9,450,499[10]	0	No	No	No	No	No	No	No

Table Definitions

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 of the country where it was extracted.

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

[2]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.

[3] Kattegat provides all non aggregate extraction.

[4] Some known extraction activity but quantities unknown.

[5] Data relates to licensed amount rather than amount extracted, no extraction for construction and non aggregate in the Mediterranean, no information is available for extraction quantities for other sectors in the Mediterranean although sand extraction for beach replenishment is likely to have occurred.

[6] Total shell extraction including Western Scheldt and Wadden Sea.

[7] Quantity estimated based on feedback from licensees.

[8] Only historic data for 2009 is available for Portugal and this data is only from the Azores.

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

[10] Total extraction figures include 3,696,000 m^3 of marine aggregate material used to cap an open-water disposal site.

[11] Total sand-extraction figures exclude 226,671 m^3 of shells as non-aggregate material.

WGEXT will again circulate a copy of the WGEXT 2011 annual report to contact points provided by OSPAR in order that the accuracy of the information presented can be assured. Annex 9 details the OSPAR resolution identifying how they will use the WGEXT annual report and the protocol for assuring the accuracy of WGEXT data through OSPAR representatives.

Similar to previous years, a number of countries (summarised in the following Table 3.2) did not provide data to the WGEXT 2010 annual report.

Table 3.2. 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 2011)	
GREENLAND AND FAROES (DENMARK) – Data for Denmark is reported separately	
DATA ADJUSTMENTS FOR SPECIFIC COUNTRIES NECESSARY TO DISTINGUISH DATA FOR THE OSPAR REGION	
SPAIN	– Atlantic coast activities only (note separation of Mediterranean data)
FRANCE	- Atlantic and Channel coast activities only (note separation of Mediterranean data)
GERMANY	– North Sea activities only (exclude Baltic)
FINLAND	– Exclude Baltic activities
SWEDEN	- Delineate activities in the Baltic area (Kattegat) 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 in comparison to the area licensed, Table 3.3 has been updated in 2011. Table 3.3 summarises 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 3.3. Licensed area and actual areas over which extraction occurs.

	LICENSED AREA KM2*					AREA IN WHICH EXTRACTION ACTIVITIES OCCUR KM2				
COUNTRY	2004	2006	2007/08	2009	2010	2004	2006	2007/08	2009	2010
Belgium (Extraction Zone 1)	300	N/d	N/d	N/d	N/d	9	N/d	N/d	N/d	N/d
Belgium (Extraction Zone 2)	228	N/d	N/d	N/d	N/d	19	N/d	N/d	N/d	N/d
Belgium Total	528	N/d	N/d /230[1]	256	256	28	N/d	N/d /100[1]	40	N/d
Denmark	800	N/d	429	430	789	30	N/d	N/d	800	N/d
France[2]	35.43[3]	73.08[3]	72.97/74.97	74.87	67.87	N/d	N/d	N/d	N/d	N/d
Germany (OSPAR)	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d
Germany (Non OSPAR)	N/d	Nd	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d
Lithuania	N/d	Nd	N/d	N/d	70.12	N/d	N/d	N/d	N/d	N/d
Netherlands [6]	484	453	456/ 585	564	490	41	47[4]	38[4]/ 35.3[4]	86[4]	86
UK	1,257	1,316	1,344	N/d	N/d	134[5]	140[5]	134.7	N/d	N/d

Table Notes

[1] 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.

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

[3] 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 and 2008, 53.89 sand-and-gravel extraction area and 21.08 non-aggregate extraction area in 2009. 46.79 sand and gravel extraction area and 21.08 non aggregate area in 2010.

[4] 90% of material extracted in the Netherlands is taken from 7.5 km^2 (2006) and 9.2 km^2 (2007) and 8.3km^2 (2008), and 23 km^2 (2009) and 38 km^2 (2010).

[5] 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).

[6] Excludes the non aggregate shell-extraction areas due to the very small operational areas on the North Sea and not really marine extraction in the Western Scheldt and Wadden Sea.

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 and therefore not possible for all WGEXT members to provide.

WGEXT also noted and welcomed the OSPAR request for WGEXT to provide additional data on sand and gravel extraction to assist with their work assessing environmental pressure. The detail of this request is identified in Annex 9. In response, WGEXT agreed to clearly identify in the forthcoming co-operative research report the topics of interest to OSPAR in order to make the document of most use. With regard to the specific additional data requests from OSPAR, WGEXT agreed that a further explanation of how OSPAR will use the additional data requested is sought to ensure we can provide additional data in the most useful way. It was noted that all WGEXT members will be able to provide additional data as requested so again would welcome OSPAR views on providing partial data. Regarding specific additional requests for data WGEXT noted the following:

Provision of Extraction data for specific permitted dredging areas

The **Netherlands**, **Belgium** and **Denmark** can provide extraction data specific to extraction areas. Other countries including **Sweden** could also provide similar data however it is unclear on the level of data which could be provided by countries not present at the meeting. The **UK** (Crown Estate) does collect this data but it is considered it to be commercial in confidence and it therefore cannot be disseminated. Extraction statistics on a regional basis are, however, available. **France** and **Portugal** collect data on the amount extracted from particular sites at a local scale but do not centrally co-ordinate this data. **France** does have central information on the quota available for extraction at each site which could be provided.

Data on the nature of sediment extracted from permitted areas

All countries should be able to provide information on the type of material extracted i.e. sand or gravel. Greater details on sediment characteristics could be more difficult to provide but where this information is available WGEXT will attempt to provide it, including where special conditions arise, such as high levels of silica sand or volcanic sand.

Provision of maps of permitted areas and identification of dredged areas located within permitted areas

All countries should be able to provide maps of the permitted areas and in many cases the location of active dredging within the permitted area. The **Netherlands**, **Belgium**, **Denmark** and **France** maintain a database with GIS which can be used to provide various data requests. **France** can provide maps of the permitted area but not the location of dredging activity. The **UK** publish area dredged maps on an annual basis.

WGEXT will identify, where we can, updates the OSPAR QSR 2010 maps of extraction.

Provision of information on the depth of the activity

Countries which have a regulation on how deep dredging can take place below the seabed will be able to identify the permitted depth of sediment removal (e.g. **Netherlands** and **Belgium**) and those countries who limit the water depth within which dredging takes place (e.g. **Netherlands** and the 20 m depth contour rule) will similarly be able to provide this information. It is unlikely that countries will be able to provide exact figures on the depth of material extracted from permitted areas.

WGEXT agreed that the chair and rapporteur would amend the data request templates sent to all countries in advance of next year's meeting, following clarifications sought from OSPAR.

4 Term of Reference (B): Review data on (b1) marine extraction activities, (b2) developments in marine resource and habitat mapping taking into account some of the outputs of ICES WGMHM as appropriate, (b3) information on changes to the legal regime (and associated environmental impact assessment requirements) governing marine aggregate extraction

4.1 Extraction Activities (b1)

Again, WGEXT members reported very different pictures of extraction levels across member countries however it was noted that in 2010, with the exception of **Spain**, **Belgium** and the **Netherlands**, there was a general decline in levels of extraction.

An increase in the amount of marine sediment extracted was reported by the **Netherlands** as a result of the continuing infrastructure projects taking place. Belgium and Spain reported increased extraction levels

Germany reported a substantial decline in extraction amounts. Previous levels of extraction were as a result of ongoing development of a port at Jade Weser. The **UK** again reported an overall reduction in annual total amounts extracted.

No extraction occurred in **Sweden**, **Finland** or **Ireland** during 2010.

4.2 Developments in Marine Resource and Habitat Mapping (b2)

As for 2010, no new significant mapping programmes were reported by WGEXT this year, however a number of coordinated and ad-hoc programmes are still taking place. In many countries, the marine aggregate sector continues to undertake mapping to address their own resource management requirements.

In 2010, IFREMER (**France**) have finalised identification of areas of sand and gravel preferred for mining (http://www.ifremer.fr/sextant/fr/web/granulats-marins/) and atlases are in press for the Bay of Lannion and the Seine Maritime. **Portugal's** Instituto Hidrografico has completed four maps covering the northern shelf to -200m; the southern coast had been completed in previous years. Maps continue to be available on demand in the **Netherlands** using an online database. Although there have been no new, coordinated national mapping programmes in the **UK** or the **United States**, a number of discrete mapping programmes (Regional Environmental Assessments and Characterisations are taking place. Increasingly, electronic databases and GIS products are used as an alternative to traditional, printed maps. Several countries (**Denmark, Finland, Belgium, France, Estonia, Sweden, UK** and **United States**) re-

port associations with continuing regional habitat mapping initiatives. **Finland**, for example, specifically reported work, completed in 2010, on marine geology and marine biotopes and species in the Bay of Bothnia and The Kvarken Archipelago. **Sweden** continue their geological mapping programme, focussing their efforts in 2010 on the Blekinge Coast in northern Hanö Bay and in the southern Kalmar Sound between the mainland and the Öland Island.

Ongoing efforts were reported specifically in **Denmark, Belgium, France, Portugal, Sweden** and **Finland**. In **Denmark**, resource mapping of 4000 km^2 in the northern North Sea is being done in conjunction with habitat mapping, and sources of marine sand for beach nourishment are being investigated along the west coast of Jytland. Mapping is also underway along the French Aquitaine shelf and the Gulf of Lion. In **Belgium**, the Sand Fund of the Ministry of Economic Affairs continues to produce maps of extraction areas and the Management Unit of the North Sea Mathematical Models (MUMM) has continued seabed mapping in the frame of the Belgian Science Policy projects Quest4D. The **Portuguese** Hydrographic Institute is carrying out superficial sediment mapping at the scale of 1:150.000 of the mainland continental shelf.

Lithuania and **Latvia** reported that there was no mapping undertaken in 2010.

4.3 Review of Developments in National Authorisation and Administrative Framework and Procedures (b3)

The majority of WGEXT countries reported no significant changes to their approaches to regulating marine aggregate extraction through legislative of administrative mechanisms.

Spain reported a change to the law governing the marine environment transposing the Marine Strategy Framework Directive. The **UK** also reported forthcoming changes to the administrative framework relating to the regulation of marine sediment extraction in relation to the new Marine and Coastal Access Act which will enter force in 2011. The **USA** reported a change in the regulatory body for marine aggregate extraction from the defunct Minerals Management Service to the new Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE).

No reports were received from Canada, Germany, Greenland, Iceland, Ireland, Latvia, Norway or Poland.

5 Term of Reference (C): Review approaches to the management and control of marine sediment extraction including a review of approaches to monitoring the effects of this activity and the use of compliance monitoring (e.g. EMS / black box) by member countries

5.1 Review the monitoring of marine sediment extraction with regards management and control of extraction activity

The group reviewed the monitoring table from the 2010 report (ToR D), however there were no changes to report. It was therefore decided to remove this table from the 2011 report.

With regards to compliance monitoring, both the UK and the Netherlands described a move within their respective monitoring bodies to a system of more regional monitoring in place of site specific monitoring conditions. However, while there is a view to move towards this type of monitoring, no formal system has yet been put in place. It is therefore proposed to discuss changes in monitoring practices at the 2012 WGEXT meeting.

To continue to better understand different approaches to monitoring across ICES countries and to capture changes in monitoring practices (such as the UK and Netherlands evolving view described above, WGEXT decided that the following table (Table 5.1) will again be circulated in advance of the 2012 meeting, alongside existing data templates, to capture information on the approaches to monitoring undertaken in member countries who were either unable to contribute to the completion of the table produced in the 2010 report, or have changing views with regards to monitoring. WGEXT would like to collect information on the regulatory aspects of monitoring as well as the scientific details of specific monitoring programmes.

Following a review of the data received, WGEXT will decide at the 2012 meeting if similar information will be collected in future years.

Table 5.1. Monitoring template questionnaire.

PLEASE PROVIDE DETAILS ON THE APPROACHES TO HOW MONITORING PROGRAMMES ARE ORGANISED INCLUDING DETAIL ON:
Is monitoring obligatory (e.g. licence condition)
Organisation / body responsible for monitoring (state / operators)
Organisation(s) / bodies undertaking monitoring (contractors / state organisations)
Organisation / body that pays for monitoring
Organisation(s) / bodies that design(s) / revise(s) / approve(s) monitoring programmes
Organisation / body responsible for reporting monitoring
Organisation(s) / bodies responsible for evaluating monitoring
How are the results of monitoring used
How is monitoring data owned / stored / disseminated

PLEASE PROVIDE SCIENTIFIC DETAILS ON SPECIFIC MONITORING PROGRAMMES UNDERTAKEN INCLUDING DETAIL ON:
Types and conditions of monitoring: equipment, parameters to be measured, frequency of measurement
Numbers of sampling points, spacing of sampling points, replicates, geographic spread
Reporting frequency, format, requirement for publication
Revision processes i.e. how is the scope of monitoring revised (e.g. on a phased basis based on initial results, if at all).

5.2 Review of the Use of Black Box and Electronic Monitoring Systems

WGEXT discussed the utilisation of EMS / Black Box systems in Belgium, France, the Netherlands and the UK during the 2010 meeting. It was clear that there were great similarities in some aspects of how the different systems operate, principally the use of GPS to identify the location of vessel operations and GIS software to analyse data generated by these systems, but also that there are differences. The systems operating in Belgium and the Netherlands are of most similarity.

There have been no significant changes in the use of EMS and black box systems in the last year, therefore the table has been removed from the 2011 report. However, there has been one correction in the French section of the table; it is not the Ministry of the Environment who collects the data, but by the regional administrations (DREAL) or by the offices of Maritime Affaires. In addition, the USA have provided some information. EMS / back box data is often required in the USA as a permit condition, and the operator is responsible for implementation. The local permitting agency enforces/ monitors the use of the EMS / back box system on a case by case ba-

sis, with each system's setup (speed, draft, pump rate etc) being implemented as required by the permit conditions. The EMS / black box system is predominately used for compliance monitoring only, therefore the data is not generally available.

To continue to better understand different approaches to electronic compliance monitoring across ICES countries, WGEXT decided that the template on the application of Black Box/ EMS systems will again be circulated in advance of the 2012 meeting, alongside existing data templates, to capture information on systems in member countries who were unable to contribute to the completion of the 2010 table.

6 Term of Reference (D): Review and report on the outputs of national and multinational scientific programmes, research projects and monitoring programmes relevant to the assessment of environmental effects of the extraction of marine sediments

National scientific programmes with relevance to marine sediment extraction were summarised by WGEXT members and a number of presentations were given on specific projects. In **Belgium**, research, based on the yearly monitoring, is going on regarding bathymetrical changes and the influence of sand extraction on macrobenthos, epibenthos and demersal fish. A presentation was given on the effect of intensive impact on macrobenthos communities and bathymetry. In the **Netherlands,** there is extensive monitoring and research occurring in the context of the Monitoring and Evaluation Programme of Maasvlakte 2 and other sand extraction and nourishment activities, including the Sand Engine. Research is ongoing (e.g. 'Building with Nature Programme'), and results and reports will become available in the future to the scientific community, as well as to the wider public. Three presentations on the different large-scale projects were given. **France** is still engaged in the SIEGMA project undertaken in the Baie de Seine region and a presentation on this project was given. **Portugal** is involved in a project on the impact of wave modification caused by the presence of a sand pit. Results are not yet available. In the **UK,** the report on sustainability of aggregate extraction is published and publically available, as are all raw data collected during this project. Furthermore, the Guidelines for the Conduct of Benthic Studies at Aggregate Dredging Sites are published and can be consulted online. The Marine Aggregate Levy Sustainability Fund (Marine ALSF) came to an end and it is currently unclear how R&D will be funded. However, monitoring surveys will be continued by the licensed companies. In the **US,** monitoring is done as a permit condition on a case by case basis, often applied to borrow areas for beach nourishment..

No reports were received from Canada, Denmark, Germany, Estonia, Iceland, Latvia, Lithuania, Norway, Greenland and the Faeroes, Ireland or Poland.

The following projects were presented during the WGEXT meeting (further information is available by contacting the relevant ICES WGEXT member).

- Intensive sand extraction on the Buitenratel: an increase in biodiversity? (**Belgium** - Annelies De Backer)
- Can we dredge a better world? (**Netherlands** – Maarten de Jong)
- SIEGMA Project (**France** – Michel Desprez)
- The sand engine (**Netherlands** – Jan van Dalfsen)
- Strategic EIA on sand extraction (**Netherlands** – Jan Van Dalfsen)
- Preliminary results of monitoring the Maasvlakte 2 (**Netherlands** – Ad Stolk)

In addition to providing reports on national programmes of relevant research, presentations were offered by a number of WGEXT members on projects of relevance to marine sediment extraction at both a national and multinational level. In addition, outputs from the EUMARSAND Project, reported in previous WGEXT reports, have been published in a special issue of the Journal of Coastal Research (Special Issue #51).

Furthermore, information was provided concerning three European projects of relevance to WGEXT; EMODNET which is ongoing since 2009, MESMA which is ongoing from last year, and VECTORS which started in March 2011.

EMODNET – Geology

Professor Ingemar Cato gave some brief information about the EU-project EMODNET – Geology. The project is run by a consortium consisting of the national geological survey organisations of the UK, Ireland, France, Belgium, The Netherlands, Germany, Denmark, Norway, Sweden, Finland, Estonia, Latvia, Lithuania and Poland. They work together to deliver the requirements of EC Tender MARE/2008/03. The geological surveys of Europe provide an existing network (through the Association of European Geological Surveys – EuroGeoSurveys) that aims to deliver marine geological information solutions to decision makers in European government and industry, as well as providing baseline information for academic research. The contract between the EC and the EMODNET-Geology project partners was signed in July 2009. The work is in progress and several maps have been produced since the start of the project.

The objectives of the EMODNET-Geology project are to compile information held by the project partners and additional datasets that are publicly available. The outputs will be delivered through the Web using the 'OneGeology' portal. Existing metadata will continue to be stored on the EU-SEASED website, currently being developed and upgraded under the EC-funded GeoSeas project. The consortium is bringing together datasets of all available sea-bed sediments including rate of accumulation or sedimentation; sea-floor geology (including age, lithology and origin); geological boundaries and faults; rate of coastal erosion and sedimentation; geological events and event probabilities (to include information on submarine landslides, volcanic activity, earthquake epicentres); seismic profiles; minerals (including aggregates, oil and gas).

The areas covered in the first step of the project are the Baltic Sea, Greater North Sea and Celtic Sea according to the boundaries shown in Figure 1. A continuation of the project (step 2) is planned for the remaining sea-areas of EU (red and green areas in Figure 6.1).

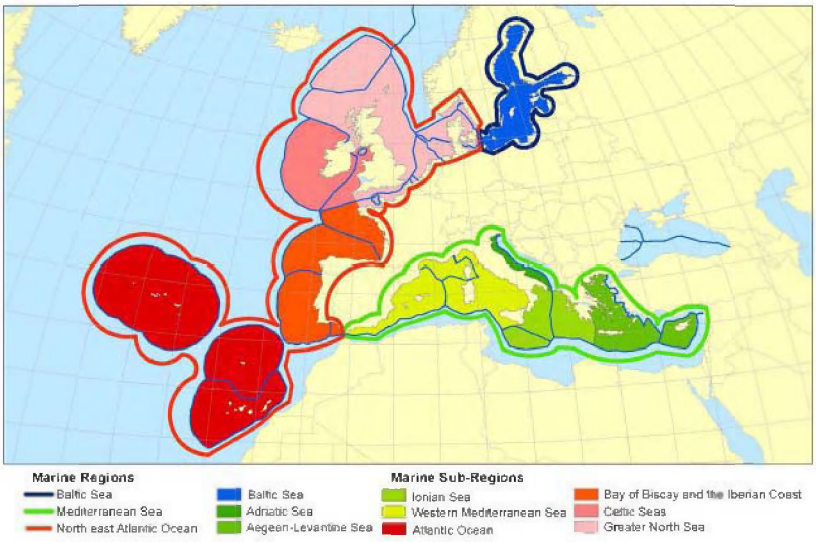

Figure 6.1. Marine Regions and Sub-Regions as defined by the Marine Strategy Framework Directive.

MESMA

The MESMA (Monitoring and Evaluation of Spatially Managed Areas) project is an project funded under 7th EU Framework Program (www.mesma.org). The project started 1st November 2009. MESMA has 18 partners from 12 EU countries. MESMA focuses on marine spatial planning and aims to produce integrated management tools (concepts, models and guidelines) for monitoring, evaluation and implementation of Spatially Managed Areas (SMAs). The project will support the formalization and implementation of EC policy and will also support integrated management plans for designated or proposed sites with assessment methods based on European collaboration. MESMA covers all EU marine waters, including the ICES area. Within the project a number of case studies will be conducted to different human pressures such as fisheries, renewable energy, shipping, aquaculture and aggregate extraction. Both the information on aggregate activities as well as the stakeholder network build up within WGEXT will be of great interest to MESMA. Some partners of WGEXT are involved in the MESMA project and will play an important role in the transfer of information of the WGEXT into the project.

VECTORS (Vectors of Change in Oceans and Seas Marine Life, Impact on Economic Sectors)

The kick off meeting for this project took place in Portugal from the 1st – 3rd March 2011. This project has members from 37 institutes from 16 countries covering the Regional Seas of the Baltic, the North Sea (including the English Channel) and the western Mediterranean. These seas provide good examples of Regional Seas where there are requirements for sustainable and profitable activity from multiple sectors including transport, fisheries, renewable energy, tourists, commerce and local stakeholders, as well the interests of a large number of EU Member States and their governments.

Specific objectives are:

- To collate understanding of the different current and potential future pressures and vectors of change in the marine environment;
- To better understand the mechanisms of changes in marine life and the role of human activity, including marine aggregate extraction;

- To determine the impacts of changes in marine life on ecosystems, their structure and functioning, the services they provide, as well as the economic and societal implications;
- To project the future changes and consequences of multi sectoral human activity in the marine environment under future possible scenarios of adaptation and mitigation;
- To synthesise the derived information into innovative predictive management tools and strategies targeted to different policy makers and other stakeholders.

COST MAGGNET

WGEXT were provided with an overview of the progress of the COST MAGGNET programme which ended in October 2010. Output of this project is limited. Only WP 1 (effects of extraction) and WP 2 (industry) might still deliver some results. There might be a possibility to finalise these sub-reports within WGEXT.

EMSAGG

The European Marine Sand and Gravel Group (EMSAGG), established in 1998 by European professionals, is an independent body which provides the marine aggregate industry with the opportunity to discuss the issues affecting this sector. EMSAGG has a website hosted by CIRIA which includes downloadable bulletins, conference reports and papers, details of members, details of relevant CIRIA publications, projects and proposals and also useful links to industry stakeholders (www.ciria.org/emsagg).

Last years' seminar was held at Futureland, Maasvlakte 2, the Netherlands in October 2010. It allowed delegates to gain an understanding of the latest environmental, technical, regulatory, economic issues relating to the Maasvlakte 2 project and to share experiences and thoughts with international peers.

6.1 Discussion on Ecological Design of Extraction Areas

During the meeting the WGEXT discussed the potential beneficial effect of landscaping extraction sites.

Traditionally, the environmental impacts of large-scale extraction operations, both in time and space, are considered negative, which has resulted in environmental policies that set restrictions and limitations to the mining operations. The goal of present regulations and the WGEXT guidelines is to en sure that the extraction is undertaken in a way that minimizes the environmental impact. This may include leave the seabed to recover naturally without intervention. The altered post-dredging situation of the borrow area, however, is rarely considered as an opportunity to improve particular environmental functions of the area, such as habitat, recreational uses and fishing. Depending the project, alterations of the water depth, morphology, local currents and sediment characteristics could be designed to create a new, different habitat for colonisation and community formation.

In France, studies at extraction sites at Dieppe (2004–2006) and at the Bay the Seine (2007 – present) showed that due to extraction, alterations of the seabed resulted in new habitats and consequently in changes in the species composition and abundance of the local fish community. These changes may be beneficial to the fishery or enhancing ecosystem function.

In the Netherlands, the innovative program, "Building with Nature", investigates the concept of ecodynamic design of marine infrastructure through a number of case studies. Two examples are the application of mega-nourishments for coastal development, and the ecological landscaping of a large, deep extraction site. These have amongst others the objective to increase the biodiversity of the impacted area.

The concept of ecological landscaping of extraction sites is inspired by terrestrial infrastructure projects, in which ecological engineering has become a standard component of licensing procedures for sand and gravel mining operations. A similar approach in the marine environment may facilitate social and political acceptance of future extraction works, thus accelerating licensing procedures and project implementation. Both present regulations and stakeholder perception may conflict with this concept. We suggest that discussions be started to explore both the negative and the positive consequences of extraction, as well as to increase awareness of the benefits of ecological landscaping.

The WGEXT recommends research aimed at assessing the opportunities for designing extraction sites in order to obtain a beneficial effect to improve in particular the ecological functions of the area or other objectives, e.g. environmental, social or economic.

7 Term of Reference (E): Continue work on a new Cooperative Research Report to cover the period 2005–2010

WGEXT discussed the production of the next Co-operative Research Report during the 2010 meeting. The group decided the report will be titled "Effects of Extraction of Marine Sediments on the Marine Ecosystem" and be published in 2012 in the *ICES Cooperative Research Report* series. The estimated number of pages is 150 and the report will be edited by the WGEXT chair.

The suggested chapters within the report will remain the same as for the 2010 suggestions. During the 2011 meeting, the group agreed that each chapter lead will circulate a chapter outline by 31 August 2011 to the rest of the members involved in that chapter in order to facilitate the chapter production. A final draft of each chapter will be sent to the group by 28 February 2012, to ensure there is sufficient time for the group to read and comment on the draft chapters ahead of the 2012 meeting. The draft report will be fully reviewed by all members during the 2012 meeting for finalisation. The chair also agreed to keep members from countries that were not present at the 2011 meeting updated on progress.

The report will consist of:

- Chapter 1. Executive Summary

  WGEXT Chair
- Chapter 2. Review of Quality, Quantity, Location and Uses of Marine Sediments Extracted

  Mark Russell (Chris Dijkshoorn, Carlos Hernandez, Laure Simplet)
- Chapter 3. Seabed Sediment (Resource) Mapping Programmes of ICES Member Countries

  Ingemar Cato (Henry Bokuniewicz, Ad Stolk, Gerry Sutton, Rui Quartau, Johan Nyberg)
- Chapter 4. Effects of Extraction Activities on the Marine Ecosystem

David Carlin (Kris Hostens, Simone Pfeifer, Jouko Rissanen, Michel Desprez, Jan van Dalfsen, Maarten de Jong, Jean-Paul Delpeche, Laura Weiss, Rebecca Walker)

- Chapter 5. Approaches to Monitoring and Mitigation of the Effects of Extraction Activities

  Jan van Dalfsen (David Carlin, Laura Weiss, Rebecca Walker, Michel Desprez, Maarten de Jong, Kris Hostens)
- Chapter 6. Aggregate Resource Management, Policy, Legislative Frameworks

  Ad Stolk (Gerry Sutton, Brigitte Lauwaert, David Carlin, Laura Weiss, Rebecca Walker)
- Chapter 7. Conclusions and Recommendations

  WGEXT Chair
- Chapter 8. References and Annexes

  Carlos Hernandez (Chapter leads)

8 Term of Reference (F): Continue to review and evaluate the use and application of the ICES WGEXT 2003 Guidelines across member countries. Continue to review and revise the Guidelines, as appropriate, with specific regard to the Marine Strategy Framework Directive. Formulate a draft resolution to ICES regarding the adoption by OSPAR of an amended version of the guidelines

WGEXT discussed the implementation of the 2003 Guidelines across member countries. All countries who provided information during the 2010 meeting (Table 8.1 below) reported the Guidelines to remain appropriately detailed, clear and up to date and used within their national procedures for marine sediment extraction. Some countries implement the Guidelines through their own guidance/legislation in support of these procedures or through acceptance of OSPAR recommendations. Finland does not officially apply the 2003 Guidelines however they have adopted HELCOM Recommendation 19/1 (1998). France reported during the 2010 meeting that there was no adoption of the Guidelines; however, during the 2011 meeting, stated that while there is no formal adoption of the Guidelines, the Guidelines are used informally by the Licensing Authority and the consultants producing EIAs.

To continue to better understand the different use of the ICES 2003 Guidelines across ICES countries, WGEXT decided to again circulate the reporting template on the use of the Guidelines in advance of the next meeting, alongside existing data templates, to capture this information from member countries who were unable to contribute to the completion of the table above. Following a review of the data received, WGEXT will decide at the 2012 meeting if similar information will be collected in future years.

Table 8.1. ICES Guidelines adoption by member countries.

	Denmark	Sweden	Netherlands	Belgium	France	Finland	UK
Has your country adopted the Guidelines?	No formal adoption	Yes	Accepted and used as recommendation of OSPAR	Accepted and used as recommendation of OSPAR	No formal adoption	No but Finland has formally adopted the HELCOM Recommendation 19/1 (1998)	Accepted and used
If so how are they implemented – as guidelines (informally) or through legislation / policy (formally)?	The principles in the ICES guidelines are integrated in the legislation.	Through legislation	Through formal Guidelines for conduct of EIA's and by licensing authority	Used by state and licensing authority	The Licensing Authority and Consultancies who produce EIAs informally follow the Guidelines	N/A	Implemented through Guidelines (MMG1)
Does your country take account of all the recommendations made in the Guidelines?	The recommendations are considered during the evaluation of an application for dredging licence.	Yes where appropriate	Yes where appropriate	Yes where appropriate	Yes – infomally used in production of EIAs and licensing.	N/A	Yes where appropriate
If not which sections are not relevant and why?	No data	N/A	N/A	N/A	N/A	N/A	N/A
Are there any additional guidance your country offers which is in addition to that outlined in the ICES Guidelines?	No data	Additional requirement under Swedish Environmental Code	Dutch policy on marine sand extraction	No	No	No	

If so what is the additional guidance? (A copy can be appended to this report where appropriate)	No data	Meetings with local people and authorities and Environmental Court	National Water Plan	N/A	N/A	N/A	Marine Minerals Guidance Note 2, Interim Marine Aggregate Dredging Policy (Wales), Guidelines on Regional Environmental Assessment, Guidance on Coastal Impact Studies, Benthic Survey Guidelines
Does your country consider the Guidelines to be clear and up to date?		Yes	Yes	Yes	Yes	N/A	Yes
If not what specific amendments are suggested?		N/A	N/A	N/A	N/A	N/A	N/A

8.1 Marine Strategy Framework Directive

WGEXT again discussed the implications of the Marine Strategy Framework Directive GES descriptor 6 on marine sediment extraction and Ad Stolk from **the Netherlands** gave a presentation on the issue. The group agreed that the recommendations made in the 2010 annual report were still relevant and reflected the agreed position of the group. WGEXT felt that where necessary any further recommendations or advice should be supplied by individual countries to their own administrations making use of the text produced by WGEXT in 2010 as appropriate. To this effect WGEXT again wished to see the previously written text repeated in the 2011 report.

Of the MSFD descriptors ICES have been requested to advise upon, the following are considered of direct relevance to the work of WGEXT.

> (6) 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.
>
> (11) Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

With respect to descriptor (6) WGEXT recognises 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 in the context of appropriate consent regimes which provide for rigorous environmental assessment and evaluation of each proposal to extract sediment, these impacts may be considered to be within environmentally acceptable limits and therefore not adverse. These assessments should take account of the 2003 "ICES Guidelines for the Management of Marine Sediment Extraction", as adopted by OSPAR, which provide for the adoption of appropriate extraction site locations, and implementation of mitigation and monitoring programmes.

WGEXT suggest that in defining "adverse" it should be accepted that direct changes to the physical structure of the seabed will result from the extraction of marine sediments. Defining "adverse" as being no environmental change from existing (predredge) 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.

With respect to descriptor (11) WGEXT recognises that extraction of marine sediment does generate underwater noise, however the impacts of this on the marine ecosystem are currently being investigated.

WGEXT also recognises that extraction of marine sediments may in combination with other anthropogenic activities have impacts on the marine environment that are relevant in the context of other MSFD descriptors, and that these are being considered by other ICES WG's under the ICES/JRC contract with DG ENV/DG MARE for scientific input to the Marine Strategy Framework Directive.

Recommendation

- ICES member countries, where necessary, to discuss the implication of MSFD GES Descriptor 6 with their own administrations using the text provided by WGEXT.

- WGEXT to continually review the implications of the MSFD with regards to marine sediment extraction.

9 Term of Reference (G): Evaluate potential for collaboration with other EGs in relation to the ICES Science Plan and report on how such cooperation has been achieved in practical terms (e.g. joint meetings, back-to-back meetings, communication between EG chairs, having representatives from own EG attend other EG meetings)

WGEXT reviewed the work of other EGs relevant to WGEXT and the link with the ICES Science Plan. The group agreed there were no significant changes to that reported last year but the group will continue to review the outputs of these groups with regard to WGEXT's own discussions.

The following groups continue to be identified as EGs with specific relevance to the work of WGEXT. Where possible, WGEXT members agreed to feed into these EGs directly or through their own professional contacts.

- Working Group on Marine Habitat Mapping (WGMHM)
- Benthic Ecology Working Group (BEWG)
- Working Group for Marine Planning and Coastal Zone Management (WGMPCZM)
- Working Group on Marine Habitat Management (WGMHM)
- ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea (WGIAB)

9.1 Promoting Cooperation between ICES EGs

It was noted by WGEXT that despite circulating the group's previous co-operative research report to other EG chairs, WGEXT had received no specific feedback.

Recognising a number of strongly aligned areas of interest of WGEXT with both the Benthic Ecology Working Group (BEWG) and Marine Habitat Mapping Working Group (WGMHM) and recommendations made at the ICES Annual Science Conference, the WGEXT chair made contact with the respective chairs of both groups. It is envisaged that a sub group of all three EGs will participate in a virtual meeting using ICES Web meeting facility later in 2011 to discuss the potential for and specific agenda points for a wider meeting of the Expert Groups.

10 Closure of the Meeting and Adoption of the Report

The group moved to adopt the final draft report and the meeting was formally closed by the chair. He thanked members of WGEXT for attending and again offered thanks to Ad Stolk, Jan van Dalfsen, Rijkswaterstaat and Deltares for hosting the meeting.

11 Annex 1: List of participants

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12 Annex 2: Agenda

Tuesday 12th April 2011	
09.00 – 09.10	Welcome by representative(s) of (Deltares/Rijkswaterstaat)
09.10 – 10.30	Welcome by WGEXT Chair
	Terms of Reference
	Adoption of Agenda
10.30 – 10.45	Coffee
11.00 – 12.30	Terms of Reference item (a) and OSPAR Summary of Extraction Statistics
12.30 – 13.30	Lunch
13.30 – 15.30	Complete Terms of Reference item (a)
15.30 – 15.45	Coffee
15.45 – 18.00	Terms of Reference (b) Review of Activities
	Aim to complete (a) and begin (b) by the end of day 1
19:30	Group meal – hosted by Rijkswaterstaat
Wednesday 13th April 2011	
08.30 – 10.15	Terms of Reference item (b)
10.15 – 10.30	Coffee
10.30 – 12.15	Complete Terms of Reference item (b)
12.15 – 13.00	Lunch
13.00 – 19.00	Field Trip to Maasvlakte 2
	Aim to complete (b), by the end of day 2
Thursday 14th April 2011	
08.30 – 10.30	Terms of Reference item (c)
10.30 – 10.45	Coffee
10.45 – 12.30	Terms of Reference item (d)
12.30 – 13.15	Lunch
13.30 – 15.30	Continue Terms of Reference item (d)
15.30 – 15.45	Coffee
15.45 – 16.30	Terms of Reference (e) update on progress
16.30 – 17.45	Terms of Reference (f) – plus presentation by Ad Stolk 'MSFD GES 6 (integrity of the sea bed) with relation to sand extraction (and coastal nourishment) in the Netherlands'

17.45 – 18.00	Presentation - Introduction to the Sand Engine Project – Jan.
18.00 – 20.00	Trip to Coastal Nourishment site
20.00 – 22.00	Evening – option for additional session to complete outstanding TORs
	Aim to begin and/or complete (c), (d), (e) and (f) by end of day 3
Friday 15th April	
08.30 – 10.30	Terms of Reference (g)
10.30 – 11.00	Coffee
11.00 – 13.00	Option for additional session to complete outstanding Terms of Reference
13.00 – 13.45	Lunch
13.45 – 15.00	Completion of outstanding action items and Recommendations for follow-up work Agree initial text of Working Group Annual Report for 2010.
15.00	Close of meeting

13 Annex 3: WGEXT draft terms of reference for the next meeting

The **Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem** (WGEXT), chaired by David Carlin, UK, will meet in Rouen, France, 23–27 April 2012 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(s) for extraction data to be provided by ICES and evaluate any feedback or comments from OSPAR on the information submitted by WGEXT 2011;

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, (b.3) information on changes to the legal regime (and associated environmental impact assessment requirements) governing marine aggregate extraction;

c) Review approaches to the management and control of marine sediment extraction including a review of approaches to monitoring the effects of this activity and the use of compliance monitoring (e.g. EMS / black box) by member countries;

d) Review and report on the outputs of national and multinational scientific programmes, research projects and monitoring programmes relevant to the assessment of environmental effects of the extraction of marine sediments;

e) Agree a final draft of a new Cooperative Research Report to cover the period 2005 to 2010 and submit this to ICES;

f) Evaluate the use and application of the ICES WGEXT 2003 Guidelines across member countries. Continue to review and revise the Guidelines, as appropriate, with specific regard to the Marine Strategy Framework Directive. Formulate a draft resolution to ICES regarding the adoption by OSPAR of any subsequently amended version of the guidelines;

g) Evaluate potential for collaboration with other EGs in relation to the ICES Science Plan and report on how such cooperation has been achieved in practical terms (e.g. joint meetings, back-to-back meetings, communication between EG chairs, having representatives from own EG attend other EG meetings);

h) Seek to elect a chair of WGEXT in advance of the 2013 meeting.

WGEXT will report by 30 June 2012 (via SSGHIE) for the attention of SCICOM.

It is proposed by WGEXT that the 2013 meeting would provisionally be held in Portugal, as guests of the Unidade de Geologia Marinha.

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	Links to following high priority research topics from ICES Science Action Plan

justification	2009–2013: Understanding of Interactions of Human Activities with Ecosystems Development of Options for Sustainable Use of Ecosystems (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) & (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 summarised. This provides a useful forum for information exchange and discussion. National reports are submitted electronically prior to the meeting. (d) To respond to any feedback received to ensure the report accurately reflect the needs of ICES and OSPAR. (e) WGEXT wish to begin 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. (f) An increasing amount of monitoring activity takes place in connection with licensed aggregate extraction across ICES member countries. WGEXT wish to consider the scientific robustness and rationale behind the design, implementation and effectiveness of such monitoring activities.
Resource requirements:	Most countries collect data and information routinely on aggregate extraction activities. The additional work in presenting these data in a standardised 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 under way and have resources committed.
Participants:	The Group is normally attended by some 20–25 members and guests.
Secretariat facilities:	None required other than services of chair and rapporteur.
Financial:	No financial implications.
Linkages to advisory committees:	SSGHIE, SCICOM
Linkages to other committees or groups:	BEWG, WGMHM, WGRED, WGPMCZM, SGCBNS, WGIAB
Linkages to other organizations:	Work is of direct interest to OSPAR and HELCOM.

14 Annex 4: Recommendations

RECOMMENDATION	FOR FOLLOW UP BY:
1. ICES member countries, where necessary, to discuss the implication of MSFD GES Descriptor 6 with their own administrations using the text provided by WGEXT.	WGEXT Members
2. WGEXT to continually review the implications of the MSFD with regards to marine sediment extraction.	WGEXT Members

15 Annex 5: Review of National Marine Aggregate Extraction Activities

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

15.1 Belgium

In Belgium the sectors of the Belgian continental Shelf where sand can be extracted are defined and limited by law. In 2010, sectors 2a and 2b were merged into 1 zone, called 2ab (not official yet). In 2010 extraction was granted in sectors 1a, 1b (March to May), 2ab (excluding the central and northern depressions), 2c and 3a (see Figure 15.1). However, no extraction is taken place in 1b and 3a. Sector 3b is still closed as this is also the largest dredge disposal site. In 2010, 4 extraction zones were delineated in sector 4 (a-d), and normally from autumn 2011 onwards permits for extraction will be ready and extraction will start. Due to the above factors the extraction was limited to zones 1a, 2ab and 2c in 2010.

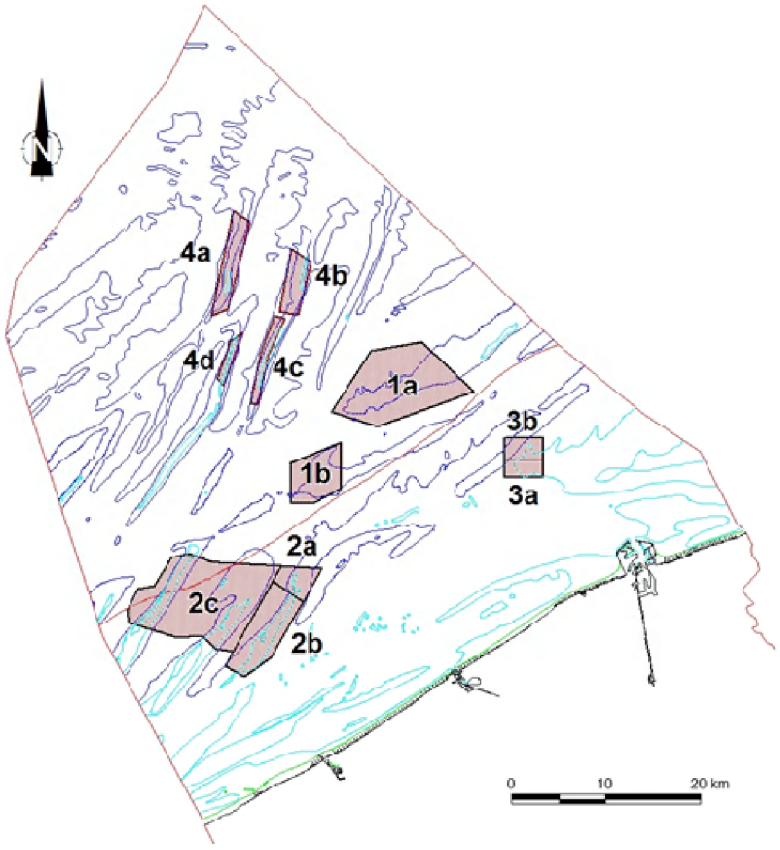

Figure 15.1. Map of permitted exploitation areas for sand and gravel on the Belgian continental shelf as defined in KB of 1 September 2004 (last adapted in 2010) and MB of 24 December 2010 (for exploitation zone 4a-d).

In 2010, 1 840 651 m^3 sand and no gravel was extracted from sectors 1 and 2 by 14 private license holders. This sand is mainly used for industrial purposes. Two licenses were also granted to the Flemish Region, Afdeling Kust and Afdeling Maritieme Toegang. 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 335 753 m^3 sand, which was used solely for beach nourishment.

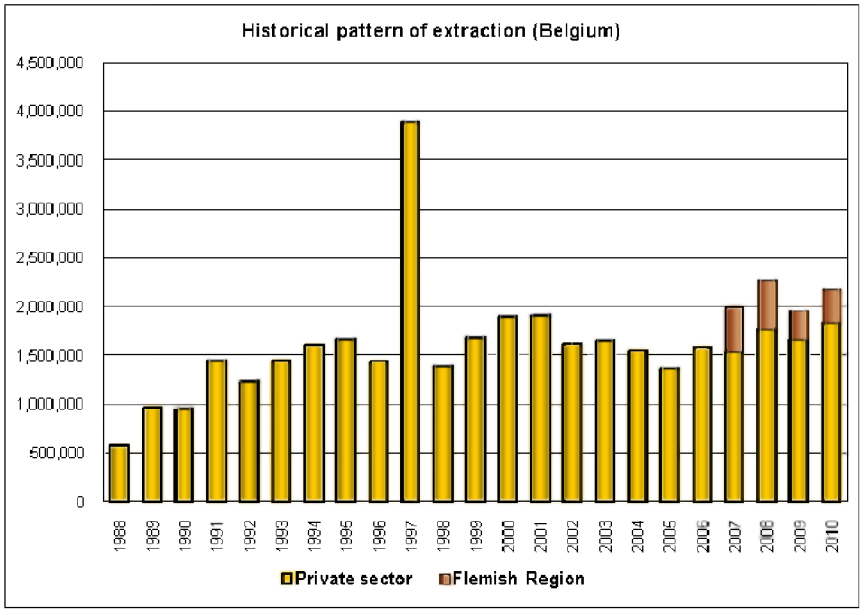

Figure 15.2. Volumes of sand and gravel extracted from the Belgian Continental Shelf between 1988 and 2010.

Although sand extraction on the Belgian continental Shelf started in 1976 and data are available since then, Figure 15.2 only includes data from 1988 onwards. From 2007 onwards the extra quantities extracted by the Flemish Region are included in the graph. The total amount of almost 2.2 Mm^3 sand extracted in 2010 from the Belgian Continental Shelf is an increase of 11 % compared to 2009 and comparable with 2008 (Figure 15.2). Most of the sand allocated to Belgian market was landed in the coastal harbors of Brugge (including the harbor of Zeebrugge), Oostende and Nieuwpoort.

The total area of the sectors where extraction was allowed in 2009 together comprised 256 km^2. A number of zones were excluded from extraction, either because deepening has exceeded the total of -5 meters (central and northern depression on Kwintebank) or because it was delineated as reference area for monitoring purposes (in zone 1a; Figure 15.3).

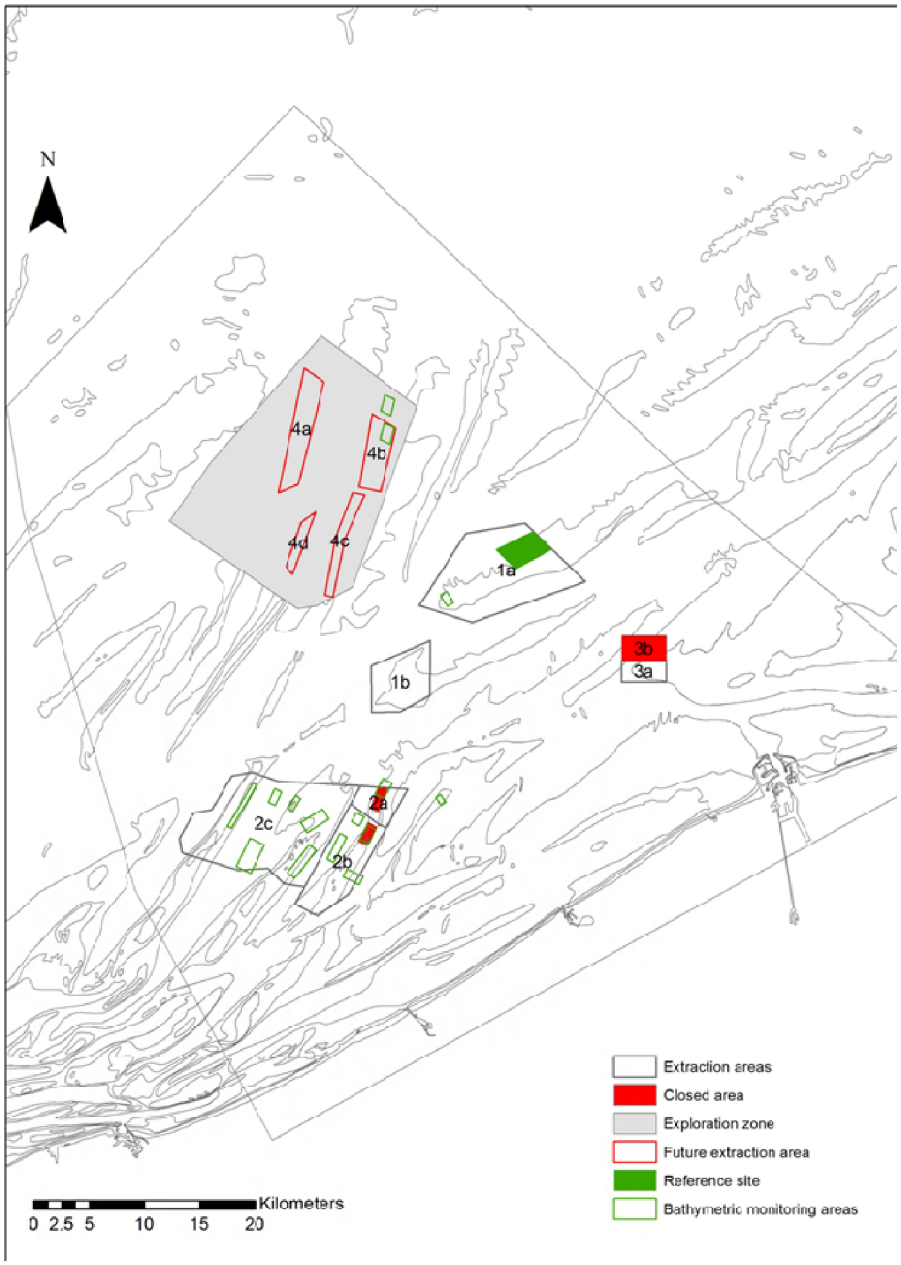

Figure 15.3. Map of aggregate exploitation zones with indication of allowed and closed zones in 2010, future extraction zones which will become open end 2011, and reference zones for biological monitoring purposes, were no extraction is allowed.

Most of the sand is extracted from the tops of the banks. Although no exact figures are available yet (the black box data can only be analysed after April, which is too late for this report), the extracted area will most probably be comparable with 2009, and will vary around 40 km^2. Most of the sand extracted in 2010 came again from the Buitenratel in sector 2c, followd by Thorntonbank (sector 1), while the importance of the Kwintebank (sector 2a) and the Oostdyck (2c) stayed low.

15.2 Canada

No information has been provided this year.

15.3 Denmark

Table 15.1. Total extracted 2010.

DREDGING AREA	AMOUNT *
Denmark total	5.7 mio. m^3
(1)OSPAR area	4.3 mio. m^3
(1)HELCOM area	2.2 mio. m^3

(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.

Table 15.2. Construction industrial aggregate (sand and gravel) extraction figures for 2010.

DREDGING AREA	AMOUNT *
Denmark total	2.3 mio. m^3
(1)OSPAR area	1.2 mio. m^3
(1)HELCOM area	1.5 mio. m^3

Table 15.3. Amount of material extracted for beach replenishment projects in 2010.

DREDGING AREA	MATERIAL	AMOUNT *
Denmark total	sand	2.3 mio. m^3
(1)OSPAR area	sand	2.3 mio. m^3
(1)HELCOM area	sand	0.1 mio. m^3

Table 15.4. Construction fill/ land reclamation (m^3) extraction figures for 2010.

DREDGING AREA	MATERIAL	AMOUNT *
Denmark total	sand	1.3 mio. m^3
(1)OSPAR area	sand	0.8 mio. m^3
(1)HELCOM area	sand	0.6 mio. m^3

Table 15.5. Non-aggregate (e.g. shell, maerl, boulders etc) extraction figures for 2010.

DREDGING AREA	MATERIAL	AMOUNT *
Kattegat	Shells	0.001 mio. m^3

Table 15.6. Exports of marine aggregate in 2010.

PORT (landing)	AMOUNT*
Sweden	0.02 mio. m^3
Germany	0.23 mio. m^3
The Netherlands	0.02 mio. m^3

Table 15.7. Historic patterns of marine aggregate extraction.

Extraction Area	1990	1991	1992–2002	Total 1990–2002
e.g. Disken	0	5.356	0	5.356

There are currently app. 100 dredging areas in Denmark. Only app. 60 areas are dredged on an annual basis.

There are currently 25 active exploration licences A limited number of exploitation applications are under consideration.

Table 15.8. Licensed area compared to area in which extraction occurs.

Country	**Licensed Area Km²***					**Area in which extraction activities occur Km²**		
	2004	**2006**	**2008**	**2009**	**2010**	**2004**	**2006**	**2009**
Denmark	800	No data	429	430	789	30	No data	No data

15.4 Estonia

In 2010 extraction of construction sand in Estonia was carried out at one deposit site (Naissaar II) located close to the Naissaar island in the Tallin and Ihasalu Bay in the Gulf of Finland (Figure 15.4 and 15.5). The extraction site covers an area of 70.12 hectares and the amount extracted was 179 000 m³ (preliminary figures).

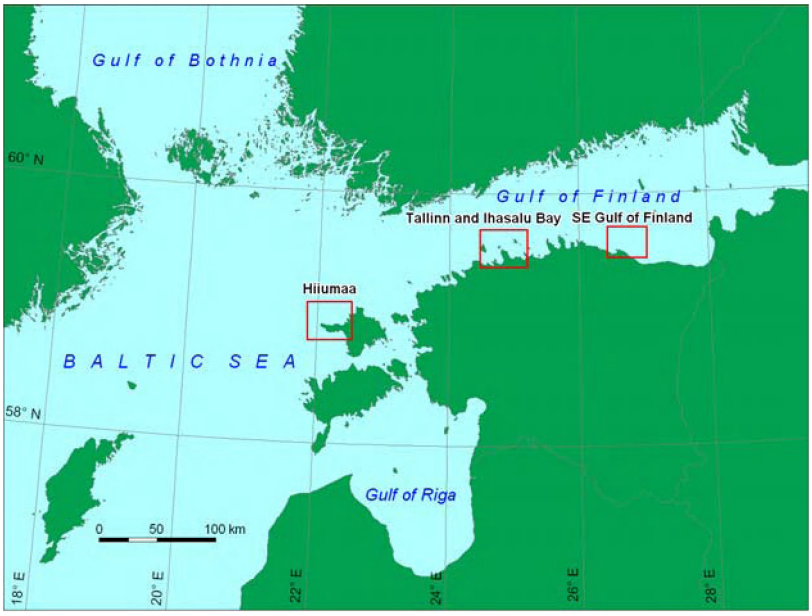

Figure 15.4. Overview map showing the Gulf of Finland and the extraction site in the middle frame.

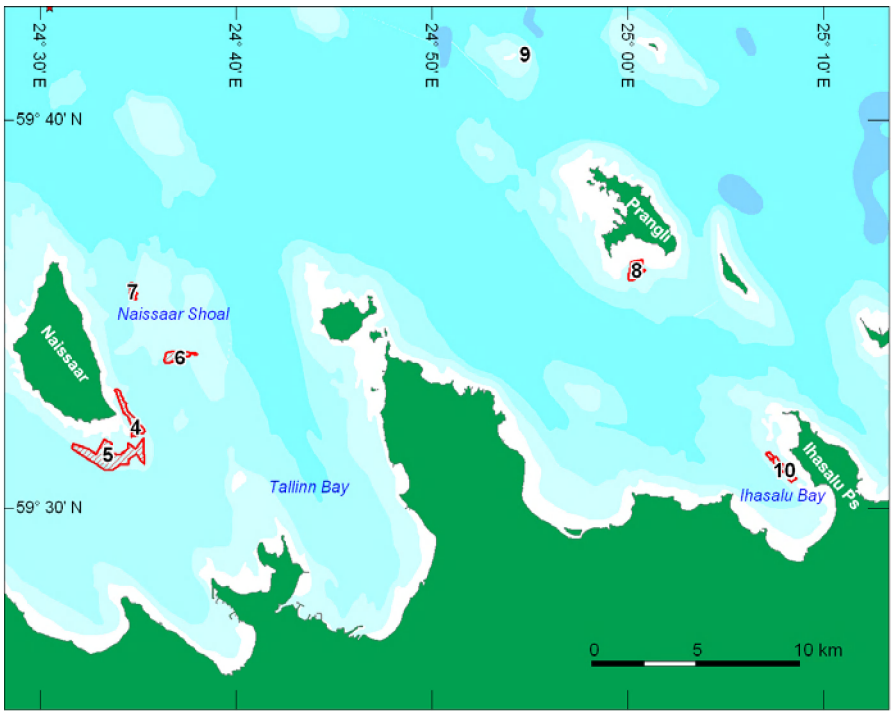

Figure 15.5. The extraction site Naissaar shoal.

No further information has been provided.

15.5 Finland

Table 15.9. Marine aggregate (sand and gravel) extraction figures for 2010.

DREDGING AREA	AMOUNT *
-	0

Only a small experimental dredging exercise off Loviisa in May 2010.

Table 15.10. Non-aggregate (e.g. shell, maerl, boulders etc) extraction figures for 20010.

DREDGING AREA	MATERIAL	AMOUNT *
-	-	0

No non-aggregate extraction activities in 2010.

Table 15.11. Exports of marine aggregate in 2008/2009.

PORT (landing)	AMOUNT*
-	0

No exports in 2010.

Table 15.12. Amount of material extracted for beach replenishment projects in 2008/2009.

DREDGING AREA	MATERIAL	AMOUNT *
-	-	0

No activities in 2010.

Table 15.13. Historic patterns of marine aggregate extraction (m^3).

EXTRACTION AREA	2000–2003	2004	2005	2006	2007–2010	TOTAL 1996–2010
Gulf of Finland	0	1 600 000	2 388 000	2 196 707	0	6 184 707

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. Since that there has not been extraction activities.

Summary of current licence position and forecasts for future exploitation of marine aggregates (e.g. 35 applications for aggregate extraction are being considered by Government Department X and 77 licences have been issued by Government Department Y)

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. Extraction has not yet started besides a small experimental dredging exercise in May 2010.

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 license application for extraction sand 3.5 Mm^3 was sent to Environment Permit Authority on 7.1.2009. However, the foundation of a new Selkämeri (Botnian Sea) national park prevented the project.

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). The EIA procedure was completed during 2009 and the report passed the examination by authorities in April 2010. The planned extraction is about 20 Mm^3. The license application is planned to be sent to authorities by the end of year 2011.

Helsinki

The licence was renewed in September 2010 for extraction of 5 Mm^3 sand.

15.6 France

Table 15.14. Construction industrial aggregate (sand and gravel) extraction figures for 2009/2010.

DREDGING AREA	AMOUNT *
Channel	1 202 588 m^3
Atlantic	5 969 000 m^3
Brittany	59 000 m^3

These figures are not extracted quantities but licence quota figures (maximum permitted).

Amount of material extracted for beach replenishment projects in 2009/2010

No data available for beach replenishment.

Construction fill/ land reclamation (m^3) extraction figures for 2008/2009

There is no activity of construction fill or land reclamation in France.

Table 15.15. Non-aggregate (e.g. shell, maerl, boulders etc) extraction figures for 2009/2010.

DREDGING AREA	MATERIAL	AMOUNT *
Brittany	Maerl	259 500 m^3
Brittany	Shelly sand	221 500 m^3

These figures are not extracted quantities but licence quota figures (maximum permitted).

Exports of marine aggregate in 2009/2010

No data available for exports of marine aggregate.

Table 15.16. Historic patterns of marine aggregate extraction.

DREDGING AREA	SITE NAME	EXTRACTED VOLUMES (m^3) in red Quotas permitted, in black Quantity really extracted										
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Atantic	Le Pilier	2124326	2271760	2092038	2163848	2491514	2465909	2358107	2466751	2239033	2267000	2267000
	Les Charpentiers	149851	199041	1500000	1500000	1500000	1500000	1500000	1500000	1500000	1500000	1500000
	Sables d'Olonne	No extraction		2349	No extraction	3387	330000	330000	330000	330000	330000	330000
	Chassiron B	Non permitted			330000	330000	330000	330000	330000	330000	330000	330000
	Chassiron C	330000	330000	330000	330000	330000	330000	330000	330000	330000	330000	330000
	Chassiron D	Non permitted			330000	330000	330000	330000	330000	330000	330000	330000
	Chassiron E	Non permitted							482000	482000	482000	482000
	Platin de Grave	117000	143000	174000	103000	400000	400000	400000	400000	400000	400000	400000
Channel	Graves-de-l'estuaire	330000	330000	330000	330000	330000	330000	330000	330000	330000	330000	330000
	Granulats Marins de Dieppe	179575	193673	167690	314857	161477	165850	347828	471200	470588	470588	470588
	Griz Nez	64287	51266	36260	35746	39388	72000	72000	72000	72000	72000	72000
	Baie de Seine	Non permitted					330000	330000	330000	330000	330000	330000
Brittany	Golfe de Saint-Malo	No extraction										License fallen due
	Ilot Saint-Michel	78081	76360	76644	75553	76680	68364	56780	75048	74955	79000	79000
	Lost Pic	130000	129625	130598	131346	123654	124077	60300	130515	129329	169500	169500
	Phare de la Croix	15100	12500	11300	12700	11500	11500	11750	12308	10461.5	11500	11500
	La Horaine	76150	68600	86205	75450	76590	71154	76754	75261.5	76558	83000	83000
	La Cormorandière	19066	21454	22322	16067	24370	22259	16126	18885	15308	22000	22000
	Le Paon	No extraction										
	Jaudy	6062	21233	10709	8070	9034	10464	12688	2110	0	End of extraction	
	Beg an Fry		15308	22111.5	22231	34446	31400	6440	20100	0	16500	16500
	Les Duons	23031	19825	25465	27801	20271	28940	10732	20913	22807	30000	30000
	Le Petit Minou		21808	21496	19315	22275	19300	22700	2272	20450	33000	33000
	Le Grand Minou											
	Kafarnao	7700	12100	7300	8500	5249	6900	6100	4140	1292	20000	20000
	Les Pourceaux		8050	1700	6385	3000	2600	600	0	300	6000	5000
	Les Glénan	87000	80710	67000	63000	55195	52000	46140	35700	39900	25000	25000
	Aber Benoît	21600	17058	No extraction								
	Aber Ildut	No extraction										
	Plateau des Fourches		1230	667	1500	1000	667	500	No extraction			
		3758829	4024601	5115855	5905369	6379030	7033384	6985545	7769204	7534982	7667088	7666088

TOTAL 2000-2010 : 69 839 974

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

22 applications (1 for exploration, 13 on actual extraction area for a renewal of license, 9 on new extraction perimeter) for aggregate extraction are being considered by Environment Ministry (MEEDDM), 28 licences and 1 prospection authorisation have been issued by local administration (Préfectures).

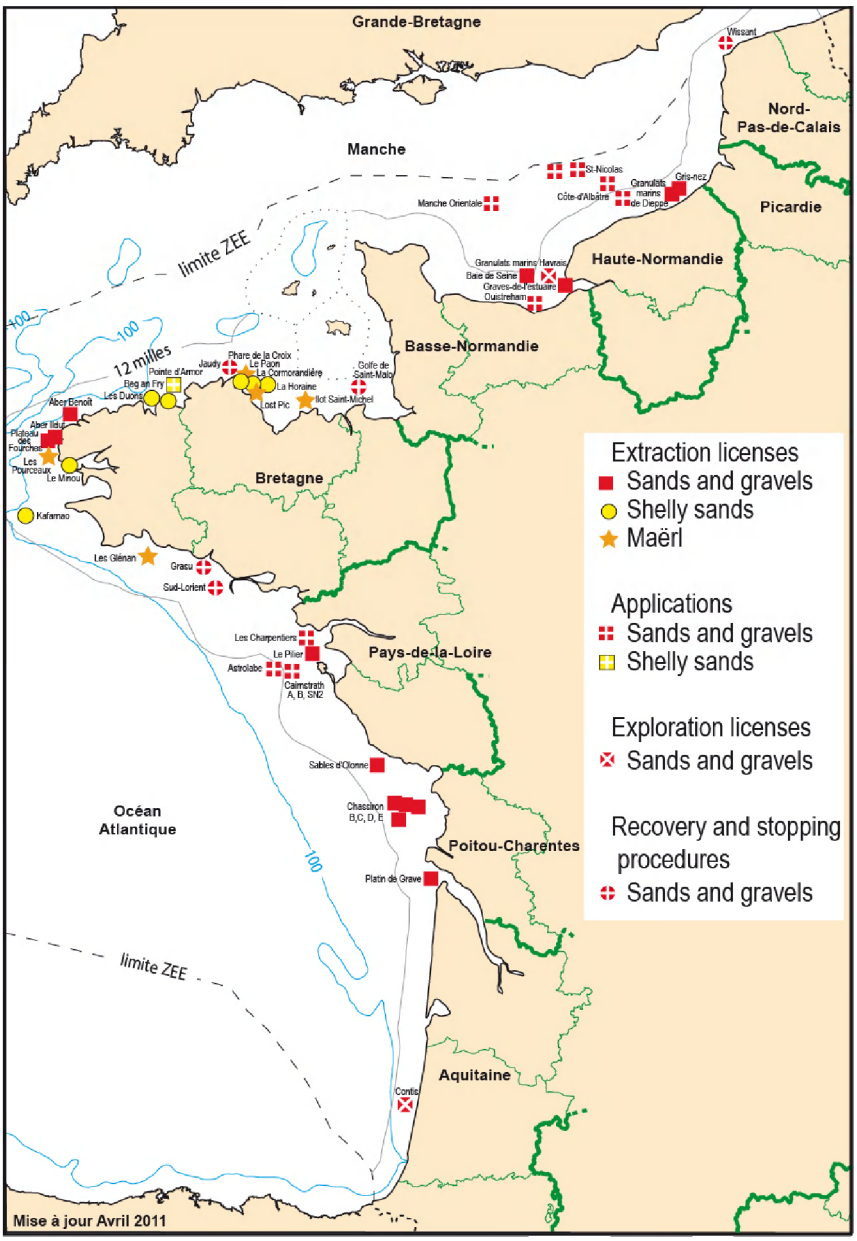

Figure 15.6. Extraction licences.

Table 15.17. Licensed area compared to area in which extraction occurs.

Country	Licensed Area Km²*			Area in which extraction activities occur Km²		
	2008	2009	2010	2008	2009	2010
FRANCE[1]	1238.2[2]	212.57[2]	109.87[2]	No data	No data	No data

15.7 Germany

OSPAR area

Replenishment: 834 300 m³

Construction: 60 410 m³

Total: 894 710 m³

The decrease compared to 2009 is due to the finalisation of the Jade Weser Port project.

HELCOM area

Replenishment: 986 251 m^3

Construction: 1 535 479 m^3

Total: 2 521 730 m^3

No further information has been provided this year.

15.8 Greenland and the Faeroes

No information has been provided this year.

15.9 Iceland

No information has been provided this year.

15.10 Ireland

No aggregate extraction activities, or non-aggregate extraction (e.g. shell, maerl, boulders etc) conducted during 2010.

15.11 Latvia

No extraction took place during 2010. Resources have been identified in the Baltic. These resources will need further investigation before exploitation takes place.

No further information has been provided.

15.12 Lithuania

Lithuania have extracted 110 000 m^3 of material from Juodkrantė for beach nourishment at Palanga. There are also plans to extract a further 300 000 m^3 for the same purpose during 2011.

15.13 The Netherlands

Table 15.18. Marine aggregate (sand) extraction figures for 2010.

DREDGING AREA	AMOUNT Mm^3
Euro-/Maas access-channel to Rotterdam	58 407
IJ-access-channel to Amsterdam	0
Dutch Continental Shelf	31 045 610
Dutch Continental Shelf / Maasvlakte 2 project	91 428 418
Total	122 532 435

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

Table 15.19. Non-aggregate (shell) extraction figures for 2010.

DREDGING AREA	MATERIAL	AMOUNT m^3
Wadden Sea	Shells	63 405
Wadden Sea inlets	Shells	74 176
Western Scheldt	Shells	9360

Voordelta of the North Sea	Shells	8640
North Sea	Shells	71 090

Description of non-aggregate extraction activities in 2010

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 2013.

These permissible amounts (in m^3) of shells to be extracted yearly from:

- the Wadden Sea max. 85 000;
- (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 85 000 up to 2013;
- the Voordelta 40 000;
- the Western Scheldt 40 000;
- the rest of the North Sea until a distance of 50 km offshore unlimited.

Table 15.20. Exports of marine aggregate in 2010.

DESTINATION/(landing)	AMOUNT (m3)*
Belgium	2 200 000
Luxembourg	12 000
France	10 000

*** Approximate figures**

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.

Table 15.21. Amount of material extracted for beach replenishment projects in 2010.

DREDGING AREA	MATERIAL	AMOUNT in Mm^3
M8D (coast of Friesland	sand	0.336
M9H (coast of Friesland)	sand	4,.587
P18K (coast of Zuid-Holland)	sand	0.009
Q5B'/Q8A' (coast of Noord-Holland)	sand	1.758
Q13K (coast of Zuid-Holland)	sand	2.675
Q16C-4 (coast of Zuid-Holland)	sand	0.081
Q16G (coast of Zuid-Holland)	sand	3.065
Q16H (coast of Zuid-Holland)	sand	4.242
S3C (coast of Zeeland)	sand	1.953
S7U (coast of Zeeland)	sand	0.294
S7W (coast of Zeeland)	sand	2.952
S7X (coast of Zeeland)	sand	0.098

Total	sand	22.050

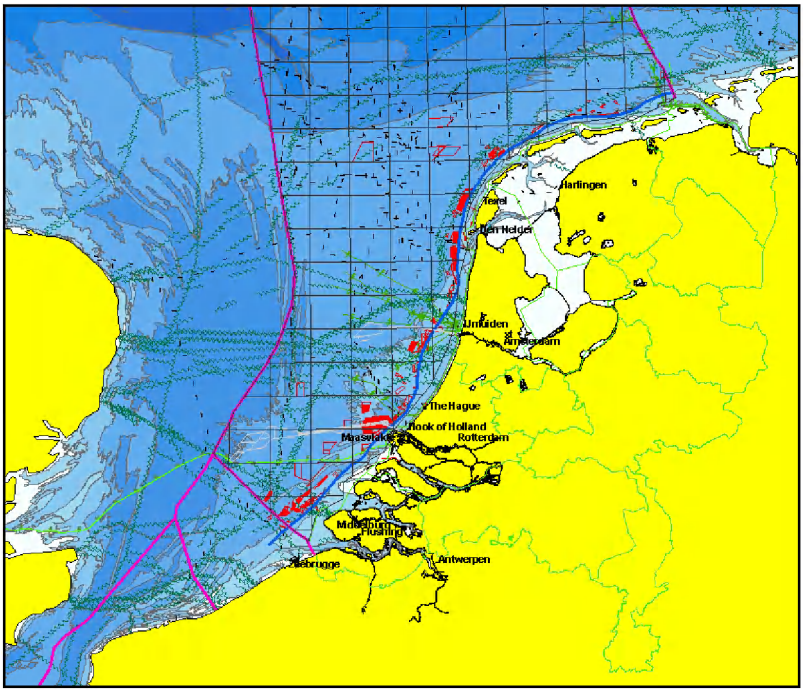

Figure 15.7. Licensed sand extraction areas 2010.

Table 15.22. Historic patterns of marine aggregate extraction in Mm³.

Extraction Area	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Euro-/Maas channel	10.32	3.90	2.94	1.23	2.32	0.49	0.65	1.94	1.22	0.06	25.07
IJ-channel	2.31	1.41	0.87	1.06	4.31	0	0	0	0	0	9.96
Dutch Continental Shelf	23.81	28.53	20.07	21.31	22.13	22.88	28.25	24.53	119.59	122.47	433.57
Total extracted	36.44	33.84	23.88	23.59	28.76	23.37	28.90	26.47	120.81	122.53	468.59

Table 15.23. Dutch sand extraction 1974–2010.

YEAR	TOTAL EXTRACTED m3	YEAR	TOTAL EXTRACTED m3
1974	2.787.962	1993	13.019.441
1975	2.230.889	1994	13.554.273
1976	1.902.409	1995	16.832.471
1977	757.130	1996	23.149.633
1978	3.353.468	1997	22.751.152
1979	2.709.703	1998	22.506.588
1980	2.864.907	1999	22.396.786
1981	2.372.337	2000	25.419.842
1982	1.456.748	2001	36.445.624

1983	2.252.118	2002	33.834.478
1984	2.666.949	2003	23.887.937
1985	2.724.057	2004	23.589.846
1986	1.955.491	2005	28.757.673
1987	4.346.131	2006	23.366.410
1988	6.954.216	2007	28.790.954
1989	8.426.896	2008	26.360.374
1990	13.356.764	2009	120.700.339
1991	12.769.685	2010	122.532.435
1992	14.795.025		

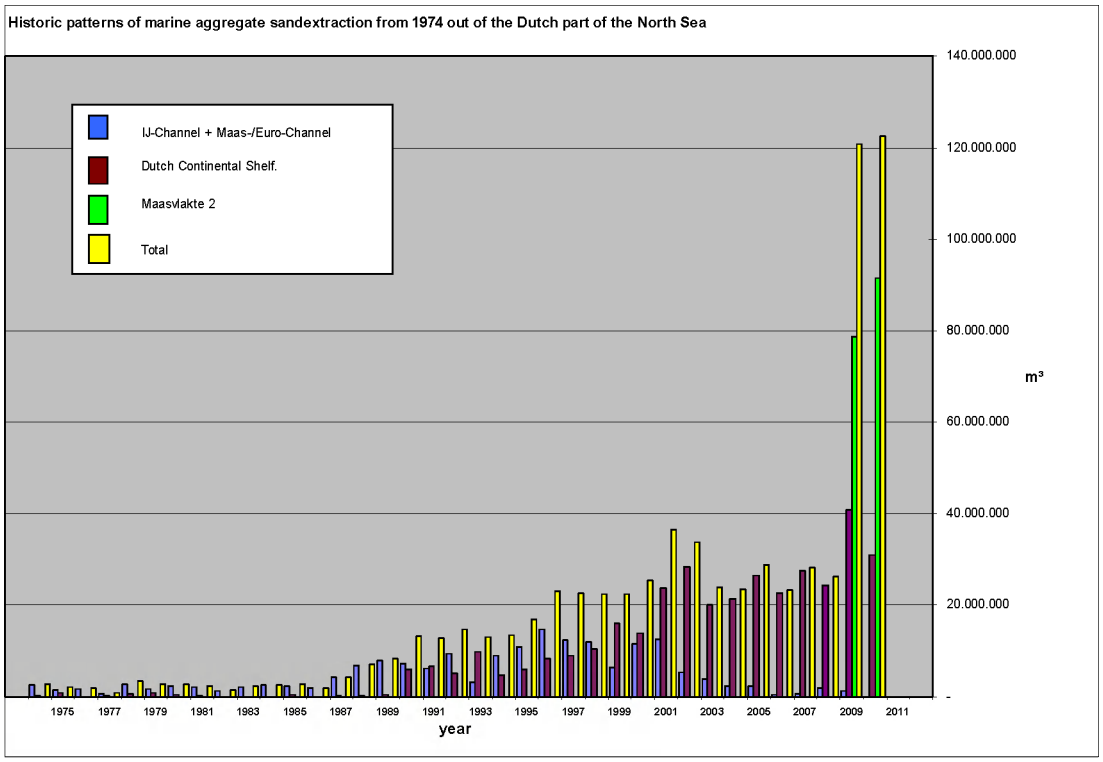

Figure 15.8. Historic patterns of marine aggregate extraction in the Netherlands.

Table 15.24. Licences considered and issued licences Rijkswaterstaat North Sea.

In the year	Amount		
1998	35	2005	33
1999	30	2006	33
2000	25	2007	24
2001	25	2008	38
2002	42	2009	23
2003	26	2010	15
2004	20		

Table 15.25. In 2010 licensed area and actual area over which extraction occurs.

Country	Licensed Area	Area in which extraction activities occur	Area in which over 90% of extracted material is taken
The Netherlands (data 2010)	490 km²	86 km²	38 km²

15.14 Norway

No information has been provided this year.

15.15 Poland

No information has been provided this year.

15.16 Portugal

Data was only received from the Azores for 2009. A total of 134 021 m³ of material was removed for construction purposes. No further information was received.

15.17 Spain

Table 15.26. Extraction data for Spain.

Country	A) Construction/ industrial aggregates (m³)	B) Beach replenishment (m³)	C) Construction fill/ land reclamation (m³)	D) Non-aggregate (m³)	E) Total Extracted (m3)	F) Aggregate exported (m³)	New Maps available	New legislation	New Policy	EIA initiated	EIA ongoing	EIA finished	EIA published
Spain (OSPAR)	0	207,000	0	0	207,000	0	no	yes[1]	no	no	no	no	no
Spain (Mediterranean)	0	964,788	0	0	964,788	0	no	Yes[1]	no	no	no	no	no

According to the Spanish coastal legislation (Law 22/1988 of July 28th), extracting activities from marine deposits are only allowed if the sediment extracted is used for the purpose of beach nourishment. In this way during 2010 one extracting activity has been registered in the Spanish OSPAR waters. It took place in Cádiz (Andalusia Autonomous Region), with a total amount of 207 000 m³ extracted from the marine deposit "Placer de Meca", next to Trafalgar Cape. The sand was destined for the replenishment of three beaches: 57 000 m³ for La Victoria beach (Cádiz), 102 000 m³ for Camposoto beach (San Fernando), and 48 000 m³ for La Barrosa beach (Chiclana).

On the Mediterranean coast there have only been extractions in front of Catalonia Autonomous Region. In particular it has been registered 10 extraction activities form a deposit located next to Premià de Mar harbour (Barcelona). The sand has been destined for the replenishment of 9 beaches of the Province of Barcelona. The amounts extracted ranged from 33 406 m³ to 154 062m³.

1 Law 41/2010 on the Protection of Marine Environment, published on 30 December 2010.

15.18 Sweden

No aggregate extraction activities, or non-aggregate extraction (e.g. shell, maerl, boulders etc) conducted during 2010.

15.19 United Kingdom

Marine aggregate (sand and gravel) extraction figures for 2010 from The Crown Estate ownership

(Includes aggregate and material for beach replenishment and fill contract)

Dredging Area	Amount (tonnes)
Humber	3 186 573
East Coast	4 871 443
Thames Estuary	688 417
East English Channel	2 409 476
South Coast	3 658 927
South West	931 951
North West	316 509
Rivers and Miscellaneous	39 458
TOTAL	16 102 754

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

Contract Fill 224 291 tonnes

Beach Replenishment 747 156 tonnes

Non-aggregate (e.g. shell, maerl, boulders etc.) extraction figures for 2010

None during 2010 from The Crown Estate ownership.

Exports of marine aggregate in 2010 from The Crown Estate ownership

Port (landing)	Amount (tonnes)
Amsterdam	1 513 107
Antwerp	337 024
Bruges	362 663
Calais	57 809
Dunkirk	253 394
Fecamp	52 280
Flushing	786 216
Gent	450 422
Harlingen	31 757
Honfleur	47 704

Le Havre	162 268
Le Treport	24 503
Ostend	469 499
River Seine Wharves	18 629
Rotterdam	414 086
Zeebrugge	210 987
TOTAL	5 192 348

Amount of material extracted for beach replenishment and contract fill projects in 2010 from The Crown Estate ownership

Dredging Area	Amount (tonnes)
Bournemouth	109 079
Brighton Outfall	27 182
Bulverhythe	15 991
Felixstowe	169 536
Lincshore	545 874
Maasvlakte	18 573
Pagham	34 699
Pevensey	33 803
Ronaldsway	9 000
Seaford	7 710
TOTAL	971 447

Historic 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	2009	2010	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	2.524.328	2.622.126	41.012.210
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	5.637.296	4.871.443	112.568.178
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	405.485	518.881	12.844.282
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	2.256.919	2.409.476	20.741.104
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	3.492.424	3.430.463	58.669.979
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	1.019.174	931.951	21.749.603
North West	284.497	275.590	355.044	316.090	421.068	482.270	470.962	558.398	611.983	608.314	633.405	432.889	271.598	307.509	6.048.515
Rivers & 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	92.263	39.458	978.194
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**	**21.103.148**	**19.334.564**	**15.699.487**	**15.131.307**	**274.593.167**

Summary of current licence position and forecasts for future exploitation of marine aggregates within The Crown Estate ownership

TYPE	STATUS	No.	AMOUNT (tonnes)
Licences	Extraction licences	66	194 million (proven primary reserve aggregate (i))
	Permitted awaiting licensing	1	(ii) Not available
Applications	New applications	34	(ii) Not available
	Renewal applications	28	(ii) Not available
	Pre applications	7	(ii) Not available
Prospecting	Prospecting licences	0	Not applicable

(i) **Primary reserve now includes all proven reserves of primary sand and gravel**

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

15.20 United States

Marine aggregate (sand and gravel) extraction figures for 2010

DREDGING AREA	AMOUNT
New York Harbour	819 591 m^3 (construction aggregate)
	3 696 000 m^3 (cap material)

Description of aggregate extraction activities in 2010

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 ocean floor. The company uses the *Sandy Hook,* a 7500-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 U.S. 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 Harbor (the Ambrose Channel), washed and mixed with crush stone, if needed, at a shore side facility.

In 2010, 230 877 m^3 of sand was used to construct a salt marsh in Jamaica Bay, NY and about 3.7 million m^3 of dredged material was used to cap an open-water disposal site, six miles offshore referred to as the Historic Area Remediation Site (HARS) site. http://www.nan.usace.army.mil/business/prjlinks/dmmp/benefic/hars.htm

Non-aggregate (e.g. shell, maerl, boulders etc) extraction figures for 2010

51 225 m^3 of rock removed from channels in the Port of New York as part of the harbour-deepening was used to construct fishing reefs offshore.

Exports of marine aggregate in 2010

None.

Amount of material extracted for beach replenishment projects in 2010

DREDGING AREA	MATERIAL	AMOUNT *
New Jersey		
Long Beach Island, NJ	sand	2 300 000 m^3
Ocean City , NJ	sand	1 414 000 m^3
Sea Isle City, NJ	sand	535 000 m^3
Long Island, NY		
Orchard Beach, Bronx, NY	sand	183 540 m^3
Smith Point, NY (Moriches Inlet)	sand	16 056 m^3
Gilgo Beach and Robert Moses Field 5	sand*	194 210 m^3

*A thirteen-year-old stockpile of sand formerly dredged from the inlet at Democrats Point was allowed to be used by NY State Parks Department for beach nourishment after sever spring storm erosion.

Description of beach replenishment schemes in 2010

About 4.7 million m^3 were used for beach nourishment in the region in 2010. 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.

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 U.S. mainly because it preserves the aesthetic and recreational values of protected beaches by replicating the protective characteristics of natural beach and dune systems.

Historic patterns of marine aggregate extraction in the NE Atlantic of the USA

Excluding beach nourishment (millions of cubic meters)

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
0.2	0.8	0.8	1.5	1.7	1.4	c1.4	c1.4	c1.3	1.3	1.1	1.3	1.1	1.4	1.6	1.4	1.2	1.2	1.0	0.7	0.8

16 Annexes 6 & 7: Review of National Seabed Resource Mapping Programmes & Review of Developments in National Authorisation and Administrative Framework and Procedures

Review of National Seabed Resource Mapping Programmes

16.1 Belgium

Development of Maps by the Belgian Sand Fund

Bathymetric maps

The Sand Fund of the Ministry of Economic Affairs in the framework of their monitoring program for sand and gravel extraction are producing maps of the extraction areas on a regular basis. For all explored areas, data on bathymetry, backscatter and acoustic sediment classification are available. With the new multi beam system EM3002D on the R.V. Belgica (since 2008) detailed maps can be produced rapidly. Blackbox data revealed a steep increase in extraction activities on a small area of the Buitenratel: 116 213 m^3 in 2007, 465 048 m^3 in 2008 and 1 168 367 m^3 in 2009. Therefore a BRMC bathymetric monitoring area was created at the beginning of 2010 to control for the depth of extraction (Figure 16.1). A detailed bathymetric survey of the BRMC area was done in February 2010 and a new map has been created (Figure 16.2).

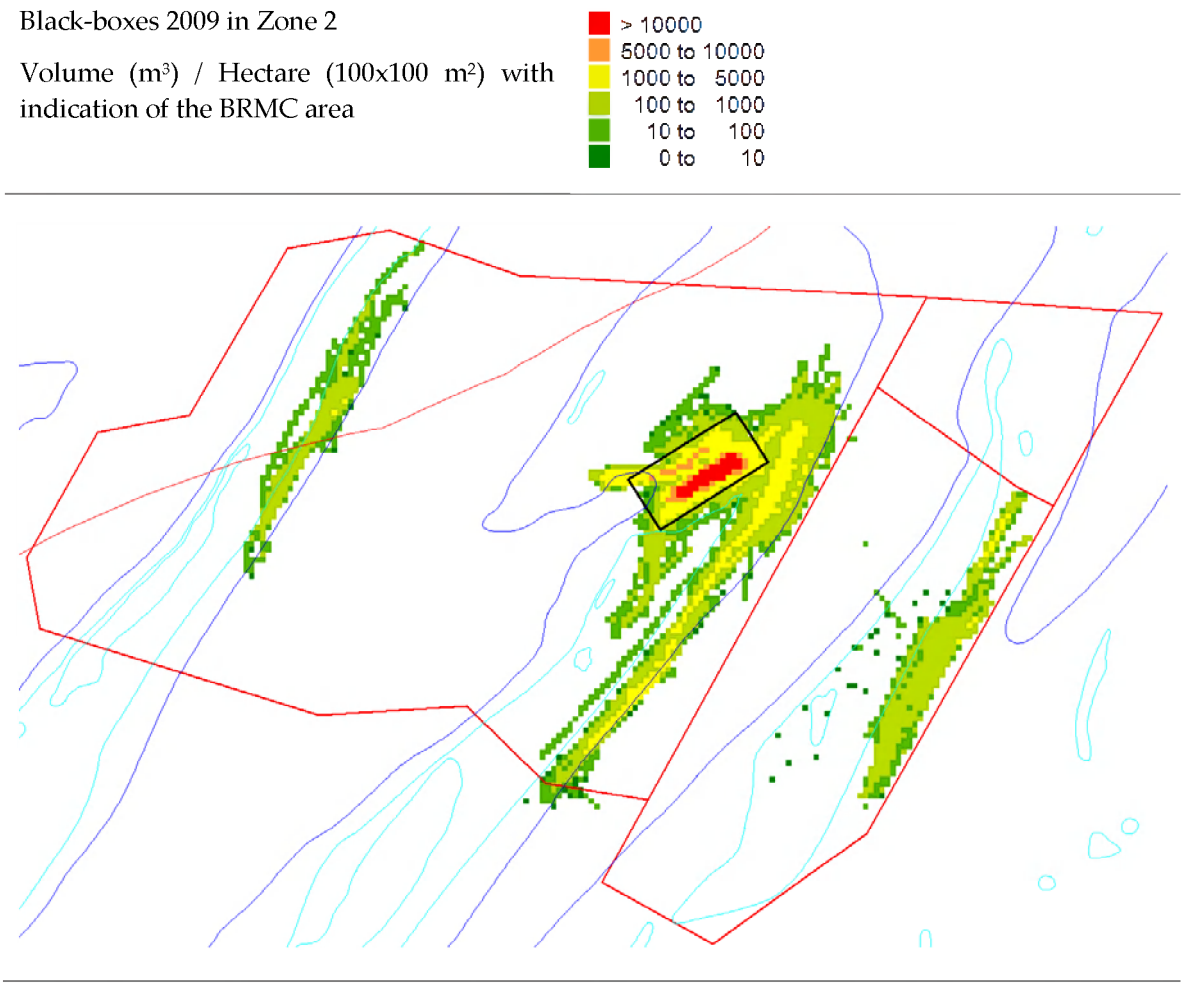

Figure 16.1. Extraction zone 2 in the Belgian part of the North Sea (BPNS) with blackbox data of 2009 and indication of the BRMC monitoring area (kindly provided by Marc Roche from FPS).

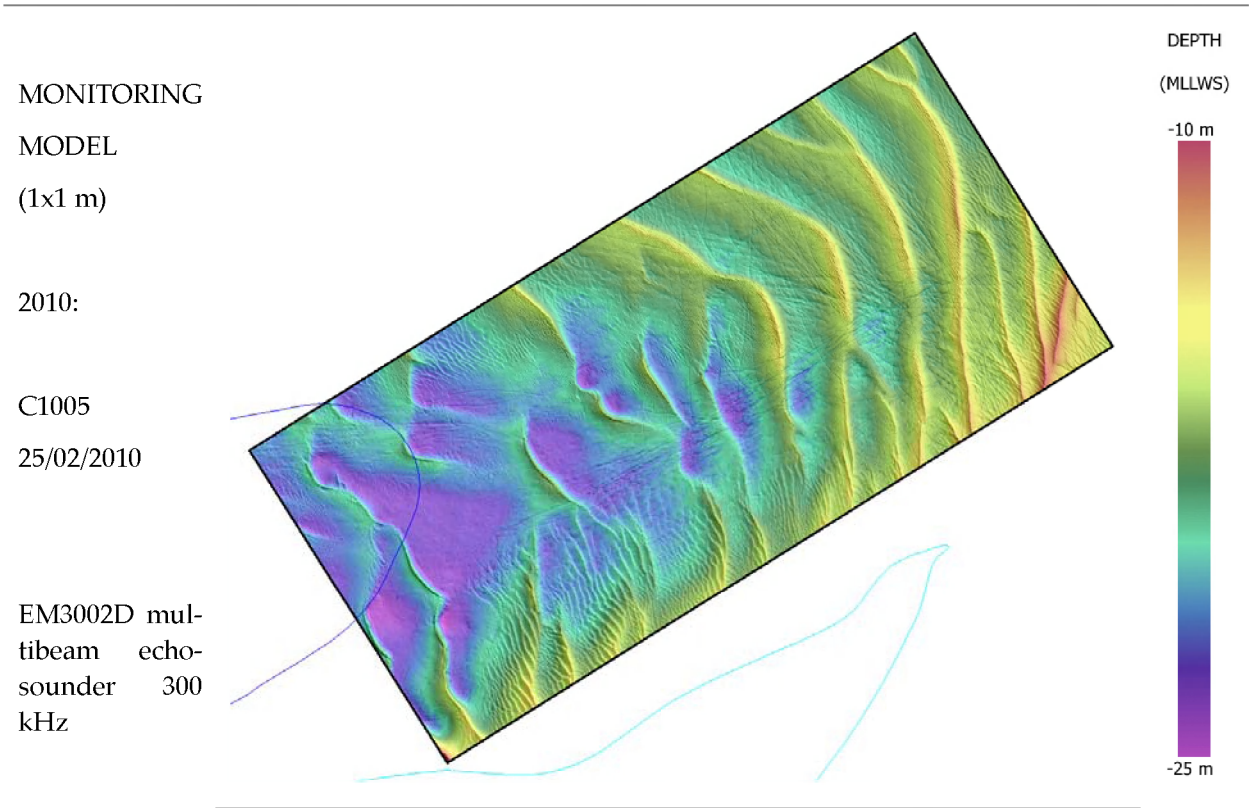

Figure 16.2. Detailed multibeam map for BRMC area on the BPNS (kindly provided by Marc Roche from FPS).

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

Delineation of new exploitation zones

In 2010, 4 new exploitation areas in the Hinderbanken area (46 km^2 in total) have been delineated (see Annex 8/ Section 17.1). Coordinates of the delineated areas have been published in MB of 24 December 2010. Extraction of the areas is currently not allowed but will probably start in the autumn of 2011.

Developments in marine resource mapping in other institutes in Belgium

The Management Unit of the North Sea Mathematical Models (MUMM) has continued seabed mapping in the frame of the Belgian Science Policy projects Quest4D (Quantification of Erosion/Sedimentation patterns to Trace the Natural from the Anthropogenically-induced Sediment dynamics,

http://www.vliz.be/projects/quest4D/) and EnSIS (Ecosystem Sensitivity of Invasive Species). Time-series of sediment volumes over sandbank areas have been acquired. Spatial distributions of the typical habitats of *Ensis directus*, the most important invasive species on the Belgian part of the North Sea have been mapped with multibeam. Similar mapping has continued of dense aggregations of the ecosystem engineers *Lanice conchilega* and *Owenia fusiformis*, both tubeworms. Within these areas, intensive

sedimentological and biological ground-truthing is being performed, as also the acquisition of current velocity data (ADCP).

For more information contact can be made directly with:

Dr. Vera Van Lancker, Royal Belgian Institute of Natural Sciences Management Unit of the North Sea Mathematical Models Gulledelle 100, 1200 Brussels, Belgium, Tel. +32 (0)2 773 21 29 Fax +32 (0)2 770 69 72, Email: vera.vanlancker@mumm.ac.be, Website http://www.mumm.ac.be

16.2 Canada

No information has been provided this year.

16.3 Denmark

Organisation(s) undertaking seabed mapping programmes

Danish Ministry of the Environment, Nature Agency is responsible for the mapping of marine aggregates.

The mapping projects are carried out by contractors.

Scope of seabed mapping programmes being undertaken in 2010

A resource mapping program including seismics, sampling and coring has been carried out in the northern North Sea covering app. 4600 km^2. The programme has been combined with a large scale habitat mapping programme in the western part of the North Sea covering app. 15 000 km^2 related to the Marine strategy Framework Directive.

A larger area along the west coast of Jutland has been carried out by the Danish Coastal Authority in order to identify suitable resources for coastal protection.

Several commercial exploitation programmes have been carried out in the period.

Published seabed resource maps in 2009/2010

None.

Future marine resource mapping programmes

The mapping in the North Sea will continue in the North Sea in 2010 with a large scale combined resource and habitat mapping project covering app. 8000 km^2.

A detailed resource mapping project will be carried out in Kattegat and the Baltic during 2010. The aim of the project is to indentify resources at greater depths than previous projects.

16.4 Estonia

Organisation(s) undertaking seabed mapping programmes

Geological Survey of Estonia

Scope of seabed mapping programmes being undertaken in 2009/2010

In 2010, seabed mapping was carried out by Geological Survey of Estonia in the Neugrund Impact structure area and surroundings. For seismoacaustic continuous profiling full spectrum subprofiler (EdgeTech 3200 XS) and low-frequency air-gun system (cooperation with Stockholm University, Sweden) were used. The 2 km profil-

ing interval was used for seismic data acquisition. Altogether 210 km of seabed was studied.

16.5 Finland

Organisation(s) undertaking seabed mapping programmes

Geological Survey of Finland (GTK)

Scope of seabed mapping programmes being undertaken in 2010

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: echo sounders, single-channel seismic and side-scan sonar and multibeam sonar equipment. 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.

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).

In the year of 2010 about 135 km^2 was surveyed in the Bay of Bothnia and 200 km^2 in the Kvarken Archipelago (Figure 16.3 below).

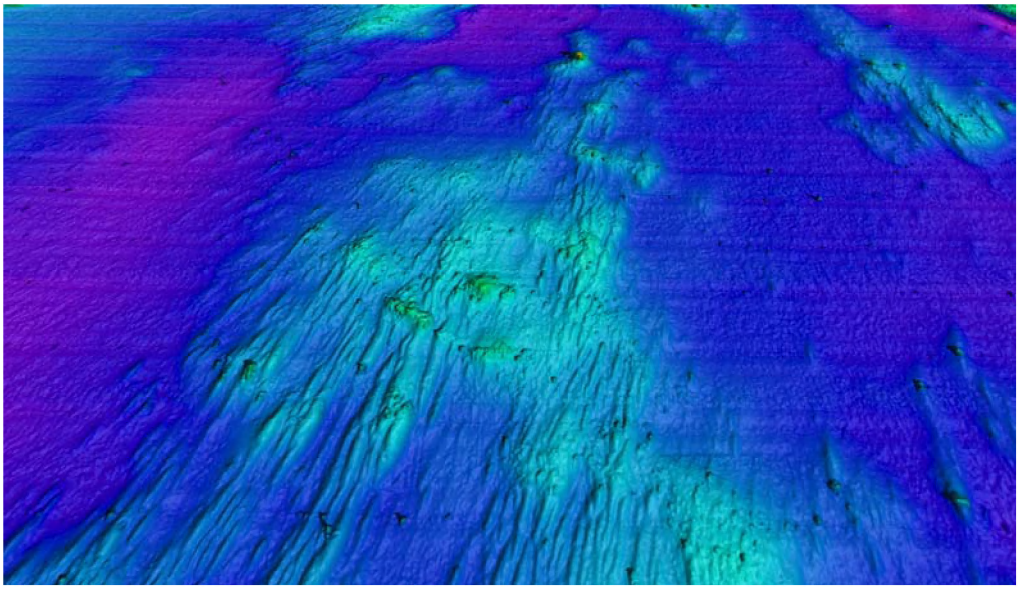

Figure 16.3. Example survey output from 2010.

Published seabed resource maps in 2010

The marine geological mapping index is shown in Figure 16.4 below.

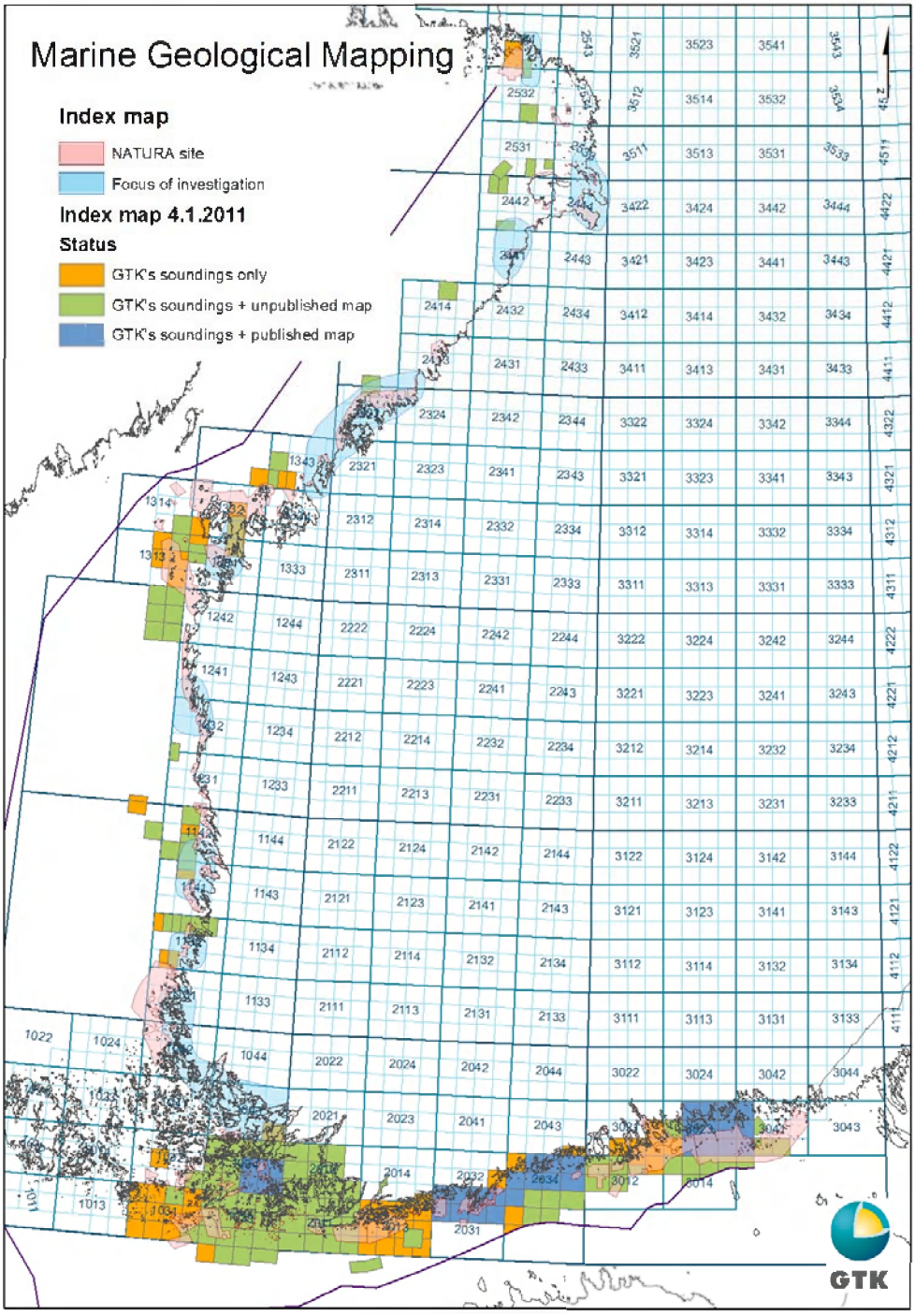

Figure 16.4. Published seabed resource maps.

Future marine resource mapping programmes

The annual goal of seabed survey is about 500 km². In the year 2011, the main focus areas are in the Gulf of Bothnia and Kvarken Archipelago. The main focus will be in the areas under utilization pressures and the new Selkämeri national park area.

16.6 France

Marine Oceanographical and Hydrographical Service (SHOM) and Ifremer have realized a 100 meters grid spacing DTM for Channel, Atlantic and Mediterranean Sea. This model, based on geostatistical analysis, is built with depth data measured during SHOM and Ifremer surveys. This bathymetric model is not yet available without SHOM agreement.

Sedimentological maps of seabed are ongoing for Gulf of Lion (Mediterranean Sea) and Aquitan Shelf (Bay of Biscay). They are made by compilation of existing data (grab samples, cores, side scan sonar, multibeam reflectivity) and with universities collaboration.

Two geological atlases of the Bay of Lannion (Brittany) and Seine Maritime coastal area are going to be published. They will provide maps on the geology of the bedrock, the bedrock top morphology, the sediment thickness, the nature of surficial sediments and the seafloor morphology.

Ifremer have finalized 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. The results are available at: http://www.ifremer.fr/sextant/fr/web/granulats-marins/

16.7 Germany

No information has been provided this year.

16.8 Greenland and the Faeroes

No information has been provided this year.

16.9 Iceland

No information has been provided this year.

16.10 Ireland

No information has been provided this year.

16.11 Latvia

No new resource mapping is licensed but previous maps are still used to identify geological deposits.

16.12 Lithuania

No mapping has taken place in Lithuania this year and none is planned for 2011.

16.13 Netherlands

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

Resource mapping is the responsibility of two organizations: the Geological Survey of the Netherlands and Deltares, a new institute that joins the forces of Delft Hydraulics, GeoDelft, parts of Rijkswaterstaat, and part of the Subsurface and Groundwater unit of TNO. The Geological Survey manages queries and analyzes the central geological database, whereas Deltares has extensive expertise in the areas of geophysical monitoring and numerical modelling.

The present mapping program for the Dutch part of the North Sea covers the entire Netherlands EEZ and the territorial sea. New data include detailed lithostratigraphic grids (flying carpets) for about half of the Dutch shelf.

In 2010, the resource mapping has concentrated on the continuation of a pilot regarding a resource-information model for the coastal zone of the Netherlands Continental Shelf, between the 15-m depth line and the 12-mile boundary. The resulting information system consists of a 3D model that can be queried to generate derivative 2D maps that contain information on total and exploitable sand thicknesses for specific locations. From these thicknesses, volumes can be calculated.

To demonstrate the usefulness of the model, four cases have been worked out. In the first case, an analysis was made of the exploitable volumes of sand if a tidal ridge is levelled completely, is lowered everywhere by 2 m, or is lowered at the top by 2 m. In the second case, a calculation was made on the loss of exploitable sand to other functions and infrastructure such as cables, pipelines, wind farms and platforms, and on the further potential loss of sand when all newly permitted cable and pipeline trajectories are claimed by their developers. In the third case, an analysis was made of the potential of geological (stratigraphical) information to assess the distribution of a coarse-grained lag deposit formed by marine reworking of glacial deposits. In the final case, three scenarios for exploitability were used to determine their influence on calculated exploitable sand volumes.

The reliability of the model, both laterally and vertically, is a function of data density and geological complexity. As a rule of thumb, the model and the 2D maps will be useful on national and regional scales. Thus, they are appropriate for strategic decision making but not for site studies.

The report on the pilot study is being translated into English and will be available in the spring of 2011.

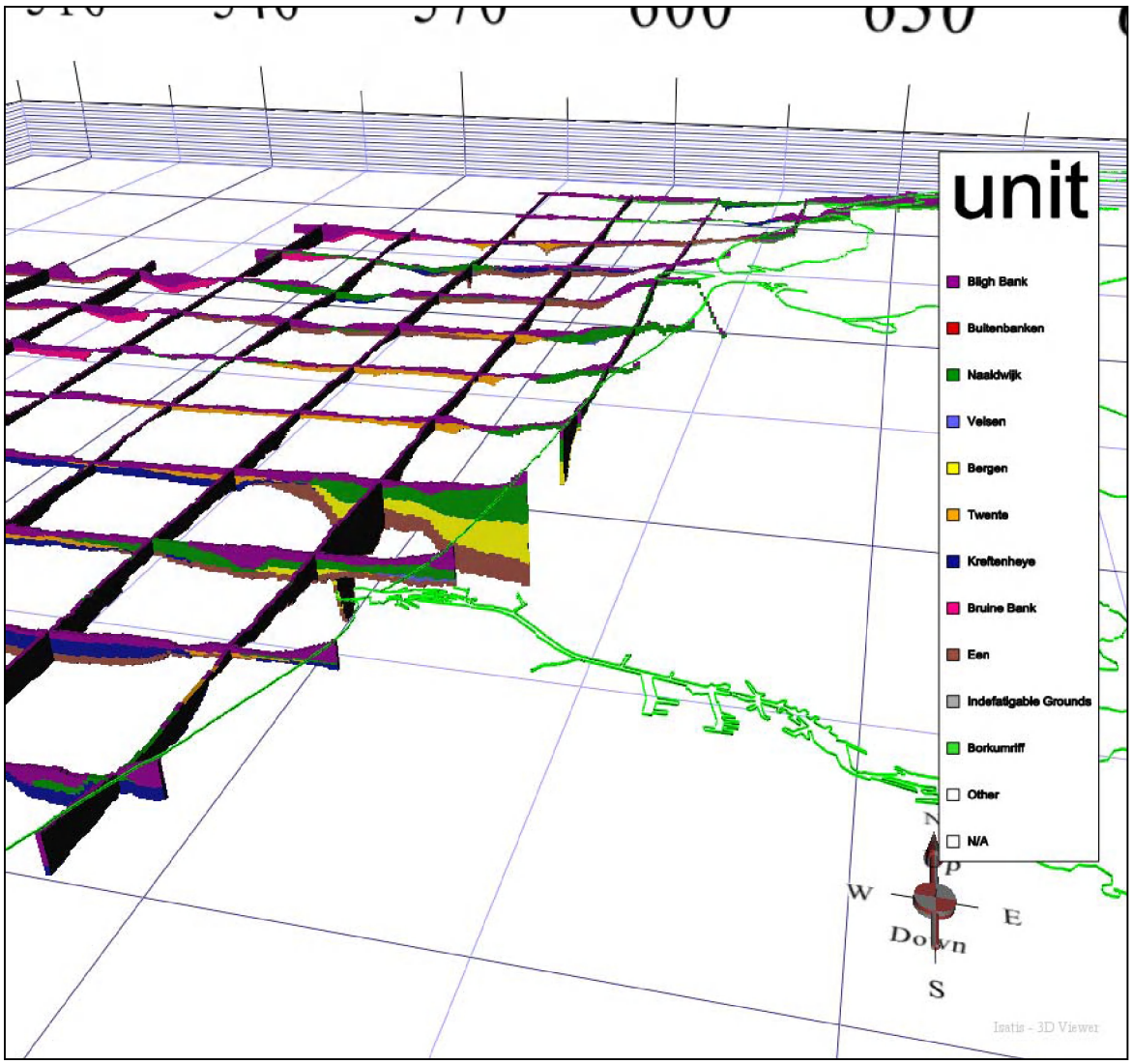

Figure 16.5. Flying-carpet model showing various stratigraphical units for part of the Dutch Shelf, and used in the assessment of aggregate resources. Rotterdam Harbor is shown as the green network of waterways in the lower half of the image. The Wadden Sea and Islands are visible on the upper right.

16.14 Norway

No information has been provided this year.

16.15 Poland

No information has been provided this year.

16.16 Portugal

Organisation(s) undertaking seabed mapping programmes

Laboratório Nacional de Energia e Geologia (LNEG). It's the Portuguese Geological Survey institute. Within the marine area it is responsible to do the geological mapping and assess the mineral resources of the submerged area under national jurisdiction (EEZ).

Instituto Hidrográfico (IH). It's the Portuguese Hydrographic Institute. It is responsible to provide the national, defence and civil, information for navigational and

other hydrographic purposes (e.g. tidal previsions, marine weather forecast, nautical and hydrographical charting).

Estrutura de Missão para a Extensão da Plataforma Continental (EMEPC). It's the Task Group for the Extension of the Portuguese Continental Shelf beyond the 200 nautical miles.

Scope of seabed mapping programmes being undertaken in 2009/2010

IH is doing superficial sediment mapping at the scale of 1:150.000 of the mainland continental shelf (8 maps). It is based on sediment sample database with samples spaced every mile in the continental shelf up to -200 m. It had already published the southern part of the shelf in previous years (4 maps) and it finished the 4 remaining northern maps in 2010 (maps 1, 2,3 and 4 in Figure 16.6).

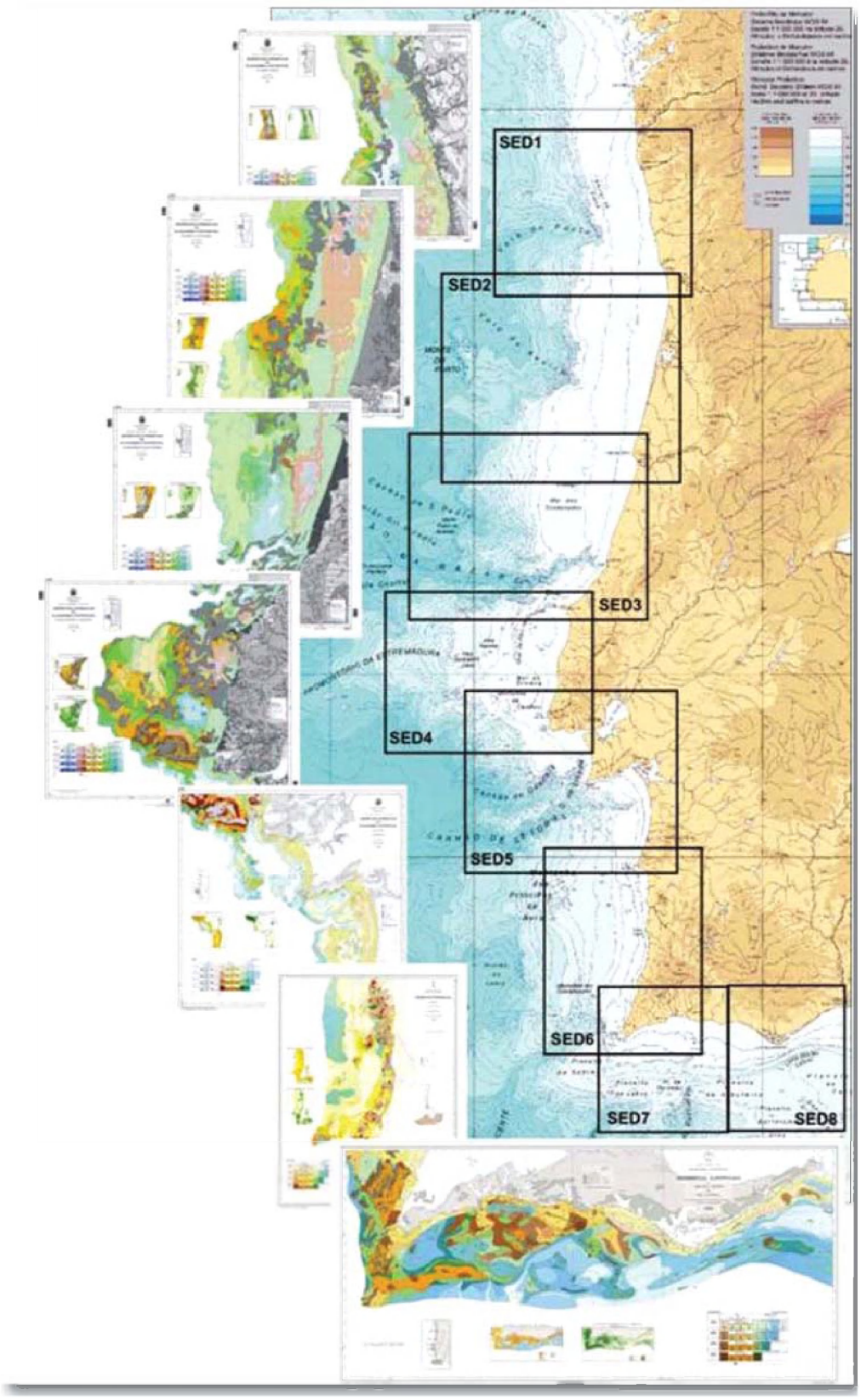

Figure 16.6. Superficial sediment mapping at the scale of 1:150.000 published by IH (from IH, 2010. Hidromar: Boletim do Instituto Hidrográfico, nº 110, II Série, Dezembro 2010. 31pp.

16.17 Spain

No mapping has taken place in Spain this year.

16.18 Sweden

The Overview Mapping Programme 1999–2008 (presentation scale 1:500 000)

The field work of this programme was ended in 2008, when the last part of the Swedish continental shelf area (162 000 sqkm) was mapped in this sparse grid. The programme was run with the same technique as the mapping programme in the scale 1:100 000 (see, below), but the grid was less dense (c. 10–12 km distance between the track lines) and fewer samples have been analysed (Figure16.7a). This means that the outcome of the project is corridors, about 1 km wide, showing the distribution of sea-bed sediments, stratigraphy, the distribution of elements and organic micro-pollutants in the topmost sediments of the corridors and the sedimentation rate.

The Swedish Marine Geological Mapping Programme (presentation scale 1:100 000)

This mapping programme started in the end of the 1970s but made a break in 1999 when the overview programme was launched, but started up again in 2007. In Figure 2 the areas that are planned to be surveyed until 2012 are illustrated. Below the activities carried out in 2010 are presented.

The Blekinge Coast 2009/2010

The fieldwork of the Swedish Marine Geological Mapping Programme was in 2009/2010 carried out along the Blekinge Coast in northern Hanö Bay and in the southern Kalmar Sound between the mainland and the Öland Island (Light blue area in the Baltic Proper, Figure 16.8). The aim of the programme is to produce a map for presentation in the scale 1:100 000; showing the distribution of the sea-bed sediments and the stratigraphy of the bottom area all the way from the shoreline of the mainland to about 2 km off the base-line. The area has been completely covered with a side scanning sonar mosaic and along the track lines shallow reflection seismic (air-gun) and sub-bottom profiling (3.5 kHz) records have been performed. In addition the distribution of 57 elements and 30 organic micro-pollutants has been investigated in the topmost sediments in accumulation areas. The sedimentation rate has been determined by 137Cs-profiles analysed on board the survey vessel, S/V Ocean Surveyor. Several 0.5 m long cores also have been recorded and analysed with digital x-ray technique (ITRAX sediment scanner) placed on board the survey vessel. This is a quality control of the sediment used for geo-chemical analyses.

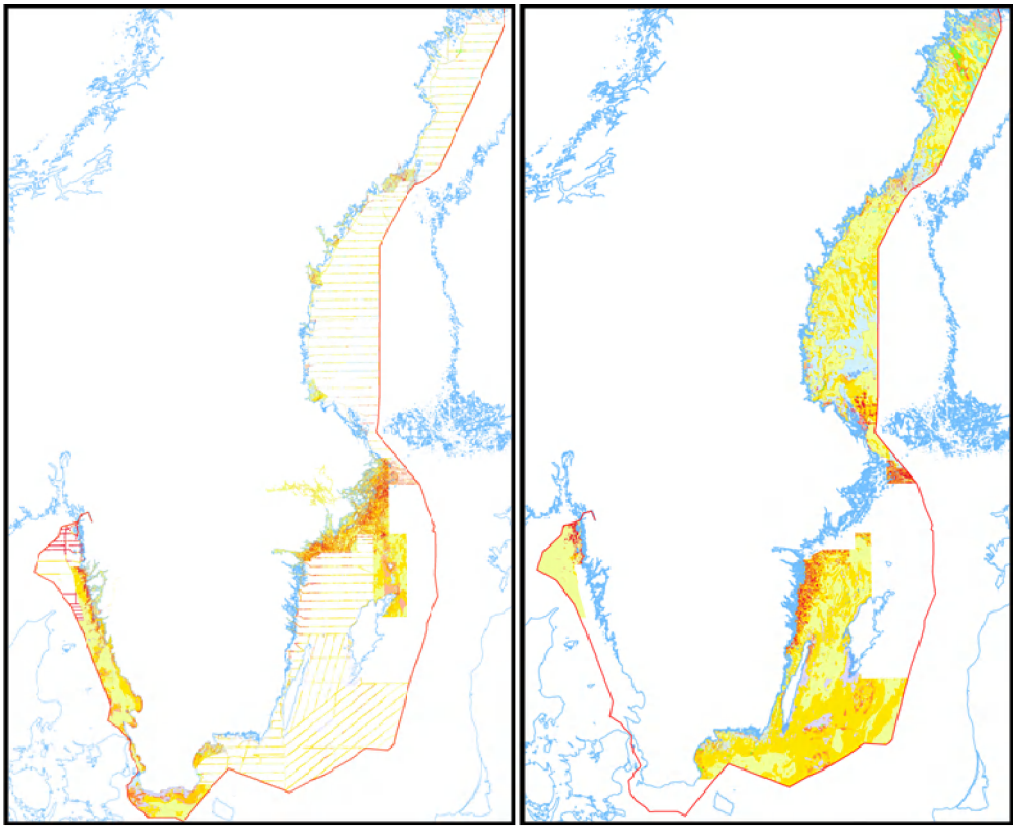

Figure 16.7.a Left: Current survey status in Sweden showing seabed sediment maps of the areas, which are compiled and presented in the scale of 1:100 000. The track-lines (corridors) were retrieved in the overview mapping programme 1999–2008.

16.7.b Right: Seabed sediment maps, in the scale 1: 500 000, over the areas covered in the overview mapping programme.

The Uppland Coast, southern Bothnian Sea 2008–2010

The fieldwork of this project started in 2008 and was finalized in 2010 (Green area in Figure 16.8). The programme was run with the same technique as the mapping described above. The Swedish EPA has plans to make a second marine national park in the Gräsö Archipelago.

The Västernorrland Coast, northern Bothnian Sea, 2010–2012

The fieldwork along the Västernorrland coast (Dark blue are in the Bothnian Sea, Figure 16.8) started in 2010 and will be run with the same aim and technique as mentioned above. The new swathsonar will be used in the shallower parts along the coast.

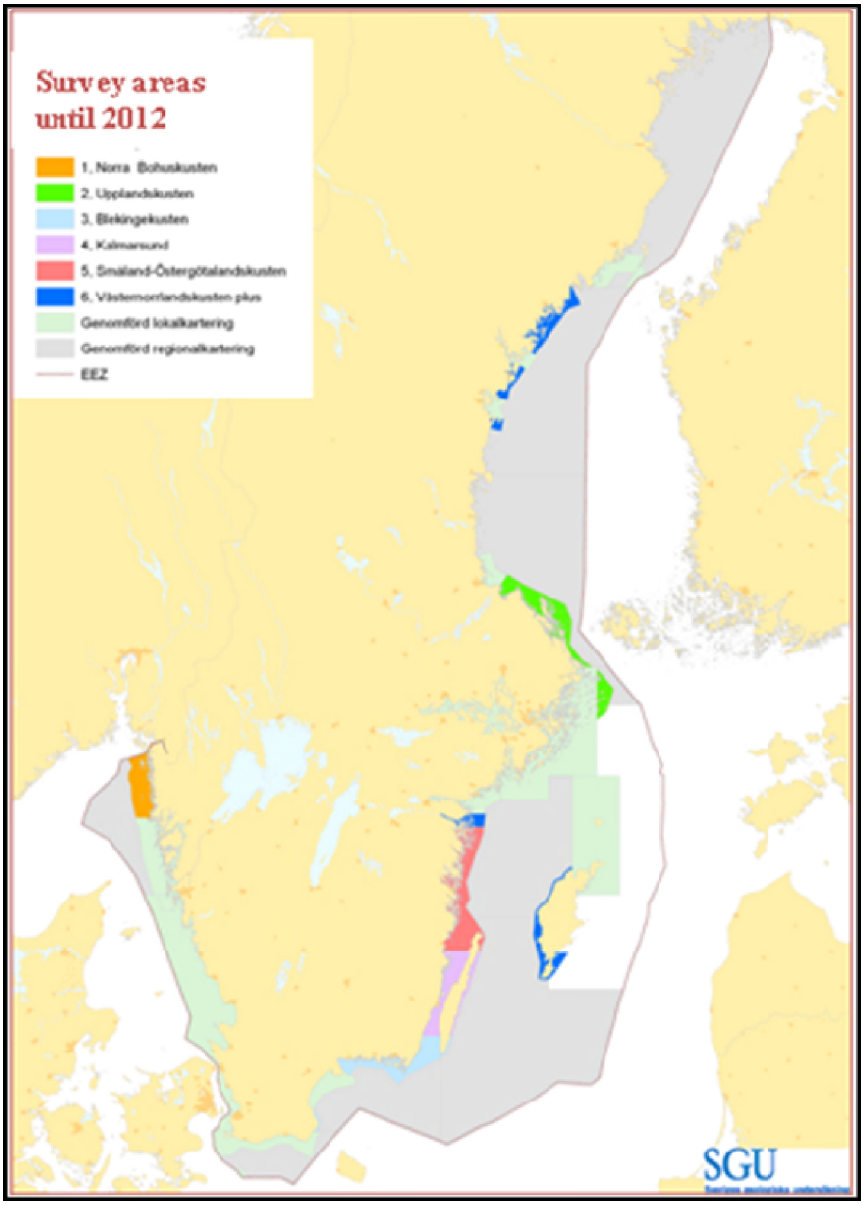

Figure 16.8. Areas that are planned to be surveyed until 2012 for the presentation scale 1:100 000.

The Kalmar Sound, Baltic Sea, 2010–2012

The fieldwork in the Kalmar Sound situated between the mainland and Öland Island (Figure 16.8) started in 2010 and will be run with the same aim and technique as mentioned above. The new swathsonar will be used in the shallower parts along the coast.

The northern Bohus Coast, Skagerrak, 2007–2010

Maps in the scale 1:100 000; showing the distribution of the sea-bed sediments and the stratigraphy of this area were finalized and delivered in 2010 (Brown area, Figure 16.8). The technique used was the same as mentioned above. Bathymetric data collected by multibeam in parts of the area was used in the compilation of the maps. In co-operation with the County Administration in Västernorrland (bordering the northern Bothnian Sea), SGU is investigating where discharges of pulp have accumulated as well as the associated volume and degree of pollution through hydroacoustic methods, sampling, visual observations and chemical analyses. Within the project, a

testing of hydroacoustic methods is also performed in order to detect sediments rich in fibres discharged from the pulp-mill industries. The fibre sediments threat the environment, mainly because of its content of mercury and chloroorganic chemicals as e.g. dioxins and PCBs

16.19 United Kingdom

It continues to be the case that there are no coordinated national mapping programmes taking place on the UK continental shelf at present. Aggregate companies and other marine users undertake their own ad-hoc prospecting surveys, under licence, as appropriate to identify new resources. However, a number of discrete habitat mapping programmes associated with aggregate extraction have been commissioned as a result of standalone research initiatives funded through the Marine Aggregate Levey Sustainability Fund (Marine ALSF). Progress with and outputs from these programmes are available from www.alsf-mepf.org.uk.

Four 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) are now available. These cover the Thames Estuary, Isle of Wight, Anglian and Humber regions (see www.alsf-mepf.org.uk for more details). These studies were commissioned to provide an environmental context within which marine aggregate extraction could be placed. They include mutlibeam mapping, biotope classification and heritage mapping. 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. The data from the REC programme is available from www.marinealsf.org.uk.

16.20 United States

Continuing efforts between the U.S. Geological Survey and the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) (formerly the Minerals Management Service can be found at:

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

Regional mapping is carried out by the U.S,. 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.

In 2010, publications in the region, included:

Valentine, P.C., Gallea, L.B., Blackwood, D.S., and Twomey, E.R., 2010, Seabed photographs, sediment texture analyses, and sun-illuminated sea floor topography in the Stellwagen Bank National Marine Sanctuary region off Boston, Massachusetts: U.S. Geological Survey Data Series 469.

Todd, B.J., and Valentine, P.C., 2010, Shaded seafloor relief, backscatter strength, and surficial geology; German Bank, Scotian Shelf, offshore Nova Scotia: Geological Survey of Canada, Open File 6124, sheet 1, Shaded seafloor relief, scale 1:100,000.

Poppe, L.J., McMullen, K.Y., Ackerman, S.D., Blackwood, D.S., Irwin, B.J., Schaer, J.D., Lewit, P.G., and Doran, E.F., 2010, Sea-floor geology and character offshore of Rocky Point, New York: U.S. Geological Survey Open-File Report 2010-1007.

Poppe, L.J., McMullen, K.Y., Foster, D.S., Blackwood, D.S., Williams, S.J., Ackerman, S.D., Moser, M.S., and Glomb, K.A., 2010, Geological interpretation of the sea floor offshore of

Edgartown, Massachusetts: U.S. Geological Survey Open-File Report 2009-1001. (Also available at http://pubs.usgs.gov/of/2009/1001/).

Poppe, L.J., Danforth, W.W., McMullen, K.Y., Parker, C.E., Lewit, P.G., and Doran, E.F., 2010, Integrated multibeam and LIDAR bathymetry data offshore of New London and Niantic, Connecticut: U.S. Geological Survey Open-File Report 2009-1231. (Also available at http://pubs.usgs.gov/of/2009/1231/).

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Arsenault, M..A., Williams, S.J., Reid, J.A., and Jenkins, C.J., 2010, Geologic characterization of U.S. shelf areas using usSEABED for GIS mapping, habitat delineation, and assessing marine sand and gravel resources, chap. 09: Ocean Globe.

This last citation describes the modern approarch using a method for " statistical analysis of randomly-located marine sediment point data, and applied to the "usSEABED database, which like many modern, large environmental datasets, is heterogeneous and interdisciplinary". They demonstrate that "usSEABED data can be used to generate reliable interpolated maps of" regional mean grain size and sediment character.

Review of Developments in National Authorisation and Administrative Framework and Procedures

16.21 Belgium

The legislation for aggregate extraction in Belgium came into force on 1 September 2004. No changes were made to that legislation in Belgium for exploitation zones 1, 2 and 3. As already 2 zones were delineated where no extraction activities can take place (the central and northern depression in zone 2a and 2b), it is proposed to dispose the alternating regime in zones 2a and 2b and merge both zones into one zone 2ab, open for extraction throughout the year. This is not yet officially published. Also, still some minor changes to the existing KB's (like inconsistent periods etc.) are in the running, but not yet implemented. At the end of 2010 (MB 24.12.10, published BS January 2011), 4 extraction zones (4a,b,c & d) were assigned in exploration zone 4 on the Belgian continental shelf, together comprising a new exploitation area of 46 km^2 (see Annex 6 on the EIA and MEB).

As such no major new developments in the authorization and administrative framework and procedures are to be reported for 2010. The regulations on the use of black boxes also didn't change in 2010.

16.22 Canada

No information has been provided this year.

16.23 Denmark

The Raw Materials Act has been changed in 2009, Order nr. 950 of 24 September 2009. The Act entered into force on 1 January 2010.

At the same time 4 Executive Orders came into force:

- Areas for common extraction of resources from the seabed;
- Fees for extraction of resources from the sea bed;
- Auction of areas for extraction of resources from the seabed;
- Application for permission to exploitation and extraction from the seabed.

An English translation of the Raw Materials Act is in preparation.

Information (in Danish) can be found on:
http://www.naturstyrelsen.dk/Vandet/Havet/Raastoffer/

Organisation(s) responsible for administering new legislation

Ministry of the Environment, Nature Agency.

Changes to the management of marine aggregate extraction activities

None.

Organisation(s) responsible for administering new procedures

Ministry of the Environment, Agency for Spatial and Environmental Planning.

Description of any new procedures

The general UAIS-system (Automatic Identification System), designed to provide information about the ship to other ships and to coastal authorities, is now used on a regular basis by the Agency to monitor dredging activities in Danish Waters. Informations are displayed in MapInfo. Special applications have been developed to customize the system to the actual needs e.g. selection of vessels, monitoring periods and storing of historical information.

16.24 Estonia

No changes to report.

16.25 Finland

No changes to report.

16.26 France

No changes to report.

16.27 Germany

No information has been provided this year.

16.28 Greenland and the Faeroes

No information has been provided this year.

16.29 Iceland

No information has been provided this year.

16.30 Ireland

No information has been provided this year

16.31 Latvia

No information has been provided this year.

16.32 Lithuania

No changes to report.

16.33 Netherlands

Policy regulations for extraction in national waters

Earlier documents on the policy and management of extraction off sediments in national waters are bundled in one document: Policy Regulation for Extraction in National Waters .

This document includes the policy and management of extraction included extraction of aggregates (sand, shells etc.) from the North Sea that was formerly described in the Second Regional Extraction Plan North Sea (RON2) and the National Policy Note for shell extraction.

EIA

The EIA procedure is slightly changed. It is no longer obliged to make a starting document for public consultation and or consultation of the EIA-commission for specific guidelines. A intention letter to the authorities is sufficient to start the procedure for an EIA.

Strategy on sand extraction

The National Water Plan (2009) has defined the area between the established NAP -20 meter depth contour and the 12 miles boundary as a zone where sand extraction has priority to other uses of the sea. Also the National Water Plan is aiming at a deeper extraction than the regular 2 meter below the sea bed, what was the previous standard. For large scale extraction the extraction depth was already free in principle, but an EIA is obliged if deeper than 2 meters. The local maximum extraction depth has to be defined. For Maasvlakte 2 for example the maximum extraction depth is 20 meter below the sea bed.

To anticipate on an increase in sand extraction for coastal nourishments due to sea level rise, a new strategy on marine sand extraction is formulated that aims at a regional approach from one or more of the following starting points: costs; natural and ecological values; environmental values; resource management; spatial planning etc.

In the four regions Delta, South-Holland, North-Holland and Wadden a different weight can be given to the different starting points.

16.34 Norway

No information has been provided this year.

16.35 Poland

No information has been provided this year.

16.36 Portugal

No changes to report.

16.37 Spain

On 29 December 2010 the Spanish Law 41/2010 on the Protection of the Marine Environment was passed as a result of the transposition of Directive 2008/56/CE (Marine Strategy Framework Directive). It provides a general framework for the protection of the environment in the Spanish jurisdictional waters, focusing on the development of Marine Strategies, the creation of the Spanish Network of Marine Protected Areas and the regulation of dumping of wastes and other matters.

16.38 Sweden

No changes to report.

16.39 United Kingdom

During 2010, the key legislation governing the extraction of Marine Minerals (Aggregates) in the UK remained as:

- 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) (Scotland) Regulations 2007.

In England, the regulations are accompanied by procedural guidance in "Marine Minerals Guidance Note 2" which supplement 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, based in part on the 2003 ICES WGEXT Guidelines.

In 2009, the Marine and Coastal Access Act received royal assent.

The key areas of interest of the Act focus on:

- Instigation of a Marine Management Organisation
- Implementation of Marine Planning
- Rationalisation of Marine Licensing
- Marine Nature Conservation
- Fisheries Management and Marine Enforcement
- Environmental Data and Information
- Migratory and Freshwater Fisheries
- Coastal Access
- Coastal and Estuary Management

Secondary legislation will follow in 2011 to introduce a single Marine Licence which will replace the existing legislation detailed above and offer a consistent approach to licensing across a large number of marine related activities.

In England the Marine Licence will be issued by the Marine Management Organisation (MMO), in Wales by the Welsh Assembly Government and in Scotland by Marine Scotland. Further information on these regulations and the changed responsibilities as a result of the Marine and Coastal Access Act can be found at

www.marinemanagement.org.uk, for Wales at www.wales.gov.uk and for Scotland at www.scotland.gov.uk/marinescotland.

16.40 United States

The BP oil spill in the Gulf of Mexico in the summer of 2010 led to the dissolution of the Minerals Management Service and it's reincarnation as the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE). Although not apparent from its home page < http://www.boemre.gov/ > this agency is still responsible for offshore sand and gravel mining.

< http://www.boemre.gov/sandandgravel/MarineMineralProjects.htm >

The US Army Corps of Engineers has progressed on a program of Regional Sediment Management directed at integrating various projects involving the use or removal of sediment for greater efficiency.

17 Annex 8: Review of Approaches to Environmental Impact Assessment and Related Environmental Research

17.1 Belgium

EIA for exploitation zone 4 (Hinderbanken)

The EIA that was published in 2008 is still valid for Belgium for extraction zones 1, 2 and 3. Since marine sand and gravel extraction started in Belgium (1978), continuous monitoring has been carried out by the three responsible governmental institutes, i.e. Fund for sand extractions of the Federal Public Service (FPS) Economy, the Management Unit of the North Sea Mathematical Models (MUMM) of the Belgian federal public planning service Science Policy, and the Institute for Agriculture and Fisheries Research (ILVO-Fisheries) of the Flemish Government. These monitoring programmes are funded by the fees which concession holders have to pay per m^3 extracted.

For exploration zone 4, the procedure for a new EIA started in 2009 and was finished in 2010. The assignment of 46 km^2 of exploitation area in this zone 4 (Hinderbanken area, Figure 17.1) has been based on multibeam, vibre coring, sediment analyses and an evaluation of base line data on the benthic ecosystem components. In the future this new EIA will be used for all new concession demands, surely in exploitation zone 4 and probably also for the other exploitation zones.

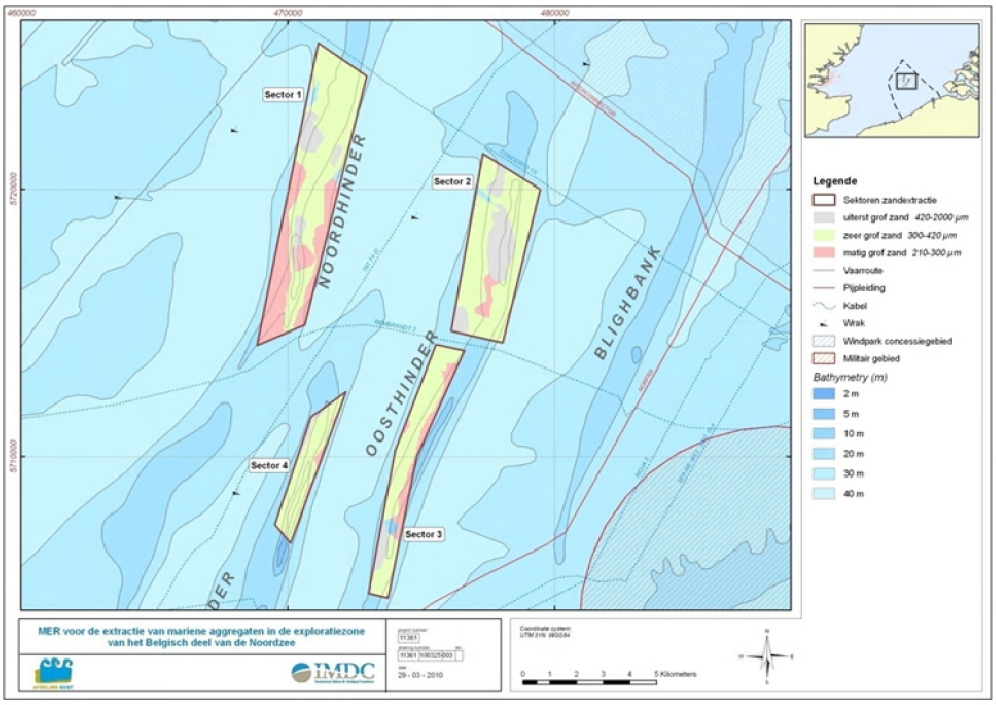

Figure 17.1. Per sector distribution of the different grain sizes at the seafloor (grey: extreme coarse sand, green: very coarse sand, red: medium coarse sand in zone 4 on the Belgian Continental Shelf.

The main conclusions of the EIA are as follows:

Soil & Water:

- A marked change in the seafloor topography is experienced: a scenario with uniform distribution of activity (scenario 1) leads to a lowering of the sea bottom with about 0.75 m; for a scenario with single extraction in zone 2 (scenario 2) about 2.5 m lowering of the sea bottom is anticipated.
- There may be layers of different composition surfacing: in scenario 1 relatively little change will occur, for scenario 2 a limited refinement of the seabed occurs (very / extremely coarse sand to medium coarse sand).
- There is probably no impact on coastal protection.
- It seems very difficult to define a sand extraction capacity on the basis of a regeneration of the area by natural transport. There is certainly scope for further research into the impact of this project on the sediment transport balance in the Belgian Part of the North Sea.

Fauna, flora & Biodiversity:

- For the benthos, there is a temporary direct habitat loss (related to the surface) by the extraction of sand substrate. There is a mortality directly associated with habitat loss, estimated at 500 to 1.500 tons. This relatively large loss is limited compared to the total biomass in the BDNZ and recolonization and recovery seems possible. The effect of the shift to slightly less coarse material appears limited.
- For fish, the effect of habitat loss is rather low, because the mobility of the species and the disturbed area at any given time is relatively small. Sedi-

mentation can cause a negative effect, but most fish exhibit an avoidance behaviour.

- The effect on food availability for birds is probably small. The effects of sedimentation on sight hunters is locally and temporarily. The severity of disturbance caused by the extraction vessels is very limited.

Air & climate:

- The expected average NOx emissions amount to approximately 250 to 385 tons per year, for Sox emissions amount to about 200 to 300 tons per year, while for hydrocarbons 10 to 17 tons per year would be emitted. The emission does not vary much depending on the size of the ship because the larger ships increased emissions are offset by having to sail less. The difference between the extraction scenarios is minimal because especially the sailing distance is decisive.

Interaction with other human activities:

- No strict loss of fishing grounds. There is also more fishing on the slopes and gullies, while the extraction of sand is situated on top of the banks. Also in time sharing multi-functionality can be pursued.
- The sand extraction does not impose any adverse conditions on the use of the exploration zone 4 for shipping.
- There is no geographical overlap between the zone of military activities and the exploration zone 4. If there is military activities, the extraction vessels are asked to stay away, like any other ship using the appropriate procedure.
- No foreseeable impacts of the sand extraction on the wind farms, the closest gap between the two is more than 5 km.
- By the definition of the four extraction sectors in the exploration zone 4 taking into account the location of cables and pipelines, there is no foreseeable impact of sand extraction on these cables and pipelines.

Noise & Vibration:

- Up to approximately 20 km from the dredging vessels, underwater background sound can be enhanced by the sound of a drag hopper.
- The sound above water damps out at a distance of 1 km from the extraction vessel.
- The impact of the additional sand extraction ships on the ambient noise above and below water, however, is negligible compared to the entire shipping activities.

Risks & Safety:

- The risk of a further collision was estimated based on literature data. The percentage increase relative to the existing situation (compared to an average of 55 ships in the BDNZ) due to sand extraction shall not exceed 5.7% (for the maximum scenario in 3 months time). For example, if one considers about 15 collisions per year on average, the sand extraction would provide a maximum increase of 1,6 collisions per year. Given the uncertainty of these calculations and the fact that sand extraction will only be carried out in good weather conditions, these figures are upper limits.

- The risk of oil discharges is assumed proportional to the intensity of vessels and the risk of collisions. With an assumption of an average leakage of oil once every 31 years, the sand extraction would provide a maximum average increase in the incidence of oil spills to once every 29.5 years. There is already a contingency plan and operational technical measures in place in case of an oil spill on the BNDZ. Hence, only because of the sand extraction activities, these facilities should not be extended.

Integrated Coastal Protection Plan and Public Works Plan Oostende

The new EIA has been submitted by the Flemish Region – Afdeling Kust in 2010 to get a new concession license in zone 4. The main reason for this new concession is the need for 'high' volumes (20 million m^3 over 10 years) of suitable sand (correct grain size) for sand suppletions in the framework of the Integrated Coastal Protection Plan and the Public Works Plan Oostende by the Flemish region, next to the normal maintenance beach nourishments along the coast. The extractions will be done by sledge hopper dredgers with a volume of 2000 to 15000 m^3.

Expected volumes of sand suppletion for the integrated Coastal Protection Plan

De Panne – centre (beach suppletion)	40 000 m^3
St Idesbald - Koksijde	100 000 m^3
Middelkerke - Westende	2 578 000 m^3
Raversijde - Oostende Wellington	3 337 000 m^3
Wenduine (complete suppletion)	1 141 000 m^3
Blankenberge	577 000 m^3
Knokke-Heist	4 736 000 m^3

In total 12 509 000 m^3 with a maximum of 14 385 000m^3 (including a 15% loss) will be needed between 2010 and 2015. These volumes also include 5 years maintenance sand.

The Public Works plan is a project to increase the protection of Oostende against flooding and an amelioration of the maritime access of Oostende harbour. The plan comprises the optimisation of the harbour entrance, linked to an embankment (dam)-project for Oostende. For this plan ca. 1.5 Mm^3 is foreseen, with a planned execution in 2012.

Since April 2011, the EIA is in public consultation round. MUMM will be finishing the MEB (an assessment of the EIA) in June 2011 after which the concession will normally be granted to the Flemish Region –Afdeling Kust in July 2011.

Presentations

On the WGEXT meeting, one presentation was given by Annelies De Backer based on the work done by FPS (Marc Roche *et al.*) and the work done by ILVO-Fisheries (Annelies De Backer *et al.*). A brief summary is included here:

Black box data showed a steep increase in extraction volumes in the BRMC area on the Buitenratel, especially in the years 2008 and 2009 with resp. 465 048 m^3 and 1 168 367 m^3 in an area of 2.5 km^2. The Belgian FPS Economy gathered detailed multibeam data from this BRMC area in February 2010 and subtracted this from the reference model made of the area in 2002 (2002–2010, Figure 17.2a). This revealed that the extraction is creating a bathymetrical depression inside the BRMC area. This depression is oriented SW-NE, ~ 1000 m long and ~ 200 m large. In February 2010, the depression

was ~ 1.4 m deep relatively to the 2002 reference model of Zone 2. Superposition of the black box data shows that this depression is spatially correlated with the subarea where the extracted volume is > 200 m^3/m^2 (Figure 17.2b). If we accept that the 1.4 m of depression has been created by the heavy extraction within a couple of year (2008/2009), than at this level of extraction this area should be closed in 2013/2014, since depth limit of extraction in Belgium is legally set at 5 m.

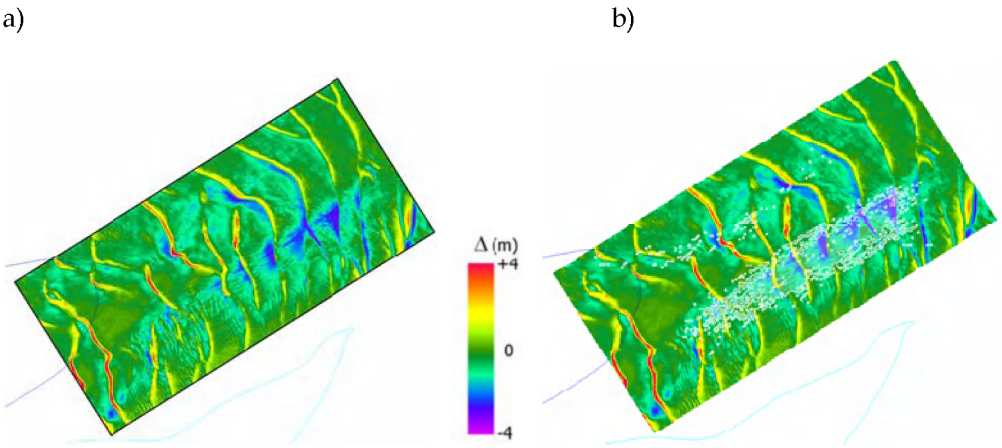

Figure 17.2. a) Λ reference bathymetrical model 2002 – bathymetrical model 2010; b) superposition of area of high density extraction (> 200 m^3/m^2) on Λ model 2002 – model 2010.

ILVO-fisheries sampled the BRMC area to investigate the impact of the heavy extraction on the macrobenthos. Therefore, 7 Van Veen samples were taken inside the BRMC area and 12 reference Van Veen samples were taken on various places outside the extraction areas, so spatial variation was included. Sampling occurred in October 2010. Unfortunately no pre-impact samples are available, however preliminary results suggest a higher number of species inside the heavy extraction area (Figure 17.3). Furthermore, multivariate analysis revealed differences in species composition between impact and reference stations (Figure 17.4). Reference stations were dominated by sandy species (e.g. Nephtys cirrosa, Spiophanes bombyx and Urothoe brevicornis), while in impact stations a mixture of sandy and muddy species occurred (e.g. Lanice conchilega, Abra alba, Corophium sp., Glycera juv.). No sediment data are available yet, but pictures from the Van Veen samples, it seems like in impact samples more silt was present and fossil shells surfaced probably due to extraction activities, while reference samples consisted of clean sand, sometimes with the presence of small shell fragments. This suggests that the observed changes in species community and number of species are due to physical changes caused by the disturbance of sand extraction.

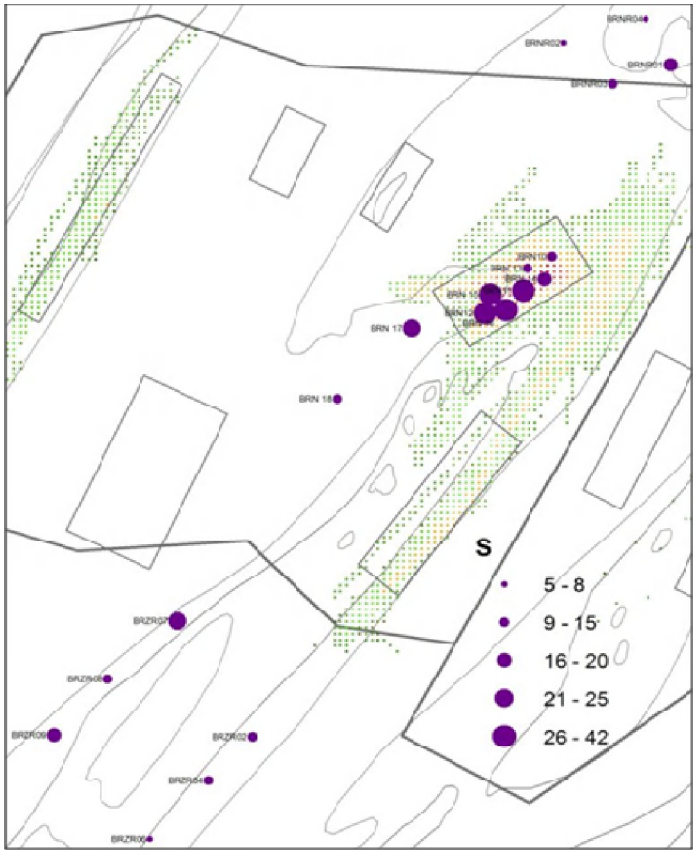

Figure 17.3. Map of the number of species (S) in both impact and reference stations.

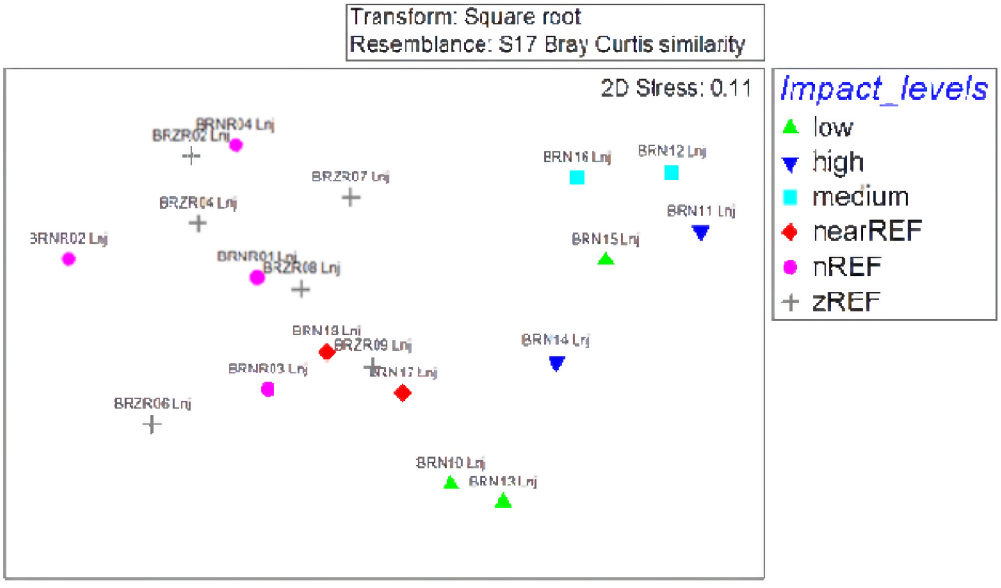

Figure 17.4. MDS plot with indication of different levels of extraction and indication of the different spatial position of the reference samples.

17.2 Canada

No information has been provided this year.

17.3 Denmark

No information on the EIA process or research has been provided this year.

17.4 Estonia

No information on the EIA process or research has been provided this year.

17.5 Finland

Oulu-Haukipudas area, Bay of Bothnia

Date project commenced:

Duration of project: 2007–2010

Organisation(s) undertaking research project: FCG Planeco Oy

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 enable the exploitation of the marine sand resources of these areas. All of these water areas are administred by Metsähallitus (National Board of Forestry) and situate 10–30 km off the coast.

In June 2007 Morenia started EIAs in four areas: Suurhiekka-Pitkämatala (Ii and Simo municipalities) , Merikallat (Hailuoto), Tauvo (Siikajoki and Raahe) and Yppäri (Pyhäjoki) in the bay of Bothina. After that the organisation undertaking research project has changed. The program includes studies on birds, fishes and fishery and habitat surveys. (http://www.ymparisto.fi/download.asp?contentid=113641&lan=fi). The EIA procedure was completed in November 2009 and passed the examination by authorities in April 2010.

17.6 France

1) Proposal of protocol for fisheries resources and fishing activity monitoring

A recommended protocol for baseline description and monitoring of fisheries resources and fishing activity, in the case of marine sediment extraction, has been proposed by Ifremer, based on data from the SIEGMA programme, to help consulting offices to carry out EIAS and monitoring studies.

Summary of framework and expected results for baseline description of fisheries resources and an environmental impact assessment

Framework to be implemented

- baseline with bibliographic research and sea operations;
- monitoring of sea operations for impact assessment (short and long term) of exploitation on the surroundings and its restorative capacity.

Topics to be considered

- juveniles and adults of benthic-demersal community: bibliography and sea operations;

- spawning grounds: bibliography and sea operations if available, bibliography or local knowledge indicating that the site is included or near an important spawning area for species of major interest;
- nursery area: bibliography and sea operations if available, bibliography or local knowledge indicating that the site is included or near an important nursery for species of major interest;
- migration routes: bibliography.

Operational framework

- a sampling scheme to be carried out (with relevant gears for each topic to be observed) and taking into account the temporal and spatial variability, from natural and human origin: multiannual scheme with seasonal samplings few years before and after the exploitation beginning, inside the exploited area (minimum 2 locations per extracted area) but also outside with many reference locations; the general principle is based on a standardised BACI (Before After Control Impact) protocol type ;
- the sampling scheme carried out for the baseline description will be the same for monitoring impacts, except the frequency.

Expected results

- •fisheries resources description at different biological scales (whole, per species groupment, per species, per size…), with indexes (of diversity, abundance, structure);
- statistical analysis of indexes in order to identify their spatial and temporal variability;
- comparison between indexes before and after the exploitation beginning, between the exploited site and the reference areas.

The provided indexes will be delivered under diagrams and charts.

Summary of framework for fishing activity description

Data type and Availability

Data presently available for fish activity description are the following:

- French fishing fleet database managed by Food, Agriculture and Fishing Ministry (MAAP) and Marine Fishing and Aquaculture Direction (DPMA);
- Index cards of catches and fishing effort (logbook) informed by fishermen and managed by DPMA;
- Auction sale data for each vessel in weight and price per species and geographical sale place (managed by France Agrimer);
- Survey of fishermen activity. This sounding is carried out once a year by the Ifremer observators of Halieutic Information System (SIH) for the whole French fleet. The annual activity calendar of ships is then simulated for the previous year;
- Data of the vessels monitoring system (VMS) are managed by DPMA.

Accessibility of data

A significant part of the available data is collected in a legislative framework. The transmission and the provision of these data thus require the agreement of the

DPMA. With the exception of the VMS data, which bring a big precision on the position of ships, the great majority of the data (catches and efforts of peach, inquiries of activity,...) is available at the ICES statistical rectangle scale (around 6000 km^2) which is little compatible with a fine necessary halieutic description during the implementation of an marine aggregates extraction.

However, these data remain the only ones existing at the moment. As such, Ifremer supplies annual syntheses containing a series of descriptive indicators of the fleet and the fishing activity being applied into the ICES statistical rectangle. In particular:

- technical characteristics and port of registry of the vessels working into the statistical rectangle;
- annual sphere activity and fishing fleet of the ships ;
- fishing gear used;
- seasonality of the fishing activity for each type of gear;
- attendance indicator and ship commitment to the statistical rectangle;
- catches per species.

These syntheses are free access on the SIH web site (www.ifremer.fr/sih).

To mitigate the scale inadequacy between the statistical rectangle and the license perimeter of extraction and/or the unavailability of certain data, the following perspectives are proposed:

- An ad hoc enquiry with professional fishermen, which is considered, by Ifremer, to be biased by the enquiry context.
- On zone observation, from the coast or with nautical facilities to describe professional and leisure fishing activity around the licensed perimeter.

For further information, see web site:

http://wwz.ifremer.fr/drogm/Ressources-minerales/Materiaux-marins/Usages-halieutiques

2) 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: Scientific Interest Group "SIEGMA" (Monitoring of impacts of extraction of marine aggregates)

Funding bodies: European Union (FEDER), French Ministry of Research, Regional Council Haute-Normandie, dredging local companies (GMN) and national association (UNICEM), IFREMER & University of Rouen

Description of research project (please give a brief description of the project including the main aims, methodology employed and any initial findings)

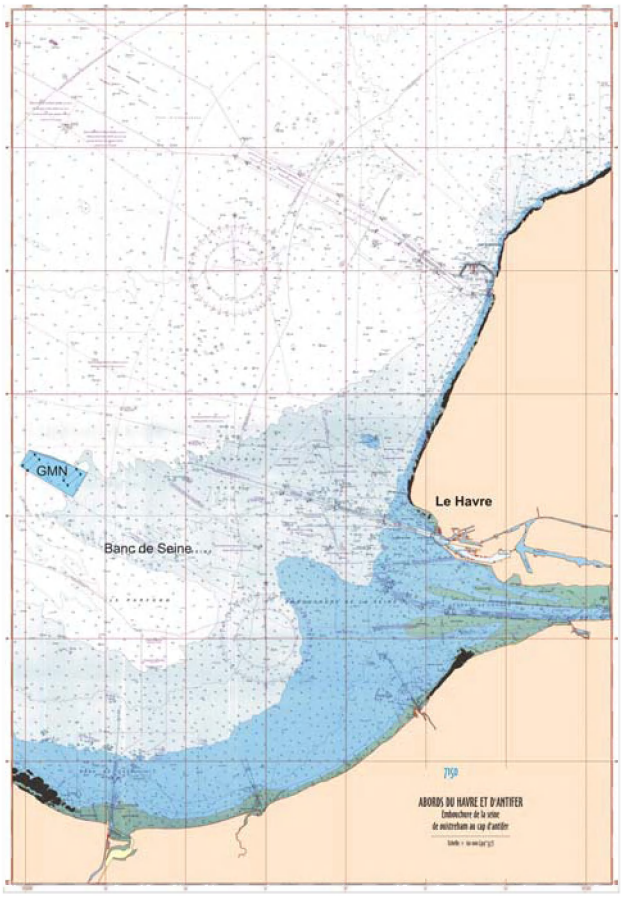

Figure 17.5 Location of the experimental site of Baie de Seine.

Monitoring of impacts in 2010 focussed on :

- the dispersion of the turbid plume (ADCP) and its vertical dynamics;
- the seabed topography (multibeam);
- the 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 impact of the site B after one year of dredging activity and the recolonisation rate of the site A (fallow test).

I. Vertical dynamics of the turbid plume (ADCP)

This phenomenon was studied during the flood tide with spring tide coefficients.

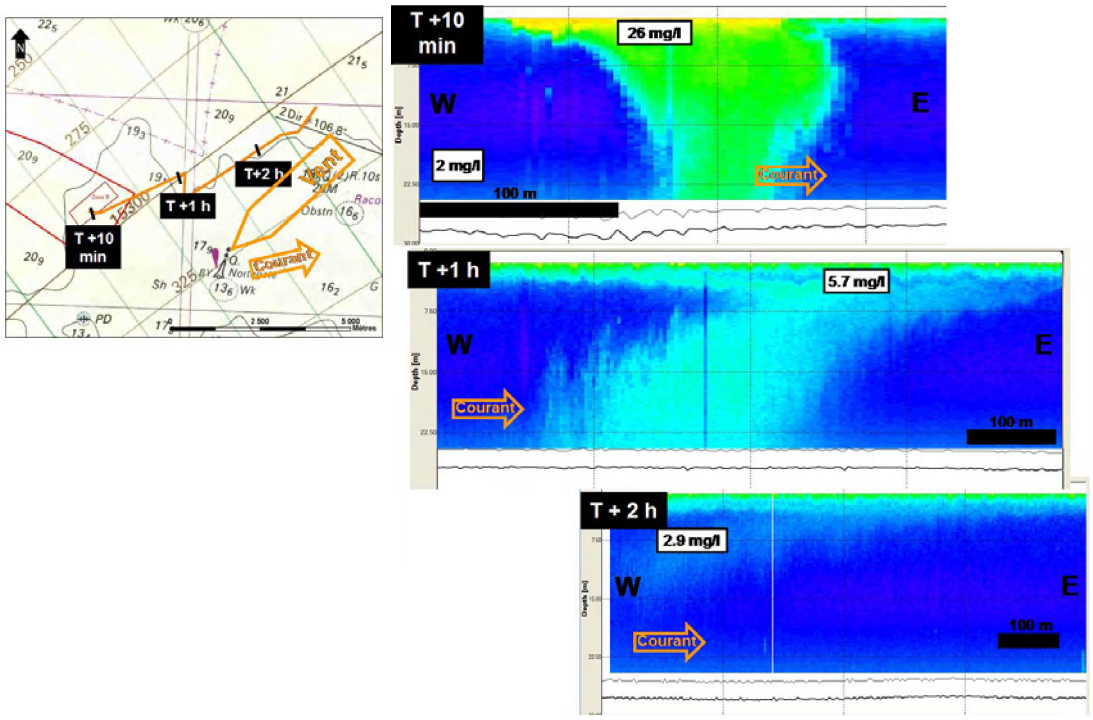

Figure 17.6. Examples of transversal transects done (1): 10 minutes after the creation of the turbid plume, (2): after 1 h, (3): after 2 h (in Duclos, 2010).

Biggest particles (100–200 μm) settle between 10 mn and 1 h; the plume is then only constituted of fine particles (< 63 μm). The turbid plume has disappeared after 2 hours.

II. Seabed topography

212 770 t were extracted from the northern half (0.3 km²) of the Site B in 2009, with a maximal deepening of 4 meters around station B103.

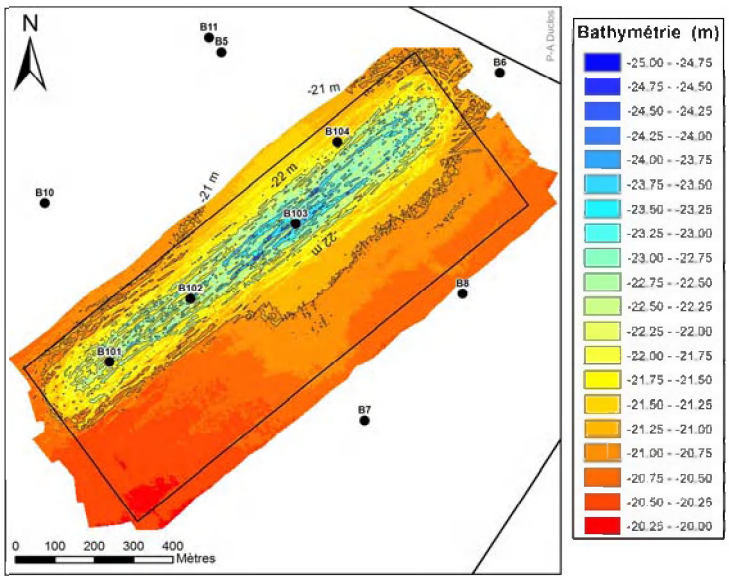

Figure 17.7. Bathymetry of the site B in January 2010 showing the dredge furrows, the depth of deepening and the location of the 4 (B101 to B104) inner monitoring stations (in Duclos, 2011).

III. Sediments and associated benthic communities: monitoring of impact of the first year of extraction in site B

Site B will be dredged during three years (2009–2011) to study the cumulative impact of extractions. Baseline survey of benthos and sediment was done in February 2008 and the first step of monitoring in February 2010.

- Evolution of the sediment mainly concerned the high proportion of shingles (25 %) in the dredging area and slightly bigger values for very fine sands and silts in close periphery

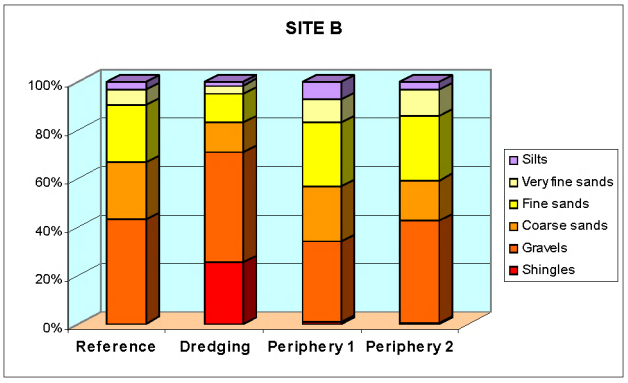

Figure 17.8. Comparison of reference sediments with those of site B.

- Impact of extraction activity on biological parameters of the site B was significant for species richness (- 42 %), abundance (- 71 %) and biomass (- 82 %); no significant impact could be observed outside the site (potential deposition area)

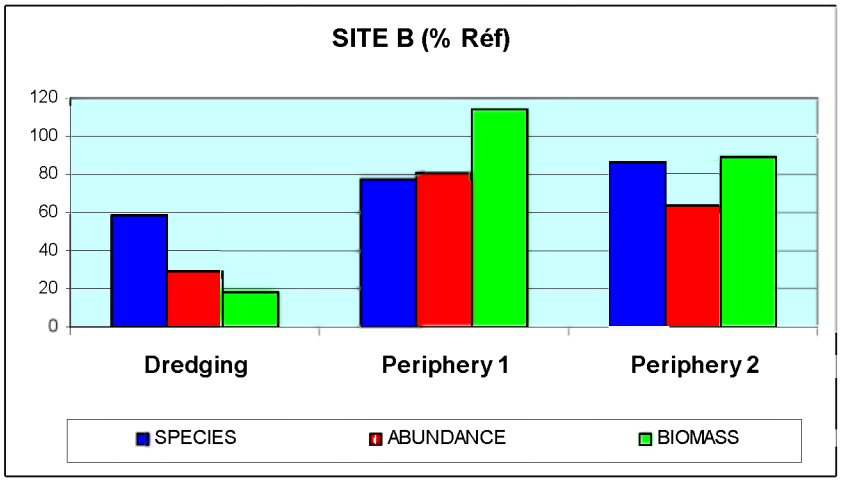

Figure 17.9. Comparison of the relative impact observed on population parameters in the three sectors prospected within and around the site B (periphery 1 = near-field < 200m ; 2 = far-field > 500m).

After one year of extraction (212 000 t), the relative decrease in abundance and biomass at site B was similar to that observed in 2009 at site A (160 000 t), except a higher decrease for species richness.

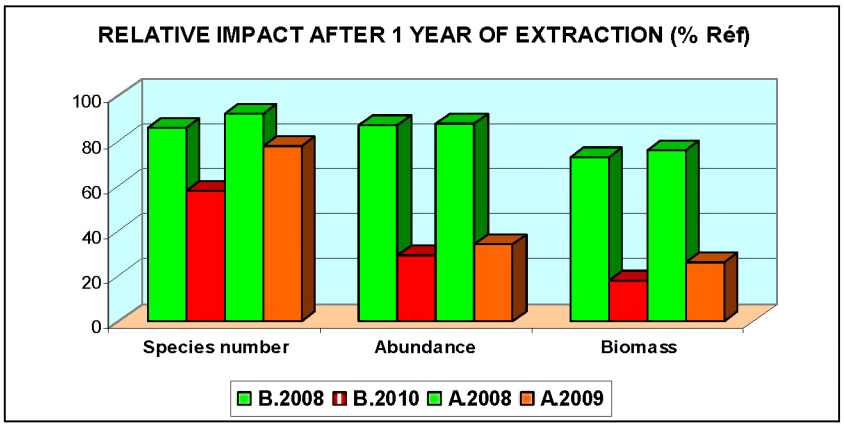

Figure 17.10. Comparison of the relative impact observed after one year of extraction at sites B and A for the three main population parameters.

Monitoring of the recolonisation process at site A showed a significant impact:

- on all population parameters (- 47 % for species number, - 74 % for abundance and - 88 % for biomass) in the northern sector 14 months after cessation of dredging activity;
- on the single biomass (- 80 %) in the southern sector 19 months after cessation of dredging activity;
- on all population parameters outside the extraction area; however there is no explanation for this result as there were no changes in sediment composition outside the extraction site.

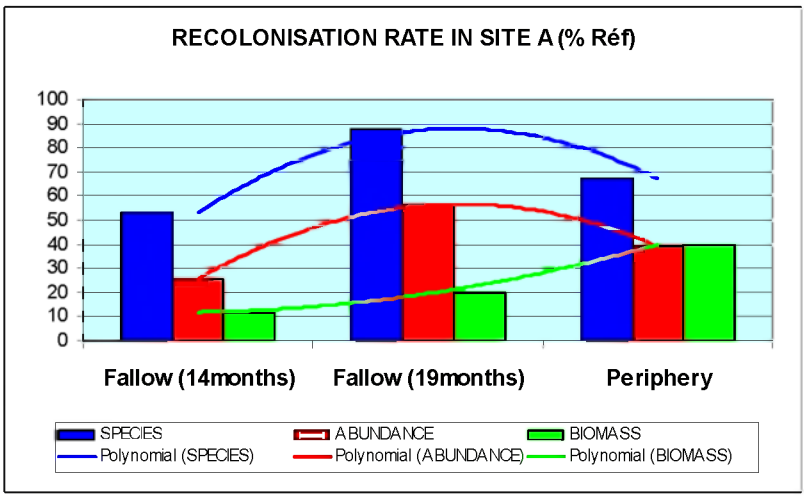

Figure 17.11. Synthesis of the relative impact (in % of reference values) observed in 2010 for the three main population parameters of the different areas of the experimental site A (test jachère).

IV. Demersal fish communities

Monitoring of benthic and demersal fish communities (4 seasonal campaigns with trawling and fixed nets) showed a global decrease of species richness and of abundances for most species.

- Impact on species richness

  Recovery in site A: 16 species were observed in the northern more recently dredged area, 15 species were observed in the southern zone.

Impact in site B: 12 species were observed during extraction (compared to a maximum of 18 in the reference area).

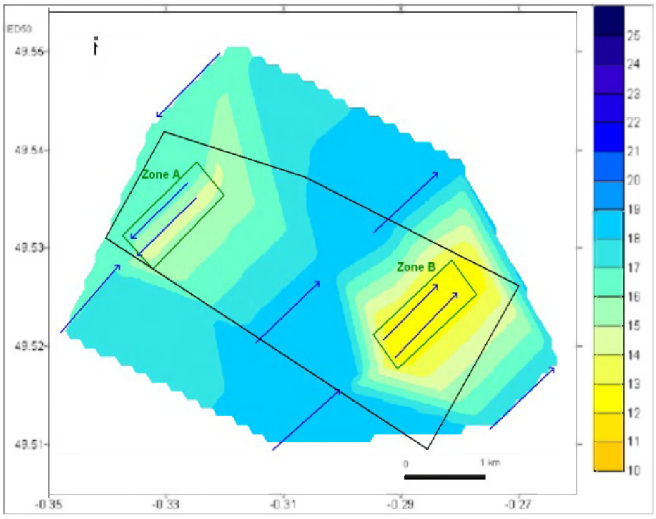

Figure 17.12. Map of the mean number of fish species sampled with a bottom-trawl during the 4 seasonal campaigns in 2010.

- Impact on abundance

  The lowest abundance (244 ind.h^{-1}) was observed at site B during extraction; abundances slowly recovered in site A (two years after cessation of dredging) with 500 to 640 ind.h^{-1} while reference values exceed 1000 ind.h^{-1}.

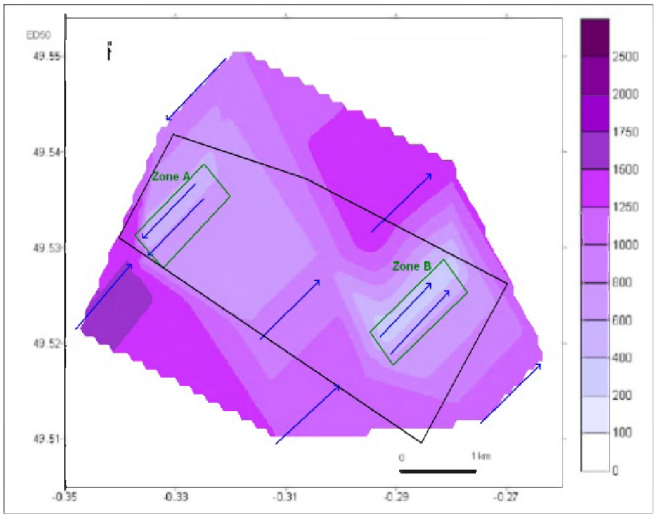

Figure 17.13. Map of the mean abundance (ind.h^{-1}) of fish species sampled with a bottom-trawl during the 4 seasonal campaigns in 2010.

The beginning of extraction in the southern part of site B in 2010 confirmed the attractive effect observed for sole with an immediate, localised and temporary increase of densities for this species. Cod was also mainly fished in the extraction areas, as previously observed in Dieppe, with the fallow areas providing their main prey items.

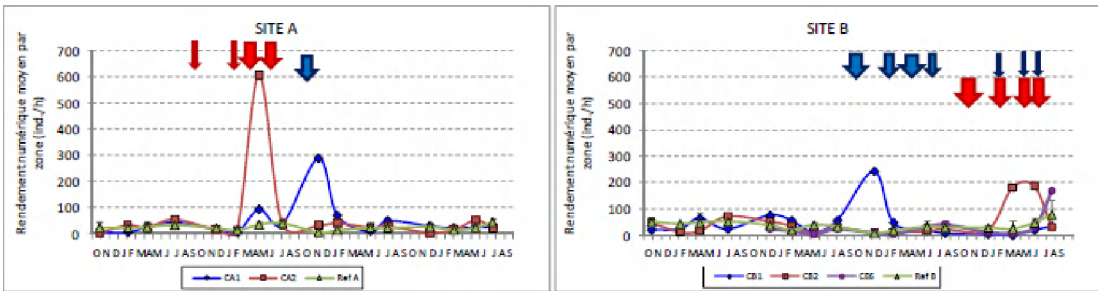

Figure 17.14. Evolution of the abundance of sole during the 3 years of monitoring, with indication of the extraction periods.

Preliminary conclusions on the impact and recolonisation of site A 2 years after cessation of extraction activity show:

- an annual decrease in species richness and abundance during extraction except for some opportunistic species (sole, dab);
- a return of natural seasonal fluctuations, but at lower abundance levels;
- a return of abundances similar to reference levels during winter minima;
- a return of abundances similar to reference levels during summer maxima.

17.7 Germany

No information has been provided this year.

17.8 Greenland and the Faeroes

No information has been provided this year.

17.9 Iceland

No information has been provided this year.

17.10 Ireland

No information has been provided this year.

17.11 Latvia

No information has been provided this year.

17.12 Lithuania

No information has been provided on EIA and monitoring research this year.

17.13 Netherlands

Monitoring and Evaluation Programme

On the basis of the several EIA's for the extraction of marine sand for coastal nourishment and the EIA for the extraction of marine sand for use as fill sand on land a combined Monitoring and Evaluation Programme is formulated, including research on recovery of benthic fauna, effects of increase in turbidity and effects of underwater noise. Within this programme special attention is given to the Zeeland Bank which is recognized as a ecological valuable area.

The monitoring is in progress. Results and conclusions are expected in 2011 and 2012.

Sand Engine

The province of South-Holland initiated a plan for a large scale coastal nourishment of 20 Mm^3 marine sand 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 plan is briefly described in the Annual Report of 2009.

The EIA for this plan is published in February 2010 and was under public consultation till the beginning of April. This EIA mainly focussed on the effects of the nourishment of the sand at the coast. Because of this, only few comments were on sand extraction. The comments of the Authorities on Cultural Heritage points to a new approach, where not only research is executed towards the presence of historical wrecks, but also to the prehistoric landscape. The licence for extraction was granted in 2010.

The sand extraction areas are partly earlier used areas that are now deepened from 2 to 6 meter below the original sea bed. Therefore there is no separate monitoring programme for this sand extraction, but a financial contribution is given to the existing monitoring programme on the effects of extraction for coastal nourishments and the use for fill sand on land due to the EIA's.

Maasvlakte 2

The construction of Maasvlakte 2, the enlargement of Rotterdam harbour, is going on successfully. By the end of 2010 already 170 Mm^3 was brought into the reclamation area. During the extraction the bathymetry of the changing sea bed is measured to control the work. The measuring will continue after the extraction. After several years the reaction of the sea bed on the extraction will show if there is any migration of the pit and if there are new bed forms developing in the pit.

Monitoring of the effects of the sand extraction for Maasvlakte 2 are in full operation. Measurements are done on bathymetry, sediment composition of the sea bed, diversity and biomass of benthic fauna, underwater noise as well as changes in the amount of suspended matter in a broad area and the influence of these changes on the timing of the yearly algae bloom.

Results and conclusions are expected in 2011 and 2012.

Unexpected was the large amount of fossil bones from mammoths and other ice-age mammals that are found in the area. By the extraction activities the sea bed is enriched with these bones, which are of high scientific interest.

Building with Nature project "modelling the ecological potential of sand extraction in the southern north sea

Next to the monitoring campaign for Maasvlakte 2 an additional campaign is coupled to an experiment with ecological landscaping. The aim of the project is to create ecologically valuable habitats through sand extraction and ecological landscaping.

In this experiment two sand ridges are realised during the dredging operation and monitored in detail on the physical and biological effects. The campaign consists of box-core (infaunal macrozoobenthos), bottom dredge (epifauna), beam trawl samples (demersal fish) and side scan sonar and lasts for three years. The results will be compared with the results of the regular Maasvlakte 2 monitoring of areas within the extraction pit which are not landscaped.

Models will be developed aimed to predict benthic infaunal, epifaunal and demersal fish abundance and assemblage (biomass and species diversity) in landscaped extrac-

tion sites. The data of the Maasvlakte 2 landscaping experiment will be used to validate the outcome of the model.

This research is part of the "Building with Nature" program, a public-private initiative which aims at developing hydraulic engineering infrastructures while creating opportunities for nature at the same time.

17.14 Norway

No information has been provided this year.

17.15 Poland

No information has been provided this year.

17.16 Portugal

There is a project running in Portugal (2008–2011) to assess the physical impacts of sand mining on the shoreface and shoreline evolution. It is called SANDEX (SAnD EXtraction in the Portuguese continental shelf: impacts and morphodynamic evolution). One offshore area in the mainland Portuguese continental shelf located in the southern coast was chosen because sand was extracted from the shoreface for beach nourishment. The sandpit had approximately a rectangular shape with 750 m length and 250 m width and was located 4000 m away from the shore at depths between 15-20 m, with average depth of the excavation around 3 m. There was a morphologic (bathymetric) and sedimentologic characterization before and after the excavation and hydrodynamic modelling is being run to study the changes on the tidal flow and wave propagation due to influence of the sand pit.

Preliminary results were published in Congress abstracts:

Lopes, V., Silva, P. A., Bertin, X., Fortunato, A.B., Oliveira, A., 2009. Time-evolution of an offshore sandpit: validation of a morphodynamic model, Journal of Coastal Research, SI56, 529-533.

Silva, P.A., Bertin, X., Oliveira, A., Fortunato, A.B., 2009. Intercomparison of sediment transport computations in current and combined wave and current conditions, Journal of Coastal Research, SI56, 559-563.

No EIA is currently being undertaken in Portugal, Annex 7 of the 2010 report provided a detailed history of Environmental Legislation and extraction development in Portugal.

17.17 Spain

None of the Spanish projects (mentioned in Chapter 15) have been submitted to an environmental impact assessment (EIA) process. In the first case the extraction was part of an emergency plan. According to a Ministers Council resolution of September 22nd, 2010, it was agreed not to submit this project to the EIA process. The extracting projects carried out in Barcelona have not been submitted to EIA either. The amounts extracted were always below 3 million m^3/year, limit established in the Spanish EIA legislation (Legislative Royal Decree 1/2008 on Environmental Impact Assessment of Projects) that determines when EIA is compulsory.

17.18 Sweden

No changes to the EIA process have taken place during 2010.

However, during 2010 the Port of Trelleborg got a 10-year permission to extract a total amount of 300 000 m3 per annum of sand, gravel and stone in a fixed area of 96 000 m2 within public waters of the Swedish continental shelf. The permission relates to the expansion of ferry piers in the port and the material will be used as fill for construction purposes. According to the EIA, the seabed after completion of work has to be restored to as original condition as possible. The excavation areas shall not contain any "bottom hole" in which hydrogen sulphide can be formed. Equipment and materials shall not be left on the seabed in the area of operation.

An application in 2010 to dredge 500 000 m2 sand (for beach nourishment) during ten years at the bank of Sandhammaren off the coast of Scania, SW Baltic Sea, was given in from the local municipality. The previous application in 2003 was denied by government partly due to the risk that the extraction of the area pointed out would lead to an increase of the natural ongoing erosion of the beaches inside the bank, and partly because the beaches was set up as a Nature 2000 area. In the new application in 2010 an area further to the west was appointed by the municipality. However, the EIA is poor, and it is uncertain if there will be a permission this time. The Geological Survey of Sweden has pointed out another area on the eastern slope of the bank where the eroded sand from the beaches is accumulated. In this area an environmental sustainable extraction could be carried out.

17.19 United Kingdom

EIA remains the responsibility of the operator / developer in the UK and therefore 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. The fund will end in March 2011 and over its lifetime has delivered projects focussing on marine mapping, assessment of environmental impacts, monitoring / mitigation associated with improving the way marine aggregate extraction is planned, assessed and managed worth around €30m.

Details on commissioned projects and information on accessing raw data associated with these projects can be accessed via www.alsf-mepf.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

As reported in previous years, the UK Marine Aggregate industry and Crown Estate continue to fund initiatives. These include Regional Environmental Assessments, regional monitoring in the Eastern English Channel and annual area involved reports. Further information can be found from the BMAPA (http://www.bmapa.org/) and Crown Estate (http://www.thecrownestate.co.uk/marine_aggregates) websites.

17.20 United States

The 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. In general, there is increased interest in ecosystem-based management of marine resources.

18 Annex 9: OSPAR agreed reporting protocol and request for additional data

Extract from EIHA Summary record

Sand and gravel extraction

2.9 Belgium introduced the annual report from ICES Working Group on the effects of extraction of marine sediments on the marine ecosystem (WGEXT) and 2009 data on sand and gravel extraction (EIHA 11/2/7). EIHA examined the data in consideration of OSPAR reporting needs and the future requirements under the EU MSFD.

2.10 The UK informed the meeting of the completion of a national cooperative research report on the extraction of aggregates and the intention to share the results of this activity as appropriate.

2.11 Following discussion, EIHA agreed:

To note the WGEXT Terms of Reference for 2011 (Annex 3 of document EIHA 11/2/7) in particular paragraphs a, e and f;

To invite Contracting Parties to submit 2010 data on sand and gravel extraction to the Chairman of WGEXT by 31 March 2011;

To note that the next meeting of WGEXT will be held 11-15 April 2011, after which the draft report of the Working Group will be circulated to the EIHA HODs via the Secretariat (by 15 May 2011) and the report finalised by the end of June 2011;

To request assistance from WGEXT for the development of a draft assessment sheet for sand and gravel, taking into account relevant guidance from OSPAR as provided by the task manager (Belgium). The draft assessment sheet will be circulated to EIHA HODs following the WGEXT meeting before being forwarded to CoG (1) 2011;

To invite Belgium, assisted by the Netherlands, to draft advice to CoG (1) 2011 on aspects of sand and gravel extraction relevant to the determination of GES under Descriptors 6 (sea floor integrity) and 11 (underwater noise). Draft advice will be circulated to EIHA HODs by 31 March 2011 before being submitted to CoG.

19 Annex 10: OSPAR National Contact Points for Sand and Gravel Extraction

LIST OF NATIONAL CONTACT POINTS FOR OSPAR REPORTING ON SAND AND GRAVEL EXTRACTION	
Belgium	Ms Brigitte Lauwaert Management Unit of the North Sea Mathematical Models Gulledelle 100 B-1200 Brussels BELGIUM Tel: 00 32 2 773 2120 Fax: 00 32 2 770 6972 E-mail: B.Lauwaert@mumm.ac.be
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France	M. Claude Augris IFREMER Département Géosciences Marines Technopôle Brest-Iroise BP 70 29280 PLOUZANÉ FRANCE Tel : 00 33 2 98 22 42 42 Fax: 00 33 2 98 22 45 70 Email: Claude.Augris@ifremer.fr
Germany	Mr Kurt Machetanz Landesamt für Bergbau, Energie und Geologie (LBEG) An der Marktkirche 9 D-38678 Clausthal-Zellerfeld GERMANY Tel: 00 49 5323 7232 50 Fax: 00 49 5323 7232 58 E-mail: kurt.machetanz@lba.niedersachsen.de
Iceland	Mr Helgi Jensson The Environment and Food Agency Sudurlandsbraut 24 IS-108 Reykjavik ICELAND Tel: 00 354 591 2000 Fax: 00 354 591 2020 E-mail: helgi@ust.is
Ireland	To be confirmed

The Netherlands	Mr Chris Dijkshoorn Ministry of Transport, Public Works and Water Management Rijleswaterstaat North Sea P O Box 5807 THE NETHERLANDS Tel: 00 31 70 336 6642 Fax: 00 31 70 390 0691 and 0031703194238 Email: chris.dijkshoorn@rws.nl
Norway	Mr Jomar Ragnhildstveit. Jomar Ragnhildstveit Hordaland County Council Agnes Mowinckelsgt. 5 Pb 7900, 5020 Bergen Email: jomar.ragnhildstveit@post.hfk.no Tel: 00 47 55 23 93 08 Fax: 00 47 55 23 93 19
Portugal	Ms Leonor Cabeçadas Institute of Environment Ministry of Environment, Landplanning and Regional Development Rua da Murgueira 9/9A Zambujal Ap. 7585 P-2611-865 Amadora PORTUGAL Tel : 00 351 21 472 1422 Fax : 00 351 21 472 8379 Email : leonor.cabecadas@iambiente.pt
Spain	Fernández Pérez Director General for Coasts Ministry of Environment Pza San Juan de la Cruz, s/n 28003 Madrid SPAIN Tel: 00 34 91 597 6062/6041 Fax: 00 34 91 597 5907
	Mr Jose L. Buceta Direccion General de Costas Division de Proteccion del Medio y los Ecosistemas Marinos Ministerio de Medio Ambiente Pza. S. Juan de la Cruz s/n E-28071 Madrid SPAIN Tel: 00 34 91 597 6652 Fax: 00 34 91 597 6903 E-mail: jbuceta@mma.es

United Kingdom	Phillip Stamp Defra Sustainable Marine Development and Climate Impacts 2D Nobel House, Smith Square, London, SW1P 3JR Tel: 020 7238 4607
	Adrian Judd Cefas Senior Marine Advisor Pakefield Road, Lowestoft , Suffolk, NR33 0HT, UK Tel: 01502 562244