ICES WGEXT REPORT 2018

HUMAN ACTIVITIES, PRESSURES AND IMPACTS STEERING GROUP

ICES CM 2018/HAPISG:05

REF. SCICOM

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

16–19 April 2018

Copenhagen, Denmark

ICES International Council for the Exploration of the Sea
CIEM Conseil International pour l'Exploration de la Mer

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Recommended format for purposes of citation:

ICES. 2018. Interim Report of the Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem (WGEXT), 16–19 April 2018, Copenhagen, Denmark. ICES CM 2018/HAPISG:05. 49 pp.

Contents

Executive summary

The Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem (WGEXT) met in Copenhagen, Denmark, 16–19 April 2018. Twelve participants from ten ICES member countries attended the meeting. Contributions were provided by correspondence from three countries whose representative were not able to attend.

The objective of WGEXT is to provide a summary of data on marine sediment extraction (ToR A1), marine resource and habitat mapping, changes to the legal regime, and research projects relevant to the assessment of environmental effects (ToR A2). The data on marine sediment extraction will be reported annually.

Data reports (ToR A1) were discussed from 14 (out of 20) member countries. Although not all the member countries provided reports, the available data is thought to provide a representative assessment of the overall total of material extracted from the ICES area. The status of the other ToRs (A2 and B to L) were reviewed.

1 Administrative details

Working Group name

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

Year of Appointment within current cycle

2017

Reporting year within current cycle (1, 2 or 3)

2

Chair(s)

Ad Stolk, the Netherlands

Meeting dates

16–19 April 2018

Meeting venue

Copenhagen, Denmark

2 Terms of Reference

ToR A1: Review data on marine extraction activities and provide a summary of data on marine sediment extraction for the OSPAR region to OSPAR.

ToR A2: Review of development in marine resource mapping, legal regime and policy, environmental impact assessment, research and monitoring and the use of the ICES Guidelines on Marine Aggregate Extraction.

ToR B: Create an ICES aggregate database comprising all aggregate related data, including scientific research and EIA licensing and monitoring data.

ToR C: Incorporate the MSFD into WGEXT.

ToR D: Ensure outputs of the WGEXT are accessible by publishing as a group and creating a webpage on the ICES website.

ToR E: Discuss the mitigation that takes place across ICES countries and where lessons can be learned or recommendations taken forward.

ToR F: Study the implications of the growing interest in deep sea mining for the WGEXT (legislation/environmental/geological).

ToR I: Cumulative assessment guidance and framework for assessment should be developed.

ToR K: Impacts of marine aggregate extraction on fish and fisheries.

ToR L: Implications of Marine Spatial Planning on marine sediment extraction.

3 Summary of Work plan

Year 1	A1, B, F, I
Year 2	A1, B, C, D, E, K, L
Year 3	A1, A2, B, C, D, E,F, I, K, L

4 List of Outcomes and Achievements of the WG in this delivery period

The outcomes and deliveries will be described in the WGEXT Final Report in 2019.

5 Progress report on ToRs and workplan

5.1 Term of Reference A1): Review data on marine extraction activities and provide a summary of data on marine sediment extraction for the OSPAR region to OSPAR

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 WGEXT meetings. From next year onwards a more standardized reporting format will be distributed.

WGEXT members again attempted to contact those countries who were unable to submit data for inclusion in the annual report. A summary of available information is included in Table 5.1.

Table 5.1. Summary Table of National Aggregate Extraction Activities in 2017.

Country	A) Construction/ industrial aggregates (m^3)	B) Beach replenishment (m^3)	C) Construction fill/ land reclamation (m^3)	D) Nonaggregate (m^3)	E) Total Extracted (m^3)	F) Aggregate exported (m^3)
Belgium (OSPAR)	2 669 615	1 527 254	0	0	4 196 860	1 321 000
Canada	N/d	N/d	N/d	N/d	N/d	N/d
Denmark (HELCOM)	2 493 673	2 347 912	254 151	0	5 095 736	188 720
Denmark (OSPAR)	1 837 265	4 056 658	16 220	0	5 910 143	313 273
Denmark[1] (total)	3 981 613	4 439 690	254 951	0	8 676 254	418 462
Estonia (HELCOM)	N/d	N/d	N/d	N/d	N/d	N/d
Finland (HELCOM)	0	0	0	0	0	0
France (OSPAR)	2 066 174	N/d[2]	N/d	563 800[3]	2 629 074[4]	0

France (Med)	0	N/d [2]	N/d	0	N/d	0
Germany (HELCOM)	941 780	0	0		941.780	0
Germany (OSPAR)	28.654	1.186.294	N/d	N/d	1.214.948	0
Greenland and Faroes (OSPAR)	N/d	N/d	N/d	N/d	N/d	N/d
Iceland (OSPAR)	268 099[5]	0	0	97 573	365 672	0[6]
Ireland (OSPAR)	0	0	0	0	0	0
Latvia (HELCOM)	N/d	N/d	N/d	N/d	N/d	N/d
Lithuania (HELCOM)	N/d	N/d	N/d	N/d	N/d	N/d
Netherlands (OSPAR)	0	11 397 977	8 309 545	147 753[7]	19 707 522	3 165 023
Norway (OSPAR)	N/d	N/d	N/d	N/d	N/d	N/d
Poland (HELCOM)	343 607	568 321			911 928	0
Portugal (OSPAR)	184 203	28 620	0	0	212 823	0
Spain (OSPAR)	0	116 476	0	0	116 476	0
Spain (MED)	0	263 423	0	0	263 423	0
Spain (Canary Islands)	N/d	N/d	N/d	N/d	N/d	N/d
Sweden (OSPAR)	0	0	0	0	0	0
Sweden (HELCOM)	0	80 304	0	0	80 304	0
United Kingdom[8] (OSPAR)	10 482 966	965 561	331 836	0	11 448 528	1 883 958
United States[9]	0	6 194 792	0	NA	6 194 792	0

Table Definitions and notes:

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 out-side of the country where it was extracted. This value is not included in the total.

[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. The total for Denmark has been reported separately.

[2] No information is available for extraction quantities used for beach nourishment in France although sand extraction for beach replenishment is likely to have occurred.

[3] Licensed data (maximum permitted) because extracted data is subject to statistical confidentiality.

[4] Included licensed data (maximum permitted) for non-aggregate because extracted data is subject to statistical confidentiality.

[5]The fraction of total extraction attributed to "construction aggregate" and that to "construction fill/reclamation" has been estimated. Most construction aggregate was used in concrete, and most of the aggregates used for fill and reclamation were are used in harbor construction.

[6] Although marine aggregates are not exported from Iceland, maerl (non-aggregate) is commercially extracted in Bíldudalur, Arnarfjörður and exported.

[7] Total shell extraction including Western Scheldt and Wadden Sea, Voordelta of the North Sea and the North Sea. Total sand-extraction figures exclude 147 753 m^3 of shells as non-aggregate material.

[8] Conversion from reported tonnes to m^3 achieved using density / specific gravity conversion factor of 1.66 tonnes/m^3 although the Mineral Products Association generally uses 1.73 tonnes/m^3 (Per. Com. 2018).

[9] Figures reported for USA pertain to northern areas of the eastern seaboard only

Table 5.2 provides information on countries with data adjustments. Ireland had no extractions in 2017 and 2016. We understand that Norway has extracted and exported maerl amounting to 12 000 tonnes in 2016 and 3500 tonnes in 2017. It seems that some exploratory dredging is being done in Ireland.

OSPAR is considering developing a standard reporting format. The WGEXT format has being developed and is being revised for use in a database (Annex 5). The WGEXT database format would seem to meet OSPAR's needs and Brigitte Lauwaert will present it to OSPAR at their meeting next year.

Table 5.2. Specific matters highlighted in response to OSPAR request for WGEXT to supply national data.

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).
SWEDEN	Delineate activities in the Baltic area (Kattegat) which fall within the boundaries of the OSPAR.
DENMARK	Delineate activities in the Baltic area (Kattegat) which fall within the boundaries of the OSPAR.

Table 5.3 summarizes information on spatial extent of areas licensed for extraction where available, for ICES WGEXT member countries. Al-though 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 the actual spatial footprint should be used to assess impacts.

Table 5.3a. Spatial extent of areas licensed for extraction.

Country	2006	2007/08	2009	2010	2011	2012	2013	2014	2015	2016	2017
	Licensed Area Km²										
Belgium	273	273	273	273	319	319	319	203.2	203.20	203.20	
Denmark	N/d	429	430	789	650	700	N/d	N/d	N/d	686	
Estonia	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	51.02	
Finland	6	10/10	10	10	10	10	12	12	12.1	12.1	10.1
France[1]	73.08	72.97/74.97	74.87	67.87	67.87	135.34	168.54	165.4	169.4	170.17	171.54
Iceland	N/d	N/d	20.55	20.50	20.57	20.57	20.55	20.57	20.62	20.58	
Netherlands[2]	453	456/585	564	490	456	439	462	470	480	524	524
Poland	51.10	51.10	51.10	51.10	25.66	25.66	25.66	25.66	25.33	25.33	44.54
Portugal	N/d This is not controlled in Portugal.										
Sweden	0	0	0	0	9.70	0	0	9.70	9.70	9.70	9.70
UK[3]	1316	1278	1286	1291	1274	711	739	726	912	930.2	1057
USA[4]											2.3

Table 5.3b. Actual areas over which extraction occurs.

Country	2006	2007/08	2009	2010	2011	2012	2013	2014	2015	2016	2017
	Area in which extraction activities occur km²										
Belgium	N/d	N/d	N/d	N/d	105.7	106.2	113.7	61.5	61.5	24	
Denmark	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	
Estonia	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	0	
Finland	N/d	0	0	0	0	0	0	0	0	0	0
France[5]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iceland	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	
Netherlands	47	383/ 35.3	86	86	71	64	86[3]	90	88	90	95
Poland	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/d	N/A
Portugal	N/d This is not controlled in Portugal.										
Sweden	0	0	0	0	9.70	0	0	9.70	0	0	3
UK	141	138	124	105	114	97	99	86		87.5	
USA[4]											0

Table Notes

[1] 46.79 sand and gravel extraction area and 21.08 non aggregate area in 2010 and 2011; 128.14 sand and gravel extraction area and 7.2 non aggregate area in 2012; 162.96 sand and gravel extraction area and 5.579 non aggregate area in 2013; 162.96 sand and gravel extraction area and 2.48 non aggregate area in 2014; 162.96 sand and gravel extraction area and 6.48 non aggregate area in 2015, 162.96 sand and gravel extraction area and 7.209 non aggregate area in 2016, and 163.96 sand and gravel extraction area and 7.58 non aggregate extraction area in 2017.

[2] 90% of material extracted in the Netherlands is taken from 7.5 km² (2006) and 9.2 km² (2007) and 8.3km² (2008), and 23 km² (2009), 38 km2 (2010), 23 km² (2011) and 45 km² (2013)

[3] 90% of material extracted in UK is taken from 46 km² (2003) and 43 km² (2004), 49.2 km² (2006) 49.95 km² (2007), and 39.2 km² (2013).

[4] leases north on latitude 36.55 and in Federal waters only (beyond three n.miles from shore).

[5] French dredging vessels are fitted with EMS but the information is not treated to make area in which extraction activity occur available.

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.

The last part of the ToR A1 concerns the collection of geospatial data on licensed and extraction locations in the form of shape files. WGEXT requests that shapefiles be provided on the WGEXT SharePoint site annually from all ICES countries including those which are not in OSPAR, and reported to both < Johan.nyberg@sgu.se > . In addition, OSPAR countries are asked to provide available shapefiles for 2017 to OSPAR at < Chris.moulton@ospar.org > or <Lucy.ritchie@ospar.org>. These data should be provided every year even if there are no changes. Joni Kaitaranta, the HELCOM Data Coordinator, also would be interested in getting an update from this year's WGEXT meeting to cater for 2017 data needs of HOLAS II and Baltic Sea pressure index. Spatial data files (e.g. shapefiles) would be required for the pressure index analysis. Countries that have shapefiles are listed in Table 5.4. More details on Terms of Reference A1 are given in Annex 4.

Table 5.4. Geospatial Shapefile information.

COUNTRY	Shapefiles licensed	Shapefiles extracted	Delivered to ICES	Delivered to OSPAR
Belgium	Yes	Yes	Yes	Yes
Canada	No	No	No	No
Denmark	Yes	No	Yes	Yes
Estonia	N/d	N/d	No	No
Finland	Yes	No	Yes	No
France	Yes	No	Yes	Yes
Germany	Yes	Yes	No	No
Greenland and Faroes	N/d	N/d	No	No
Iceland	Yes	No	Yes	Yes
Ireland	N/d	N/d	No	No
Latvia	N/d	N/d	No	No
Lithuania	N/d	N/d	No	No
Netherlands	Yes	Yes	Yes	Yes
Norway	No	No	No	No
Poland	Yes	No	Yes	No
Portugal	N/d	N/d	No	No
Spain	N/d	N/d	No	No
Sweden	Yes	Yes	Yes	Yes
United Kingdom	Yes	No	Yes	Yes
United States	No	No	No	No

5.2 Terms of Reference A2) – L): progress update

ToRs G, H and J have been completed. The following section provides a narrative of discussions concerning each active ToR and outputs from the 2017 meeting.

ToR A2: Review of development in marine resource mapping, legal regime and policy, environmental impact assessment, research and monitoring and the use of the ICES Guidelines on Marine Aggregate Extraction

Reports had been provided last year by six countries. These were Belgium, Finland, the Netherlands, Portugal, the United Kingdom, and the United States (Annex 5). The chairman requests those members that have submitted reports to update them if necessary and those members who have not submitted reports to provide them for next year's report.

Alexandre Robert from France has developed a questionnaire about the assessment of extraction: "Survey of aggregate extraction in Europe: how impact assessments are performed?". In next years report we hope to present the results.

ToR B: Create an ICES aggregate database comprising all aggregate related data, including scientific research and EIA licensing and monitoring data

Carlos Pinto and Signe Bagger from ICES Data Centre participated in the meeting during the Monday afternoon and informed the group of the progress with the database. They had had been able to start on the WGEXT database in 2018 with the help of Johan Nyberg and Laure Simplet. They presented the reporting format and revisions were suggested. A template (Annex 6) and an associated guidance document were discussed. This had been developed and sent out to the members of the working group before the meeting, to be used by WGEX members to provide data annually to the database. The template is based on the proposals from the group produced during earlier meetings and can be found at http://magg.ices.dk. The template, an Excel spreadsheet template, has three primary worksheet tabs (Header, Total Licensed Area and Licensed Area Level). Some entries, like "Reporting Organization" is entered as a numeric code; the reference codes are tabulated in the "Vocabulary". If the organization is not on the list, a code will have to be requested. The worksheets contain both mandatory data elements, indicated by red columns, and non-mandatory data (green columns). Some members had filled in the template and uploaded the resulting xml-document to the database.

In discussion, it was recommended that the number of cells be reduced. We deleted the "Legislative Authority", whether the permitting authority or the supervisor, because we do not collect that data in Table 5.1 and the question make replies more complicated. Historical data or revisions to data already submitted can be made as long as the appropriate "Year" is entered. It was concluded that some information in the Licensed area level, that is the area from which aggregate was actually extracted, would be difficult, if not impossible, for some countries to provide. It was also suggested that information provided in the new form be linked to attribute tables in shapefiles.

ToR C: Incorporate the MSFD into WGEXT

The new six-year period for the Marine Strategy Framework Directive (MSFD) is currently in progress. The WGEXT leader of ToR C, Michel Desprez, could not attend this meeting, but the latest draft of the paper was reviewed by Keith Cooper and Ad Stolk. Some outstanding questions were resolved and the latest version sent to Michel Desprez to be finalized. We intend to produce a condensed version for publication (see ToR D1).

ToR D: Ensure outputs of the WGEXT are accessible by publishing as a group and creating a webpage on the ICES website

ToR D1. Revisions were made to review article on *Marine Aggregate Extraction and Marine Strategy Framework Directive: A review of existing research* (ToR C) under the leadership of Michel Desprez. The paper will be finalized and then condensed for publication.

ToR D2. The Summary Report will be done next year. This report will represent WGEXT's cooperative research for the period 2012 to 2018, as a result, a new, redundant Cooperative Research Report will not be written.

ToR D3. The review of the WGEXT webpage on the ICES website has been completed.

ToR D4. We intend to prepare a presentation for the next ICES Annual Science Conference

ToR E: Discuss the mitigation that takes place across ICES countries and where lessons can be learned or recommendations taken forward

A questionnaire on mitigation had been prepared and distributed in 2014. Responses were provided by the Netherlands, France and the UK. Because of the low number of responses, questions on mitigation will be included in a new questionnaire being prepared for ToR A2.

ToR F: Study the implications of the growing interest in deep sea mining for the WGEXT (legislation/environmental/geological)

The official term in ISA International Sea Bed Authority is "deep-sea mining", however ISA's jurisdiction is the high seas and not defined by depth. In addition, some deep-sea mining occurs in national waters, outside of ISA's jurisdiction, in the Azores, for example, close to a marine protected area, and in Iceland and other places mining for metals (rare earth elements) and industrial minerals as well as for aggregates occurs in shallow coastal waters. Any commercial industry applying for a license from ISA must be sponsored by an ISA member country (Annex 7). Because the U.S. is the only ICES country not a member of ISA, a U.S. company is being sponsored by the UK. A legal foundation must be established in each country before they can sponsor an industry.

Exploration of Ilmenite sands for recovery of titanium has been done by Blue Jay Mining in Dundas, Greenland and reported at the 11th Fennoscandia Exploration and Mining meeting in 2017. It is estimated that the total resource amounts to 7.9 million tonnes with 350 000 tonnes. Recovery is intended to begin in 2019.

Deep-sea mining was discussed on the OSPAR EIHA Meeting in April 2018. Documents on deep-sea mining were provided by the UK ('Draft OSPAR background document on the management of deep seabed mining') and by Central Dredging Association-CEDA

('CEDA deep-sea mining information portal'). This portal can be found on the CEDA website. There are still open questions concerning how monitoring should occur and how operations should be regulated.

ToR I: Cumulative assessment guidance and framework for assessment should be developed

The WGEXT leader for ToR I, Jan van Dalfsen, was not able to attend this meeting. The Chair will take steps to finalize and publish this report.

An assessment of dredging intensity can provide the actual footprint of actively dredged areas. Although, it was recognized that intensity is defined as volume/area/time period, a surrogate for 'intensity' measure within the ICES area is only achievable as hours dredged/area/year because of different analysis procedures between countries. A pilot study with U.K., Belgium and part of Dutch data has shown that this measure gives a good view on the actual dredging footprint that can be used in regional assessments. This could be done with data from EMS data ("black boxes"), as is done in the Netherlands, Belgium and U.K., if available, but it is also possible using AIS data as has been done in Denmark and the U.S.

When in operation, data is typically provided every 10 or 30 seconds, but, for this purpose, decimating the data to a time interval of five minutes is, perhaps, adequate and more manageable. If the full data set is used, a grid size of 50 x 50m is possible, but if a longer time resolution is used, larger grid cells should be necessary in order to capture gradients in the intensity. For data provided at time intervals of five minutes, a cell size of 100 x 100m is suggested, but a coarser resolution may be adequate and necessary. A five-minute interval at 2 knots covers 300 m; one-minute data would be a 60 m grid. Times spent in a 50 x 50 m grid cell ranged from less than 15 minutes to over two hours/year. The UK uses 500 x 500 m grids. Within the designated areas, times of active dredging can be determined by noting when the pumps are turned on, but this information is only available if black boxes (EMS) are used. If AIS data is used, times of active dredging might be identified by the speed of the vessel. Speed thresholds used are country dependent because it depends on the sediment type extracted, the type of dredger used and whether static (or "anchor") dredging is allowed. Static dredging can create isolated, deep holes; in some settings, there is concern that deep holes may go hypoxic. A two-knot speed limit seems to work fine for identifying times of active dredging although larger vessels operate faster. A lower limit of 0.5 knots has been used by Belgium to avoid static dredging.

For compliance, positioning errors due to the use of different projections as well as typographical errors in coordinate entries can put the vessel outside of the designated borrow area. This might be especially critical near pipelines or cable crossings; the Netherlands maintains a 1000 m buffer, but Denmark only 200 m. The captain is notified of positon errors but it can be important to have a face-to-face inspection on board to resolve errors quickly.

If reporting of AIS/EMS data is standardized, it should be possible to produce one, overview map of dredging footprint for each year for the ICES area. All available data could be made publicly available. Countries capable of contributing to this effort are requested to provide shape files of the licensed areas for the year 2017 (plus metadata on a

geographic system), a shapefile with X-Y coordinates of actual dredging points distinguishing between dredging and non-dredging. These should be sent to annelies.debacker@ilvo.vlaanderen.be by 31 October 2018. The intention is to combine all data to produce a dredging footprint (hours dredging/area/year). It should be possible for Netherlands, Belgium, Denmark, UK, and, perhaps the US, but any member country is invited to participate.

ToR K: Impacts of marine aggregate extraction on fish and fisheries

Reports had been submitted last year by Belgium, Denmark, Finland, France, Portugal, Sweden and the UK. The chairman will request that members that have not submitted reports do so for next year.

ToR L Implications of Marine Spatial Planning on marine sediment extraction

ToR L1. Inventory of countries policy development.

ToR L2. Review of the incorporation of marine sediment extraction in Marine Spatial Planning in member countries.

There was no progress on this ToR.

Presentations given to the WGEXT

Six presentations were given to WGEXT by:

- Bryndis G. Robertsdottir
- Keith Cooper: A big data appoarch to macrofaunal baseline assessment, monitoring,and sustainable explotation of the sea bed.
- Annelies De Backer: Results of the Belgian monitoring program on sand extraction.act of marine aggregates extraction in France
- Alexandre Robert (with N. Desroy, C. Vogel and L. Simplet): Impact of Marine Aggregate Extraction in France.
- Thomas Klinggaard: Oresund: "The Sound".
- Hans Ohrt: Peberholm - an artificial Island.

Available abstracts of the presentation can be found in Annex 8. The presenters are asked to upload their Power Point presentations to the WGEXT SharePoint site.

6 Revisions to the workplan

None.

7 Next meetings

WGEXT offered thanks to Laura Addington and the Danish Environmental Protection Agency of the Ministry of Environment and Food of Denmark for hosting the meeting and to Henry Bokuniewicz for continuing to serve as rapporteur. The 2018 meeting included a field-trip to Peberholm (artificial) Island.

The 2019 meeting will be held in Lisbon, Portugal, 6–9 May 2019.

Annex 1: List of participants

Name	Institute	Country (of institute)	Email
Ad Stolk (Chair)	Ministry of Infrastructure and Water Management	The Netherlands	ad.stolk@rws.nl
Henry Bokuniewicz (Rapporteur)	Stony Brook University	United States	henry.bokuniewicz@stonybrook.edu
Laura Addington	Ministry of Environment annd Food of Denmark	Denmark	lauad@mst.dk
Keith Cooper	CEFAS	United Kingdom	Keith.cooper@cefas.co.uk
Annelies De Backer	Flanders Research Institute for Agriculture, Fisheries and Food	Belgium	Annelies.debacker@ilvo.vlaanderen.be
Sander de Jong (by correspondence)	Ministry of Infrastructure and Water Management	The Netherlands	sander.de.jong@rws.nl
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Brigitte Lauwaert	Operational Directorate Nature	Belgium	brigitte.lauwaert@naturalsciences.be
Kurt Machetanz (by correspondance)	Landesamt fur Bergbau,Energie,und Geologie	Germany	Kurt.Machetanz@lbeg.niedersachsen.de
Marta Martinez-Gil Pardo de Vera (by Correspondance	Ministry of Agriculture, Fisheries, Fodd, and Environment	Spain	MMGil@mapama.es
Johan Nyberg	Geological Survey of Sweden	Sweden	Johan.nyberg@sgu.se
Rui Quartau (by correspondence)	Divisao de Geologia Marinha	Portugal	Rui.Quartau@hidrografico.pt
Bryndis G. Robertsdottir	Icelandic National Energy Authority	Iceland	bgr@os.is
Mark Russell (by correspondence)	BMAPA	United Kingdom	Mark.Russell@mineralproducts.org
Laure Simplet	IFREMER	France	laure.simplet@ifremer.fr
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Alexandre Robert	IFREMER	France	Alexander.robert@ifremer.fr

Annex 2: Recommendations

None.

Annex 3: Agenda

Monday, 16 April 2018	
09.30 – 09.45	Meet at Ministry of Environment and Food, Copenhagen, Denmark.
09.45 – 10.30	Welcome by Danish Environment Protection
	Welcome by WGEXT Chair
	Apologies for absence
	Adoption of Agenda
10.30 – 10.45	Coffee break
10.45 – 11.30	Term of Reference A1a: OSPAR Summary of extraction statistics
11.30 – 12.15	Term of Reference A1b: Review data on marine extraction activities
12.15 – 13.30	Lunch
13.30 – 14.30	Presentation ICES database by Carlos Pinto and Signe Bagger (ICES)
14.30 – 15.30	Discussion of Term of Reference B: ICES aggregate database
15.30 – 15.45	Coffee break
15.45 - 17.00	Discussion of Term of Reference B: ICES aggregate database
Tuesday, 17 April 2018	
09.00 – 10.00	Round up on all Terms of Reference C to L
10.00 – 12.15	Subgroup discussions on Terms of Reference C to L
12.15 – 13.30	Lunch
13.30 – 14.00	Presentations and discussions on Term of Reference F: Deep sea mining
14.00 – 15.30	Presentations from subgroups and discussions on Terms of Reference C to L
15.30 – 15.45	Coffee break
15.45 – 16.15	Presentations from subgroups and discussions on Terms of Reference C to L
16.15 – 17.00	Discussion on format for request for extraction data
17.00 – 17.30	Discussion on Cooperative Research Report
Wednesday, 18 April 2018	
09.30 – 12.00	Presentations
12.00 – 13.00	Lunch
13.00 – 14.00	Presentation on Peberholm
14.00 – 18.00	Excursion to Peberholm
Thursday, 19 April 2018	
09.00 – 10.00	Presentations
10.00 – 11.30	Agree initial text of WGEXT Interim Report 2018
11.30 – 12.00	Next meeting, outstanding actions, closing remarks
12.00 – 13.00	Lunch
13.00 – 15.30	Subgroup inputs for Annual Report 2018

Annex 4: ToR A1. Review of National Marine Aggregate Extraction Activities

A detailed breakdown of each country's sediment extraction dredging activities is provided here.

A4.1.1 Belgium.

Due to the change to the marine sand and gravel legislation by the entry into the marine spatial plan of 12 June 2014, the maximum amount which can be extracted from zone 2, which is laying in a habitat area, during 2016 is 1 615 000 m³. This amount decreases annually by 1%, i.e. 17 000m³ per year from 2014 until 2019. In zone 2, it is also prohibited to extract gravel.

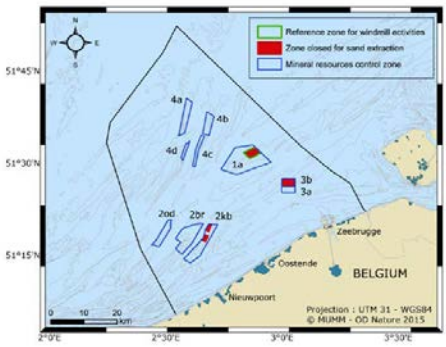

Figure A4.1.1: Extraction areas on the Belgian part of the North Sea, from 12 June, 2014 onwards.

In 2017, a total amount of 4 196 860 m³ sand was extracted from the Belgian Continental Shelf both by the private sector and the Flemish Region, Coastal Division and Division Maritime Access. No gravel was extracted.

Thirteen private license holders extracted 2 669 615 m³ sand which is mainly used for industrial purposes. Two licenses were also granted to the Flemish Region, Coastal Division and Division Maritime Access.

The licenses for the Flemish Region have the same conditions (reporting, black-boxes, etc.) as licenses for the private sector, but they are exempted from the fee system. The Flemish Region-Coastal Division extracted 1 527 245 m³ sand, which was used solely for beach nourishment and originated mainly from zone 4. The increase of the total amount extracted in 2017 compared to 2016 is mainly due to the increased extraction by Flemish region for breach nourishment. There was only a small decrease in the extraction total from industry (Table A4.1.1)

In 2017, 1 321 000 m³ of sand was exported for industrial purposes to France, the U.K. and the Netherlands. The other 1 248 000 m³ of industrial sand was landed in the Belgian coastal harbours of Oostende, Nieuwpoort and Brugge (including the harbour of Zeebrugge).

Table A4.1.1: Marine aggregate extraction figures for 2017 from FOD Economie, KMO, Middenstand en Energie (Includes aggregate extraction for beach nourishment).

Dredging area	Amount (m^3)
Thorntonbank (1a)	1 538 000
Gootebank (1b)	0,000
Kwintebank (2ab)	402 000
Buiten Ratel (2c)	466 000
Oostdyck (2c)	350 000
Sierra Ventana (3a)	345 000
Hinderbanken (4c)	1 095 000
TOTAL	4 196 000

Sand extraction on the Belgian Continental Shelf started in 1976 and data are available since then (Figure A4.1.2). From 2007 onwards the extra quantities extracted by the Flemish Region are included in the graph.

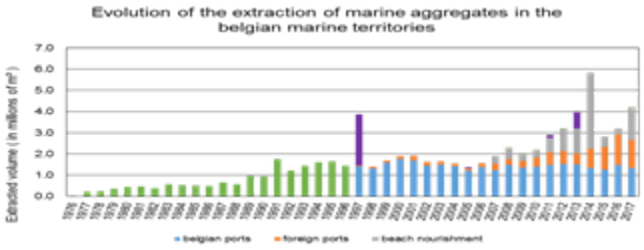

Figure A4.1.2: Volumes of sand and gravel extracted from the Belgian Continental Shelf between 1976 and 2017.

A4.2 Canada. No report.

A4.3 Denmark. See Table 3.1.

A4.4 Estonia. No report.

A4.5 Finland. There was no extraction in 2017.

Table A4.5.1. Historic pattern of marine aggregate extraction in Finland (m^3).

YEAR	Amount
2003	0
2004	1,600 000
2005	2 388 000
2006	2 196 707
2007	0
2008	0
2009	0
2010	0
2011	0
2012	5800
2013	0
2014	0
2015	0
2016	0
2017	0
Total (2003-2017)	**6 190 507**

Sand and gravel was extracted from Finnish waters until the 1980s without systematic permitting procedures. Though, the amounts extracted before that are only speculative. It is known that extraction was taking place at least offshore the biggest coastal cities and the volumes reached at least millions of cubic meters.

Extraction from Finnish coastal areas between 1995 and 2004 was negligible. The Port of Helsinki extracted 1.6 million m^3 off Helsinki (Gulf of Finland) in 2004, 2.4 million m^3 in 2005 and 2.2 million m^3 in 2006. Since then there has been only a small experimental dredging operation in 2010 and a 5800 m^3 test extraction in 2012 in the Loviisa area, Eastern Gulf of Finland.

At the moment there are three valid permits issued by the Regional State Administrative Agencies (AVI). These are:

1. Loviisa: A permission to extract 8 million m^3 of marine sand from the Loviisa-Pernaja area was given in April 2007 by the Environment Permit Authority to Morenia Ltd. Extraction has not yet started except for a small experimental dredging exercise in May 2010 and another feasibility test exercise of 5800 m^3 in 2012. The permit was renewed in June 2017 and is now valid until 30 April, 2027. The permit holder is currently MH-Kivi Ltd.
2. Soratonttu and Itä-Tonttu (off Helsinki): In 2010 The Regional State Administrative Agency of Southern Finland issued a permit to Morenia Ltd. for extracting 5 Mm^3 marine sand and gravel

in the Itä-Tonttu and Soratonttu areas off the city of Helsinki. The extraction should start within 4 years of issuing the permit. The permit is valid until 31 August, 2020. In 2014 The Regional State Administrative Agency of Southern Finland extended the starting time for extraction until 20 June 2020. The permit holder is currently MH-Kivi Ltd.

3. Iijoki river mouth: Southern Ii partition unit applied in October 2015 to extract 240 000 m3 of sand over the next 12 years in Iijoki river mouth, Bay of Bothnia. The Regional State Administrative Agency of Northern Finland issued the permit in March 2016 for extractionwithin an area of 10 hectares. The permit is valid until 31 December, 2027.

A permit of Yppäri area expired in 2017 as the extraction activities did not start within three years of issuing the permit.

There are plans for several large building projects, especially in the Gulf of Finland, which may require substantial amounts of building material in the future. For example LNG terminal, housing areas in coastal zone and artificial islands are planned to be build.

A4.6 France.

Construction industrial aggregate (sand and gravel) extraction figures for 2017.

DREDGING AREA	AMOUNT *
Channel	1 037 453 m^3
Atlantic	1 731 205 m^3
Brittany	0 m^3

Non-aggregate (e.g. shell, maerl, boulders, etc.) extraction figures for 2017.

DREDGING AREA	MATERIAL	AMOUNT *
Brittany	Shelly sand	563 800 m^3 (1)

[1] Licensed data (maximum permitted) because extracted data is subject to statistical confidentiality.

No extraction of maerl took place in 2017. Maerl extraction was prohibited by the end of 2013.

Amount of material extracted for beach replenishment projects in 2017.

France does extract sand for beach replenishment but data is not available because these extractions are in the jurisdiction of the local/regional authorities. An environmental assessment has to be done but mining license is not required.

Construction fill/ land reclamation (m³) extraction figures for 2017

No data available for construction fill or land reclamation in France.

Historic patterns of marine aggregate extraction

Description of historic extraction activities for 2010-2015.

Year	Quantities extracted (m^3)			Total extracted (m^3)	Maximum quantities permitted by Authorities (m^3)
	Channel	*Brittany*	*Atlantic*		
2010	545 881	225 400	2 598 423	3 369 704	6 448 662
2011	592 539	196 393	2 688 844	3 477 776	6 550 746
2012	406 594	175 264	2 750 178	3 332 036	11 320 746
2013	768 999	230 068	2 557 782	3 556 849	10 597 877
2014	358 686	200 800 [1]	2 157 738	2 700 629 [2]	12 431 000
2015	689 367	250 800 [1]	2 003 261	2 943 428 [2]	13 184 800
2016	711 842	265 400 [1]	2 028 974	3 006 216 [2]	13 184 800
2017	1 037453	563 800 [1]	1 028 721	2 629 974 [2]	15 250 400

[1] Licensed data (maximum permitted) because extracted data is subject to statistical confidentiality.

[2] Included licensed data (maximum permitted) for non-aggregate (Brittany) because extracted data is subject to statistical confidentiality.

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

Tweny-one mining licences (171.54 km^2) and two exploration licenses (863.83 km^2) have been granted by authorities but extraction takes place only in 17 licensed areas.

Four applications for aggregate extraction (one on actual extraction area for a renewal of license, one on a previous extraction area, and two on anew extraction perimeter) are being considered by Ministry in charge of Economy. These applications represent 24.889 km^2 with a potential increase for new licensed area of 23.759 km^2.

Country	Exploration and exploitation Licensed Area (km²)				Area in which extraction activities occur (km²)			
	2014	2015	2016	2017	2014	2015	2016	2017
FRANCE	260.71[1]	264.71[1]	643.6[1]	1035.37[1]	N/A [2]	N/A [2]	N/A [2]	N/A [2]

[1] Includes 95.27 research licenses and 165.44 extraction licenses in 2014; 95.27 research licenses and 169.44 extraction licenses in 2015; 473.43 research licenses and 170.169 extraction licenses in 2016 and 863.83 research licenses and 171.54 extraction licenses in 2017.

[2] French dredging vessels are fitted with EMS but the information is not treated to make area in which extraction activity occur available.

A4.7 Germany.

OSPAR (extraction in m³

Year	2016	2017
Construction	35,986	28.654
Replenishment	1.178.741	1.186.294
Total	1,214,727	1.214.948

HELCOM (extraction in m³)

Year	2016	2017
Construction	89,414	0
Replenishment	342,060	941,780
Total	431,474	941,780

A4.8 Greenland and the Faeroes. No report.

A4.9 Iceland

Year	Marine Aggregate Extraction gravel & sand	Marine Non-Aggregate Extraction shell sand	maerl	Total Extraction
2000	1,435,665	147,280	0	1,582,945
2001	1,189,950	133,640	0	1,323,590
2002	861,315	114,250	0	975,565
2003	1,155,485	83,920	0	1,239,405
2004	1,412,430	118,340	0	1,530,770
2005	1,259,157	143,780	13,740	1,416,677
2006	1,253,464	151,460	20,535	1,425,459
2007	1,145,390	158,300	21,666	1,325,356
2008	921,000	134,680	50,445	1,106,125
2009	374,885	69,360	25,435	469,680
2010	125,800	39,760	54,450	220,010
2011	138,700	40,740	46,415	225,855
2012	145,070	12,780	58,800	216,650
2013	182,115	7,100	64,230	253,445
2014	179,440	11,140	77,605	268,185
2015	174,750	5,680	69,036	249,466
2016	215,537	8,520	69,250	293,307
2017	268,099	9,670	87,903	365,672

A4.10 Ireland. No report.

A4.11 Latvia. No report.

A4.12 Lithuania. No report.

A4.13 The Netherlands.

Table A4.13.1 Marine aggregate (sand) extraction figures for 2017.

DREDGING AREA	AMOUNT (m^3)
Euro-/Maas access-channel to Rotterdam	0*
IJ-access-channel to Amsterdam	0*
Dutch Continental Shelf	8,309,545
TOTAL	**8,309,545**

* No sand was extracted for commercial use. Only maintenance dredging was done.

Table A4.13.2 Non-aggregate (shell) extraction figures for 2017

DREDGING AREA	MATERIAL	AMOUNT (m^3)
Wadden Sea	Shells	46,263
Western Scheldt	Shells	0
Voordelta of the North Sea	Shells	14,530
North Sea	Shells	86,960
TOTAL	**Shells**	**147,753**

Description of non-aggregate extraction activities in 2017**:** Based on National Policy for shell extraction, the maximum permissible amounts (in m^3) of shells to be extracted yearly are :

- From the Wadden Sea max. 85,000, but no more than 50% of the total quantity (The Wadden Sea and Sea Inlets).
- From the Voordelta (North Sea) 40,000.
- From the Western Scheldt 40,000.
- From the rest of the North Sea outside the 5 m water depth to a distance of 50 km offshore is unlimited.

Table A4.13.3 Exports of marine aggregate in 2017

DESTINATION (landing)	AMOUNT (m^3)
Belgium	3,106,298
France	36,124
United Kingdom	22,601
TOTAL	**3,165,023**

Table A4.13.4 Amount of material extracted for beach replenishment projects in 2017

DREDGING AREA	MATERIAL	AMOUNT (m^3)
Netherlands coast (general)	sand	11,397,977
TOTAL	**sand**	**11,397,977**

Figure A4.13.1 Licensed sand extraction areas 2017.

Table A4.13.5 Historic patterns of marine aggregate extraction in Mm³

Extraction Area	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Euro-/Maas channel	0,65	1,94	1,22	0,06	0,32	0	0,8	1,8	0	0	0
IJ-channel	0	0	0	0	0,75	0,83	1,5	1,2	0	0	0
Channel Voordelta	-	-	-	-	-	0,05	-	0,03	0	0	0
Dutch Continental Shelf	28,25	24,53	119,59	122,47	68,88	66,89	10,63	8,9	8,1	6,7	8,3
Total extracted	**28,9**	**26,47**	**120,81**	**122,53**	**69,95**	**67,87**	**12,96**	**12,1**	**8,1**	**6,7**	**8,3**

Table A4.13.6 Dutch sand extraction (Commercial and beach replenishment) 1974–2017.

YEAR	TOTAL EXTRACTED m³	YEAR	TOTAL EXTRACTED m³
1974	2,787,962	1996	23,149,633
1975	2,230,889	1997	22,751,152
1976	1,902,409	1998	22,506,588
1977	757,130	1999	22,396,786
1978	3,353,468	2000	25,419,842
1979	2,709,703	2001	36,445,624
1980	2,864,907	2002	33,834,478
1981	2,372,337	2003	23,887,937
1982	1,456,748	2004	23,589,846
1983	2,252,118	2005	28,757,673
1984	2,666,949	2006	23,366,410
1985	2,724,057	2007	28,790,954
1986	1,955,491	2008	26,360,374

1987	4,346,131	2009	120,700,339
1988	6,954,216	2010	122,532,435
1989	8,426,896	2011	62,948,704
1990	13,356,764	2012	41,899,276
1991	12,769,685	2013	23,167,720
1992	14,795,025	2014	51,271,582
1993	13,019,441	2015	25,895,775
1994	13,554,273	2016	15,693,294
1995	16,832,471	2017	19,707,522

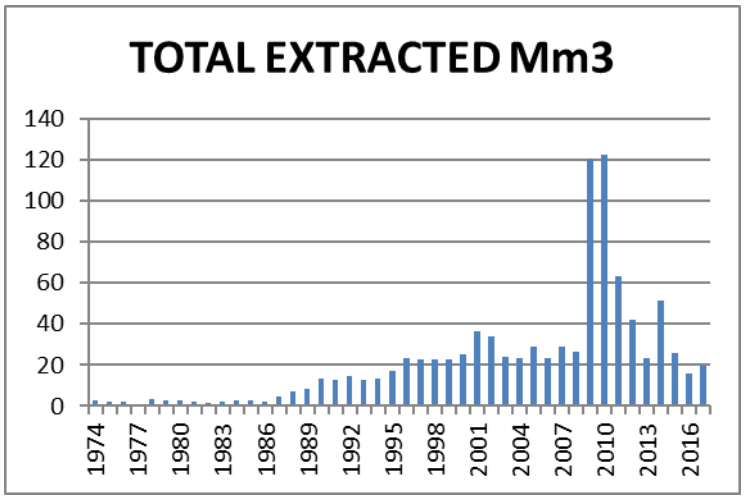

Figure A4.13.2 Dutch sand extraction (Commercial and beach replenishment) 1974–2017.

Table A4.13.7 Licences considered and issued licences Rijkswaterstaat North Sea.

In year	Amount
1998	35
1999	30
2000	25
2001	25
2002	42
2003	26
2004	20

2005	33
2006	33
2007	24
2008	38
2009	23
2010	15
2011	26
2012	10
2013	19*
2014	20*
2015	15*
2016	12*
2017	17*

* one of the issued licenses is a general permit for beach nourishments/replenishments in which several extraction areas for the next 5 years are covered in one single permit.

A4.14 Norway. No report.

A4.15 Poland. See table 3.1.

A4.16 Portugal.

	Azores archipelago	Madeira archipelago	Administração da região hidrográfica do Norte (northern continental shelf)	Administração da região hidrográfica do Centro (central continental shelf)	Administração da região hidrográfica do Tejo (southern central continental shelf)	Administração da região hidrográfica do Alentejo (southwestern continental shelf)	Administração da região hidrográfica do Algarve (southern continental shelf)
1998							1,285,000[2]
1999	6,083[1]						
2000	145,519[1]						
2001	146,791[1]						
2002	115,613[1]	562,353[1]					
2003	176,285[1]	683,521[1]					
2004	197,636[1]	910,179[1]					
2005	159,968[1]	703,620[1]					
2006	181,691[1]	478,473[1]					370,000[2]
2007	141,991[1]	369,008[1]			500,000[2]		
2008	144,647[1]	345,890[1]			1,000,000[2]		
2009	134,021[1]	291,290[1]			1,000,000[2]		

2010	124,132[1]	276,090[1]					1,250,000[2]
2011	126,381[1]	210,720[1]					600,000[2]
2012	69,392[1]	114,360[1]					
2013	50,729[1]	117,980[1]					
2014	45,964[1]	115,262[1]			1,000,000[2]		340,000[2]
2015	61,266[1]	100,935[1]					140,000[2]
2016	59,553[1]	88,770[1]				30,856[2]	
2017	82,573[1]	101,630[1]				28,620[2]	

Table A4.16.1. Historical dredging in Portugal, cubic meters.

[1] Civil construction [2] Beach nourishment

A4.17 Spain.

No extraction activities from marine sand deposits have been carried out in Spain in 2016. A total amount of 379,899 m3 of sand was placed on beaches: 116,476 m3 in the OSPAR area, 263,423 m3 in the Mediterranean area). There was no placement on beaches in the Canary Islands. The sources of these materials were essentially harbours dredged material, in beach sand redistribution and terrestrial quarries.

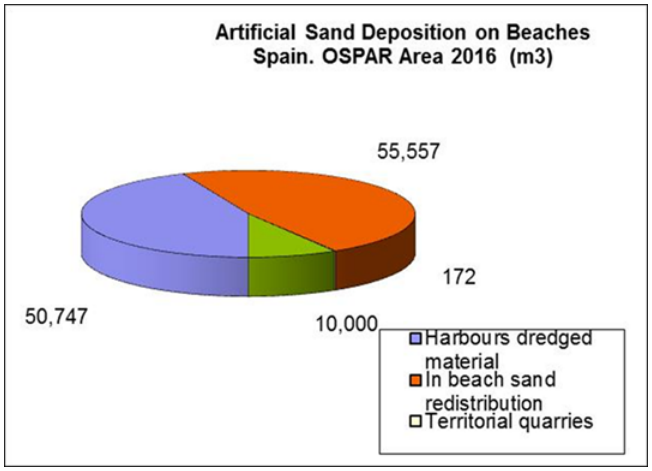

Figure A4.17.1. Sources on Beach nourishments sand in the Spanish OSPAR region.

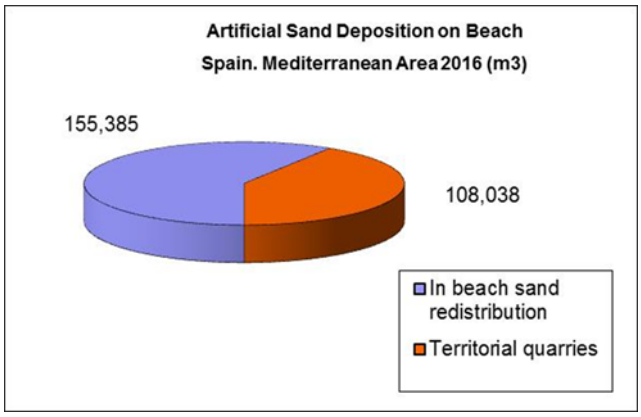

Figure A4.17.2. Sources on Beach nourishments sand in the Spanish Mediterranean region.

A4.18 Sweden.

In Sweden, 80.304 m^3 is extraction in the HELCOM area for beach replenishment.

A4.19 United Kingdom.

For details see: https://www.thecrownestate.co.uk/energy-minerals-and-infrastructure/downloads/marine-aggregate-downloads

A4.20 United States.

These are minimum volumes because no reports were received from the Baltimore District of the U.S. Army Corps of Engineers, covering the states of Maryland or from the Norfolk District covering the States of Virginia. A mixture of dredged sand, silt and clay amounting to 265,300 m^3 were placed as cap in 2017 at the offshore "Historic Area Remediation Site" (HARS).

Table A4.20.1 Amount of sand extracted for beach replenishment projects in 2017.

Beach nourishment 2017	
LOCATION	CUBIC METERS
Townsends Inlet to Cape May Inlet, NJ	1,251,336
Cape May Inlet to Lower Township, NJ	495,432
Lower Cape May Meadows - Cape May Point, NJ	232,425
Rockaway Beach, NY	3,673,443
Channel maintenance stockpiled at Sea Bright (NJ) borrow area.	217,898
Chatham Stage Harbor, MA	35,640
Green Harbor, MA	16,277
Gresat Salt Pond, RI	13,104
Block Island Harbor,RI	2,000
Cohsssett Harbor, MA	12,183

Menemsha Pond, Marthas Vineyard, MA	35,657
Hammonasett Beach, CT	209,397
TOTAL	6,194,792

There were no exports of marine aggregate in 2017.

Table A4.20.2. Historic patterns of marine aggregate extraction.

Year	Millions of m^3
1990	0.2
1991	0.8
1992	0.8
1993	1.5
1994	1.7
1995	1.4
1996	1.4
1997	1.4
1998	1.3
1999	1.3
2000	1.1
2001	1.3
2002	1.1
2003	1.4
2004	1.6
2005	1.4
2006	1.2
2007	1.2
2008	1.0
2009	0.7
2010	0.8
2011	0.8
2012	0.8
2013	0.8
2014	0.2
2015	0
2016	0
2017	0

Annex 5: ToR A2. Review of development in marine resource mapping legal regime and policy, environmental impact assessment, research and monitoring and the use of ICES Guidelines on marine aggregate extraction

A5.1 Belgium.

In the framework of the Transnational and Integrated Long-term Marine Exploitation Strategies research project (TILES), a geological knowledge base is being built for the Belgian and southern Netherlands part of the North Sea. Partners in this effort include the Royal Belgian Institute of Natural Sciences, Ghent Universitu (Department of Geology and Department of Telecommunications and Information Processing), and TNO - Geological Survey of the Netherlands, with the active cooperation with FPS Economy, Continental Shelf Service.

Voxel models of the subsurface are used for predictions on sand and gravel quantities and qualities, to ensure long-term resource use. The voxels are filled with geological data from boreholes and seismic lines, but other information can be added also. The geology provides boundary conditions needed to run environmental impact models that calculate resource depletion and regeneration under various scenarios of aggregate extraction. Such analyses are important in monitoring progress towards good environmental status, as outlined in the Marine Strategy Framework Directive. By including uncertainty, data products can be generated with confidence limits, which is critical for assessing the significance of changes in the habitat or in any other resource-relevant parameter. All of the information is integrated into a cross-domain, multi-criteria decision support system optimised for user-friendliness and online visualisation. More information: http://odnature.naturalsciences.be/tiles

Reference

Van Lancker, V., Francken, F., Kint, L., Terseleer, N., Van den Eynde, D., De Mol, L., De Tré, G., De Mol, R., Missiaen, T., Chademenos, V., Bakker, M., Maljers, D., Stafleu, J. & van Heteren, S. (2017). Building a 4D Voxel-Based Decision Support System for a Sustainable Management of Marine Geological Resources. pp. 224-252. In: Diviacco, P., Leadbetter, A. & Glaves, H. (eds.). Oceanographic and Marine Cross-Domain Data Management for Sustainable Development. IGI Global.

A5.2 Canada. No report.

A5.3 Denmark. No report.

A5.4 Estonia. No report.

A5.5 Finland.

The seabed mapping program (Figure A5.5.1) is undertaken by the Geological Survey of Finland (GTK). 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, thast is using echo sounders, single-channel seismic and side-scan sonar and multibeam sonar equipment. Investigations are supplemented with seabed sampling and visual observations. The study was established 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 to increase knowledge of the physical properties and the geochemical variations in seabed sediments induced by both nature and human activity, while insuring that the demand of various practical and scientific needs arising in a surrounding community should be met.

One of the least studied marine areas of Finland has been the Åland Sea. After negotiations with the authorities of Åland, a pilot project was set up together with the Geological Survey of Finland, Åbo Akademi University and the Government of Åland to start both geological and habitat mapping in the area.

The mapping information as well as a generalized seabed substrate map is available using GTK's map service Hakku < http://hakku.gtk.fi/fi/ >.

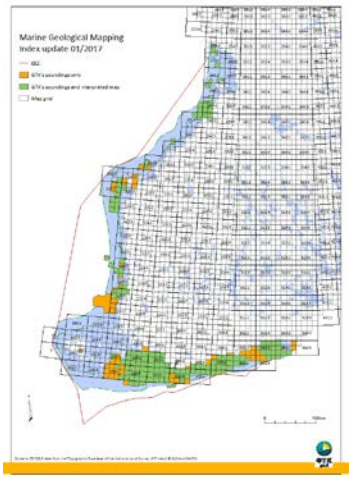

Figure A5.5.1.The marine geological mapping index.

The Ministry of Environment has assigned the Geological Survey of Finland (GTK) to prepare a background paper on sustainable use of marine minerals and aggregates in Finland. This is part of the Programme of measures of Finnish marine strategy which aims at achieving Good Environmental Status (GES) in Finnish waters by 2020. The background paper will be used as a starting point for future work with a view to create new policy and national guidelines for sustainable use of marine mineral and aggregate resources.

A5.6 France.

Three national organizations are responsible for seabed mapping. These are:

(1) the Institut Français de Recherche pour l'Exploitation de la Mer (Ifremer), Z.I. Pointe du Diable, CS 10070, 29280 Plouzané, France. Contact: Laure Simplet; e-mail: laure.simplet@ifremer.fr.

(2) the Service Hydrographique et Océanographique de la Marine (SHOM), CS 92803-29 228 BREST Cedex 2, France. Contact: Thierry Garlan, email: thierry.garlan@shom.fr.

(3) the Bureau de Recherches Géologiques et Minières (BRGM), 3 avenue Claude Guillemin, BP 36009, 45060 Orléans Cedex 2, France. Contacts: Isabelle Thinon: tel: +33 2 38643345; e-mail: i.thinon@brgm.fr, and Fabien Paquet: e-mail: f.paquet@brgm.fr.

Ifremer is in charge of mapping offshore aggregates and publishing atlases of coastal areas dealing with seabed type, morpho-bathymetry, morpho-sedimentary, geology, sediment thickness, and bedrock morphology. Ifremer is also involved in mapping the continental shelf, slope, and abyssal plain.

The French Naval Hydrographic and Oceanographic Service (SHOM) is in charge of bathymetric surveys dedicated to marine safety. Their nautical charts and seabed sedimentological charts ("G" type maps) cover the area between 5 and 15 nautical miles from the coast at various scales (typically 1:50,000). These are compiled from existing data, for example, derived from tallow-lead samples that cover 95% of the continental shelf, grab samples, cores, sidescan sonar, multibeam bathymetry and reflectivity, and aerial photography, in collaboration with universities and national organisations.

The French Geological Survey, BRGM, is in charge of the offshore geological ("hard substrate geology") mapping of the continental shelf at scales of 1:50,000, 1:250,000, and 1:1,000,000. The geological mapping of the continental shelf continues through the RGF national programme (Référentiel Géologique de la France)

BRGM and Ifremer were involved in the second phase of the EMODNet Geology Project (2013-2016). Seafloor geology and seabed substrate have been mapped at scales of 1:1,000,000 and 1: 250,000, within the French EEZ for European seas. SHOM and Ifremer were involved in EMODNet Bathymetry lot. Ifremer also coordinated the Habitat mapping lot of EMODNet Project (2013-2016). Data can be downloaded from EMODnet website < http://www.emodnet.eu/ >. EMODNet has just begun its third phase of its two-year project.

Since 2014, eight seabed substrate and geomorphological maps have been issued. These are

(1) Ehrhold A. coord. (2015). Cartes sédimentologiques et morpho-bathymétriques de la baie de Morlaix et de sa région. *Éd. Quae*. 3 feuilles, échelle 1/30 000 et une clé USB.

(2) Gregoire Gwendoline, Ehrhold Axel, Le Roy Pascal, Jouet Gwenael, Garlan Thierry (2016). Modern morpho-sedimentological patterns in a tide-dominated estuary system: the Bay of Brest (west Brittany, France) . Journal Of Maps , 12(5), 1152-1159 . http://doi.org/10.1080/17445647.2016.1139514

(3) Cirac Pierre, Gillet Hervé, Mazières Alaïs, Simplet Laure (2016). Carte des formations superficielles du plateau aquitain (2016). EPOC-Université de Bordeaux. http://doi.org/10.12770/602a30c5-c338-4e75-a591-baccb8ba1f79

(4) Bourillet Jean-Francois, De Chambure Laurent, Menot Lenaick, Simplet Laure, Loubrieu Benoit (2016). Classification Géomorphologique de la pente continentale du Golfe de Gascogne (1/500,000). Ifremer - Géosciences Marines. http://doi.org/10.12770/d5da916a-163c-47b9-8a8e-73dcaeec7986

(5) Bourillet Jean-Francois, De Chambure Laurent, Menot Lenaick, Simplet Laure, Loubrieu Benoit (2016). Classification Géomorphologique de la pente continentale

de la façade méditerranéenne (1/500 000). Ifremer - Géosciences Marines. http://doi.org/10.12770/7a96a6c4-fcbe-4969-b554-5a94fe49e8ee

(6) Simplet Laure, Gautier Emeric (2016). Carte des formations sédimentaires superficielles de l'anse de la Mondée (Biéroc la Mondrée, 2014). Ifremer. http://doi.org/10.12770/049fad57-7595-48c7-a4f0-d40bee1a5dc6

(7) Bourillet Jean-Francois, Simplet Laure, Sterckman Aurore, Moreau Julien, Veslin Mathieu, Biville Romain (2017). Formations superficielles du Plateau aquitain (2017) au 1/20,000 (projection de Mercator à N44°45'). Ifremer. http://doi.org/10.12770/2efa6d8b-7caf-444f-813a-c4178215b2ce

(8) Simplet Laure, Gautier Emeric, Salaun Jessica (2017). Carte des formations sédimentaires superficielles au large de la baie de Somme (2017). Ifremer. http://doi.org/10.12770/de87d248-d217-4b32-9ee3-fa40980cdaf0

Publications can be ordered from IFREMER: Editions QUAE < http://www.quae.com/fr/c75-atlas-cartes.html >, BRGM: Editions < http://www.brgm.fr/editions.jsp >, and SHOM: Editions < http://www.shom.fr/les-produits/produits-nautiques >. Further information is available online at http://sextant.ifremer.fr/fr/, http://sextant.ifremer.fr/fr/web/granulats-marins, http://infoterre.brgm.fr/viewer/MainTileForward.do, and http://data.shom.fr/ .

The French Mining code was created in 1956 (based on resumption of the law of 1810). Its recodification in 2011 resulted in the current order 2011-91. Its reformation is in progress to bring it into conformity with national environmental requirements. The proposal for an act to adapt Mining code to environmental rights includes the consideration of environmental challenges in the issuance of mining titles, the enhancement of information-sharing and conciliation procedure, the creation of a high council for mines and the definition of a national policy for resources and mining purpose. It was debated in a public meeting at National Assembly on January 24 and 25, 2017 and remains currently pending before the Senate.

More information can be found at https://www.senat.fr/dossier-legislatif/ppl16-337.html and
http://www.assembleenationale.fr/14/dossiers/droit_environnement_adaptation_code_minier.asp .

The law 2016-1087 for biodiversity, nature and landscape restoration of August 8, 2016 introduced an article in the Mining code. This new article created a specific licensing fee for the exploitation of non-energy mineral resources, including marine aggregates, on the French continental shelf and EEZ seafloor. The licensing fee should be calculated on the basis of the advantages of any kind provided to the license-holder, the environmental impact of the activity, water depth and distance to the coastline of the licensed area, and the amount of expenditure incurred during the duration of exploration and extraction license. The license-fee could be increased for exploitation occurring in a marine protected area (as defined in article L. 334-1 of Environment code). It will be applied as of 2019 on the basis of quantities extracted in 2018 and will be returned to the French Agency for Biodiversity to help preservation, management and restoration of marine biodiversity.

More information can be found at:

https://www.legifrance.gouv.fr/eli/decret/2017/1/12/ECFL1630724D/jo/texte

https://www.legifrance.gouv.fr/affichCodeArticle.do;jsessionid=CEB2D33D4DF5C9076FC6A050D587028A.tpdila09v_3?idArticle=LEGIARTI000033028884&cidTexte=LEGITEXT000023501962&dateTexte=20170303

Ifremer completed a study, commissioned by French Environment Ministry, whose aim was to define and identify areas for sand and gravel extraction with minimal constraints for benthic fauna, fishing activity and fisheries resources. The results are available at : http://sextant.ifremer.fr/fr/web/granulats-marins

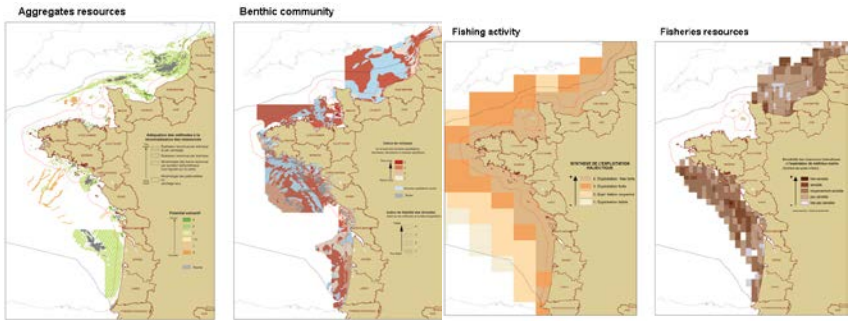

Figure A5.6.1 Synthesis maps for aggregates resources, benthic fauna, fishing activity and fisheries resources (Ifremer 2005-2012).

The ESPEXS (2007-2013) project, led by the Languedoc-Rousillon Regional authority with the collaboration of Ifremer and the University of Perpignan, published its final reports. This project aimed to complete knowledge on marine environment and to define environmental issues on two areas of potential sand extraction for beach replenishment identified in the European BEACHMED project. Reports can be downloaded at: http://littoral.languedocroussillon.fr/ESPEXS-Phase-2.html

The SCOOTER (2012-2015) project studied the effect of marine aggregate extraction on water quality due to the remobilization of contaminants from sediments. The objectives of this project were (1) to bring information on the dynamics of contaminant remobilization within the dredging-induced turbid plume and on the fate of contaminant between the dissolved and particulate phase, and (2) to examine water quality evolution under natural and dredging conditions to identify any need for long-term monitoring in period covered by the mining license. Final report can be downloaded at: http://archimer.ifremer.fr/doc/00310/42078/41381.pdf

The IMPECAPE project (2016-2018), funded by the French Agency for Biodiversity, tackles to assess ecological impacts on benthic habitat due to physical disturbance , including sediment extraction and scallop dredging. It aims to produce indicators for environmental status of coastal benthic habitat in relation with the Habitats and Marine strategy framework directives and to propose monitoring program:

http://www.sb-roscoff.fr/fr/observation/programmes/impecape .

France does not incorporate ICES Guidelines in a formal way in its legal regime but takes into account all of them for its marine aggregate extraction management, such as re-

quirements for an EIA before authorization, and monitoring prior to and during the period covered by the license and after the extraction takes place to examine restoration of the area.

A5.7 Germany. No report.

A5.8 Greenland and the Faeroes. No report.

A5.9 Iceland. No report.

A5.10 Ireland. No report.

A5.11 Latvia. No report.

A5.12 Lithuania. No extractions in 2016.

A5.13 The Netherlands.

In the framework of the research project TILES (Transnational and Integrated Long-term Marine Exploitation Strategies) a geological knowledge base is built for the Belgium and southern Netherlands part of the North Sea (Stolk, 2015). For details see the above section "A5.1 Belgium". The main development in policy in the last years is the regulation of other activities in the area reserved for sand extraction. In the Policy Document on the North Sea 2016-2021 (I&E and EA, 2015) it is formulated as follows: *The zone between the continuous NAP -20m isobath and the 12-mile boundary is regarded as a reserve area for sand extraction for the purposes of coastal replenishment and flood protection as well as for sand extraction for filling purposes and concrete and masonry sand for construction and infrastructure. The spatial pressure in this area will increase due to the construction of wind farms at sea and the laying of electric cables through the areas with the most cost-effective sand reserves and where sand extraction has the highest priority. If parties engaged in other activities of national interest, such as oil and gas extraction and wind energy, wish to use the area reserved for sand extraction, then a solution tailored to the specific situation will be sought. In the case of cables and pipelines, including interconnector and telecommunications cables, the following will be examined in succession: 1) whether a route is possible with the new cables and pipelines being bundled with existing cables and pipelines; and 2) whether a route is possible without appreciably affecting the supply of extractable sand. These preferred routes are shown on the framework vision map and are based on:*

- *location of less suitable sand extraction zones (thin package*
- *existing bundling of cables and pipelines, enabling maintenance zone to be limited;*
- *landing points for gas, oil and electricity;*
- *location of sand extraction sites that have already been depleted.*

If use of a preferred route is impossible for economic or environmental reasons, or if no route has been designated in an area, then customised work will be necessary. In exceptional cases it may be possible to extract sand in this area prior to it being used for cables or pipelines. If this is not possible and the new route will force the sand extraction activities out to another site entailing extra costs, the initiator will have to compensate these extra costs.

The far-field effects on benthos of the sand extraction (about 200 million m^3) for the construction of Maasvlakte 2, an extension of Rotterdam harbour, are analysed by Heinis and Van Tongeren (2016). The main conclusion is that, in the area where a significant

increase was seen in the silt content in the second and third years of sand extraction (the high-impact area), there was a small change in the composition of the benthos. However, this was a subtle change involving a slight increase in the biomass of a small number of silt-tolerant species and a slight decrease in the biomass of species that are averse to silt. In the area with significantly increased silt content (high-impact area), there was no emergence or disappearance of species that could not be accounted for by autonomous development (emerging from a comparison of the baseline years and the effect years). The conclusion with respect to the possible effect on animals higher in the food chain (including birds) is that any possible effects of higher silt content in the seabed can be excluded.

In the framework of 'Building with Nature', a small part inside the deep (20m) extraction pit for the sand extraction for Maasvlakte 2 was not extracted. As a result a ridge was formed in the pit. On and around this ridge research was done on fish and benthic fauna to investigate the short-term effects of deep sand extraction and ecological landscaping (De Jong, 2016).

References

De Jong, M.F. (2016) The ecological effects of deep sand extraction on the Dutch Continental shelf. Implication for future sand extraction. PhD Thesis, Wageningen University, Wageningen, The Netherlands, 164 p.

Heinis, F. and O.F.R. van Tongeren (2016) Monitoring of the effects of Maasvlakte 2. Far-field effects on benthos of the construction of Maasvlakte 2. Maasvlakte 2 Project Organisation, World Port Center, Rotterdam, 53 p.

I&E and EA (2015) Policy Document on the North Sea 2016-2021, including the Netherlands' Maritime Spatial Plan. Appendix to the National Water Plan 2016-2021.

The Dutch Ministry of Infrastructure and the Environment and the Dutch Ministry of Economic Affairs, The Hague, The Netherlands, 119 p.

Stolk, A. (2015) Synthesis and future course of monitoring marine sand extraction in the Netherlands. Proceedings EMSAGG 2015 Conference: Marine sand and gravel – finding common grounds, 4-5 June 2015, Delft, The Netherlands.

A5.14 Norway. No report.

A5.15 Poland. Polish Geological Institute

Activities related to elaboration of the high resolution geological mapping program of the bottom of the Polish maritime areas were continued in 2017. Collecting of existing data and metadata from external sources have progressed (e.g. bathymetry). The scope of investigations/analysis as well as preliminary time/cost frame of the mapping program implementation have been designed with respect to existing data as well as various geological complexity of the area. Technical aspects of data gathering (including field efforts) and its integrity with existing data base were analyzed. The framework sets guidelines for data processing and definitions dedicated to different mapping products (e.g. lithology, perspective for natural resources and sand for beach nourishment). Subsequently, the creation of repository of geological and geophysical mass data from the Polish maritime areas was to follow. Elaboration of Geo-environmental map of Polish maritime areas

for rational seabed resources management (currently at the GIS processing stage) allowed to support the marine spatial planning processes which are currently going on in Poland (PIG-PIB consultations in the aspect of natural resources occurrence and the perspectives).

A5.16 Portugal. No new information to report.

A45.17 Spain. No report.

A5.18 Sweden.

From an assignment by the Department of Enterprise, the Geological Survey of Sweden (SGU) has mapped the marine geology in nine areas on the Swedish continental shelf. These had been identified as possible for sustainable marine sand and gravel extraction. The nine areas are chosen primarily from marine geological data retrieved by SGU through a systematic mapping of the Swedish seabed between the late 1970s and 2010, although resolutions and methodology varied over time. The nine areas are located from Kattegatt, in the southwest to the Bothnian Bay, in northeast (Figure A5.18.1).

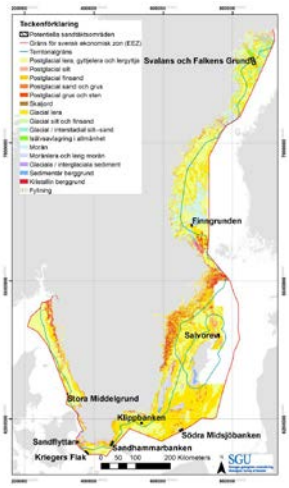

Figure A5.18.1. The nine areas identified as possible for marine sand and gravel extraction, from a sustainable point of view, that were surveyed by SGU during 2016.

The multibeam, side-scan sonar, sub-bottom profiler and seismic data, sampling data and observations of the seabed retrieved by SGU in 2016, as well as qualitative environmental assessments the Swedish Agency for Marine and Water Management (HaV) made from the data, show that environmentally sustainable extraction of marine sand and gravel may be possible in parts of the four areas of Sandflyttan, Sandhammar bank and Klippbanken in the southern Baltic Sea, and Svalans /Falkens grund in the Gulf of Bothnia. The areas that are identified as suitable:

- are located on slopes and depressions deeper than the photic zone
- consist of larger and thicker sand and gravel deposits, up to the seabed
- have seabed substrates consisting mainly of the sand and gravel fractions
- have such a high movement in the bottom water that larger transports and accumulations of sand and gravel occur on the seabed

- are located at such distance from shore that the risk of increased coastal erosion is negligible
- have material with the right quality for use in the construction industry.

Shallow, biologically sensitive hard seabed, located closer to shore, is to be avoided, thus, enhancing the likelihood that the ecosystem services and biodiversity in those areas are maintained. Below the photic zone, substrates predominantly of sand and gravel are delineated and volumes of aggregates are estimated from the thickness of the deposits. The sediment dynamics for potential resource areas and water depths have also been estimated through observations of movement patterns of sand and gravel. Continued biodiversity and ecosystem services after extraction are estimated also. The conflict of interests and distances to regions where the material primarily could be used for each investigated area are shown. The report with an English summary could be found at www.sgu.se.

A5.19 United Kingdom.

In many cases, the area available to be dredged within a licence area will be restricted through zoning. This may be as a result of a licence condition or as a voluntary initiative introduced by the dredging operator. The value of such zoning lies in minimising the spatial footprint of marine aggregate dredging activity, which in turn can reduce the potential footprint of environmental impact, and reduces the potential for spatial impacts with other users of the sea. Zoning also allows operators to manage their resources more effectively.

Since 2003, BMAPA and The Crown Estate have undertaken to produce Regional Active Dredge Area (RADA) charts for all dredging regions on a bi-annual basis. These charts provide a snapshot of the extent of active dredge areas on the 31 January and 31 July, with any changes to working areas highlighted in red.

Where there is a need to highlight regional changes to existing marine aggregate production licence areas, the industry will occasionally also issue updated RADA charts outside of the bi-annual cycle. This ensures that the most up-to-date information on active dredge areas is available to other marine users.

The charts are distributed to the fishing industry through the District offices of the Marine Management Organisation, and the latest versions can also be downloaded here:

http://www.bmapa.org/issues/other_sea_users.php.

Background. English marine aggregate operators have increasingly been required to undertake a range of marine surveys (bathymetry, side scan sonar, seabed sediment sampling and benthic sampling) to deliver the compliance conditions attached to site specific marine licences. Often, the scope and frequency of these compliance requirements would vary between individual licences, and as a consequence the surveys would be designed and commissioned by individual industry operators in consultation with regulators and advisors at a licence specific scale. Given the proximity of many marine licence areas to one another, this approach resulted in considerable duplication of time and effort by all parties involved in the process together with inconsistent data outcomes. This duplication of effort was also reflected in the costs expended by industry to undertake such

work, as a consequence of multiple surveys being commissioned to acquire data from adjacent sites at different times.

In 2014, the marine aggregate industry commissioned a series of Regional Seabed Monitoring Plans (RSMP) to determine the baseline environmental conditions across five geographic regions; the Humber, the Anglian, the Outer Thames, the Eastern English Channel and the South coast.

These works were undertaken to fulfil the seabed sampling conditions attached to marine licences for marine aggregate extraction issued by the Marine Management Organisation (MMO) from 2013 onwards. Additionally, marine aggregate operators chose to apply this new approach to a number of existing marine aggregate licence and application areas that were present in each region. In total the RSMP programme applies to over 60 marine aggregate production licence and application areas operated by 10 operating companies, and has required seabed data to be collected from 3500 sample stations.

For each region, a baseline array of sample stations focussing on primary and secondary impact zones of the licence/application areas being surveyed has been defined, together with a supporting array of regional context sample stations and regional reference areas.

Development of a wider approach to Regional Monitoring & Management. The practical delivery of the RSMP baseline surveys, simultaneously across five regions during 2014/15, highlighted the significant time, effort and costs that were involved for industry and also for the regulators and advisors that would ultimately receive and review the data for compliance purposes. Repeat monitoring surveys would be required to deliver the compliance requirements throughout the term of each marine licence, which are typically 15 years, but with the potential for licences being renewed for a further 15 years. As a result, there was the potential for the workload and cost to be concentrated into particular years with implications for practical resourcing and delivery.

Given the practical savings in time, effort and cost that could be realised through a more coordinate approach, it was agreed that the benefits derived from the RSMP approach, of planning, undertaking and reporting the compliance surveys required at a licence specific scale using a common standard, could be extended across to all the standard compliance monitoring requirements that applied to all licences. For this to occur in practice, it was recognised the common monitoring requirements that applied to every licence area would need to be standardised, so their scope and frequency was consistent. In turn, this would allow the timings of all standard monitoring survey events to be aligned at a regional scale so that all licences were required to deliver the same surveys at the same time. By aligning the timings at a regional scale, it should then be possible to stagger the various regional survey events across multiple years so the pressures on workload and cost could be spread more evenly, rather than being concentrated into particular years.

An agreed monitoring plan is now being developed by the industry for each region, with the South Coast region representing the first of these. This will define the management blueprint that sets out the timings and scope of all the various standard compliance and reporting events that will apply to all existing marine licences for aggregate extraction in a region. This framework is also intended to apply to any new marine licences that may be permitted in the future.

Given the potential long term benefits of this approach, the marine aggregate sector has been working closely with MMO and their advisors to agree the terms of reference for each regional monitoring plan.

The regional monitoring approach is intended to apply across the full term of all marine licences for marine mineral extraction, typically 15 years. During this period, interim regional multibeam bathymetry will be required in the second, seventh and twelfth years. Full multibeam bathymetry, sidescan sonar and seabed monitoring will be required in the fourth, ninth and fourteenth years. The results from the interim and full regional surveys will be used to inform the substantive reviews for site specific marine licences undertaken by regulators every five years in the sixth, eleventh and sixteenth years.

The integrated approach used to define each regional survey array will allow acoustic coverage and/or sample stations data acquired to be applied across multiple licence areas, therefore reducing duplication of effort. This approach also increases the robustness and consistency of the baseline data that is being acquired, and of any monitoring data obtained thereafter. The principle benefits derived through this new approach arise through a combination of factors:

(1) Reduction in compliance survey effort – The regional monitoring surveys will be designed to take into account the direct and indirect impact footprints from all of the licence and application areas that are present. Due to their proximity to one another, survey coverages can often overlap with one another therefore the regional data will be able to fulfil the requirements of multiple licence areas, reducing amount of survey time that has to be expended. This reduces survey time and associated weather risk.

(2) Reduction in compliance survey data analysis – As the scope of the regional monitoring will encompass all licensed interests, the regional data acquired should be able to be processed to the same consistent standard.

(3) Simplified compliance reporting – Licence-specific compliance surveys will be able to be reported on a more consistent basis, drawing on a single regional survey report.

(4) Spread of time/effort/cost over time – By phasing the regional survey requirements across a number of years, the time/effort/costs associated with delivering the requirements should be able to be managed more effectively. This allows the resourcing requirements within operators, regulators and advisors to be managed more effectively as the workload over time will be more consistent. Staggering the delivery regional surveys also delivers more practical advantages given the capacity available within the survey contractors can vary.

(5) Reduction in survey costs – By commissioning a single regional survey rather than multiple site specific surveys, savings are realised by reducing the number of mobilisation events and the general management associated with delivering a survey. A larger survey also enables economies of scale to be realised when booking vessel time.

11.20. United States.

The Federal Bureau of Ocean Energy Management (BOEM, formerly the Mineral Management Agency) completed reconnaissance geophysical track lines and geologic sample locations along the Atlantic Outer Continental Shelf (OCS) for a national OCS sand inventory. Thirty-six survey areas were identified (Figure A5.20.1); survey areas 1 to 22 are considered as being in the ICES territory. Along the US coast this is considered to be north of Cape Hatteras (35.2546;-75.5200). This area comprises the responsibility of North Atlantic Division of the U.S. Army Corps of Engineers, NOAA's Large Marine Ecosystem for the NE U.S. Continental Shelf, and the Mid Atlantic Fisheries Council (under the Magnuson-Stevens Act).

In this area, the jurisdiction of individual States (Maine, New Hampshire, Massachusetts, Rhode Island, New York, New Jersey, Delaware, Maryland and Virginia) to the marine natural resources extends 3 nautical miles (5.6 km) into the Atlantic. The BOEM study area begins 5.6 km offshore within water depths less than 30 m or to 14.8 km offshore whichever is closer to shore. The limitation of 30-m water depth is the maximum practical dredging capability of U.S. dredges. Data is managed in the Marine Minerals Information System (MMIS) with the goals of (1) collecting geophysical and geological mapping data, (2) identifying and analysing sediment/sand resources, (3) resource planning and administration, and (4) facilitating coastal restoration requiring offshore sand extraction.

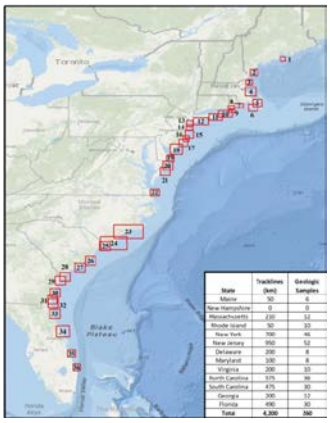

Figure A5.20.1. BOEM survey areas.

There are two areas leased and one area pending for sand extraction currently in the ICES area. The leased area in New Jersey is offshore Long Beach Island. A request for 9.2 million m^3 for beach nourishment has been approved by MOU with (Memorandum of The US army Corps of Engineers and the State of New Jersey's Department of Environmental Protection. Understanding) for a three-year period. There are no royalties and the lease is non-inclusive. An environmental assessment was required and environmental and cultural resource consultations are required. The US Army Corps of Engineers are responsible for stewardship and environmental compliance. State Water Quality Certification and assurance of consistency with State coastal policy are also required. Monthly reports are to be supplied to BOEM as well as pre- and post-dredging surveys. Pending in Virginia is a request to BOEM for 1.7 million m^3 to be taken from Sandbridge Shoal.

Some marine sand extractions in State waters can be found at:

(1) Northeast: http://www.nj.gov/dep/shoreprotection/projects.htm

(2) Virginia: http://www.nao.usace.army.mil/About/Projects/

(3) Southeast

- Wilmington: http://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Public-Notices/Tag/12934/shore-protection-project/
- Charleston: http://www.sac.usace.army.mil/Missions/Civil-Works/
- Savannah: http://www.sas.usace.army.mil/
- Florida: http://www.saj.usace.army.mil/Missions/Civil-Works/Shore-Protection/
- http://www.sac.usace.army.mil/Missions/Civil-Works/Hurricane-and-Storm-Damage- Reduction/

Annex 6: ToR B. Create an ICES aggregate database comprising all aggregate related data, including scientific research, EIA, licensing and monitoring data

Text WGEX members to provide data annually to the ICES MAGG database using a template (Figure A6.1) accessible at http://magg.ices.dk.

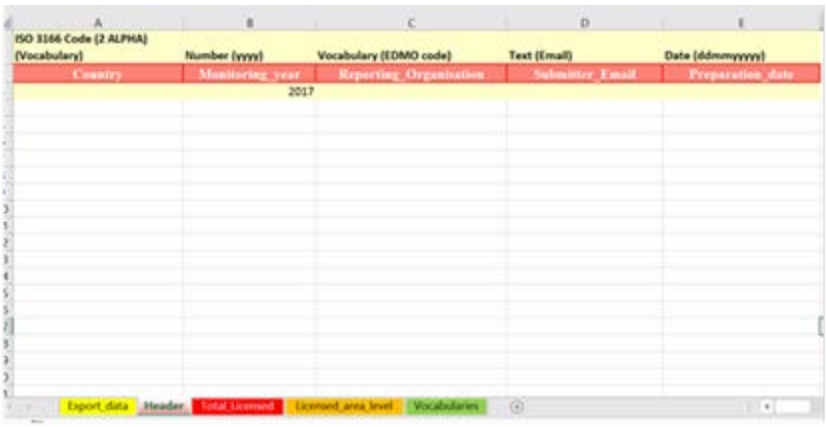

Figure A6.1 The Header sheet in the reporting template developed before the meeting. The template exists of three sheets, Header, Total Licensed and Licensed Area Level, where data is filled in.

Annex 7: ToR F. Study the implications of the growing interest in deep sea mining for the WGEXT

ICES Countries	ISA	DEEP A:KSEABED MINERALS CONTRACTOR for PN	PN	DEEP SEABED MINERALS CONTRACTOR for PS	PS	DEEP SEABED MINERALS CONTRACTOR for CRF	CRF
PN=Polymetalic nodules PS+ polymetalu Sulfides CRF=Colbalt-rich ferromanganese nodules							
Belgium	Yes	Global Sea Mineral Resources NV	1				
Canada	Yes						
Denmark	Yes						
Estonia	Yes						
Finland	Yes						
France	Yes	Institut français de recherche pour l'exploitation de la mer	1	Institut français de recherche pour l'exploitation de la mer	1		
Germany	Yes	Federal Institute for Geosciences and Natural Resources of Germany	1	Federal Institute for Geosciences and Natural Resources of Germany	1		
Iceland	Yes						
Ireland	Yes						
Latvia	Yes						
Lithuania	Yes						
The Netherlands	Yes						
Norway	Yes						
Poland	Yes	Interoceanmetal Joint Organization; Bulgaria, Cuba, Czech Republic, Poland, Russian Federation and Slovakia	1	Government of the Republic of Poland	1		
Portugal	Yes						
Russian Federation	Yes	JSC Yuzhmorgeologiya; (also IOM memeber)	1(2)	Government of the Russian Federation	1	Ministry of Natural Resources and Environment of the Russian Federation	1
Spain	Yes						
Sweden	Yes						
United Kingdom	Yes	UK Seabed Resources Ltd	2				
USA	No						

Annex 8: List of presentations

Keith Cooper: *A big data approach to macro faunal baseline assessment, monitoring, and sustainable exploitation of the sea bed"*. Published in *Scientific Reports* and available at www.nature.com/articles/s41598-017-11377-9.

Alexandre Robert (with N. Desroy, C. Vogel and L. Simplet): *Impact of Marine Aggregate Extraction in France*

So far, knowledge about the impact of marine aggregates extraction in France only provided from Michel Desprez works, eastern-Channel. In the framework of the law on the restauration of biodiversity, nature and landscapes, the french government had to produce a report on the environmental and economical impacts of marine aggregates extraction (end of 2017). The Ifremer was in charge of the environmental part of this report. In order to adress this issue we analysed the industrial monitorings performed on a subsamples of the extraction sites (6 sites from the 21 extractions sites that occur in the mainland). The talk first described the legislative framework of the extraction in France as well as the socio-economic importance of marine aggregates for coastal areas. Then, environmental impacts of the mining activity, as observed from industrial monitoring, have been presented and discussed. Conclusions was that the impacts were relatively consistant with those highlighted in other ICES countries, such as UK. Industrial monitoring provided a general overview about the impacts of marine aggregates extraction. Nevertheless, the site-specific impacts were sometimes difficult to infer from industrial monitoring because of several bias in the execution of the experimental protocoles. We opened a discussion about how industrial monitoring are performed in other ICES country on the basis of a questionnary that has been sent to the WGEXT members, before the meeting.

Thomas Klinggaard: *Oresund: "The Sound"*

Hans Ohrt: *Peberholm: an artificial Island*

Annelies De Backer: *Results of the Belgian monitoring program on sand extraction.*

Links to the presentation and to the reports where this presentation is based on.

Presentation: https://economie.fgov.be/sites/default/files/Files/Event/170609/2-Monitoringsresultaten-en-nieuwe-onderzoeksmethoden-Roche-DeBacker-VandenEynde.pdf

Report: https://economie.fgov.be/sites/default/files/Files/Entreprises/Sand/Belgian-marine-sand-a-scarce-resource-study-day-9-06-2017.pdf

Presented by (ILVO) but containing results collected by ILVO, FPS Economy (Marc Roche, Ko Annelies De Backer en Degrendele) and OD Nature (Vera Van Lancker, Dries Van den Eynde)

Yearly around 3 million m^3 of marine sand is extracted in the Belgian part of the North Sea (BPNS) both for construction purposes and coastal protection. The extraction is only allowed offshore in specifically defined areas on sandbanks and only with trailing suction hopper dredgers. As a precautionary principle, the extraction is limited to 5m under a reference bathymetric surface.

Inevitably, the extraction of large volumes of sediment disturbs the seabed and the associated fauna. The changes in surficial sediments and the deposition of suspended fine sediments plumes, generated during dredging operations, and through changes of wave and tidal currents, have a direct and indirect impact on the seabed habitats. The monitoring of the impact of the extraction on the marine environment is a legal obligation embedded in Belgian and European legislation.

The evaluation of the impact of extraction on the marine environment requires multiple scientific and technical expertise, generating a broad knowledge field. In Belgium, for more than 15 years, several teams have been working on this theme and have enabled the development of a well-controlled monitoring program based on highly valuable and informative time series.

The direct impact assessment on the seabed is based on multiple types of data: statistics derived from the extraction registers, data from the Electronic Monitoring Systems (EMS = "black-boxes") on board the dredging vessels, and bathymetric and backscatter time series derived from regular multibeam echosounder (MBES) surveys. Direct impact assessment on the benthic fauna is based on multivariate analyses of species identifications and count data derived from Van Veen grabs.

In addition to this local approach, regular but less frequent MBES surveys along straight lines, parallel and perpendicular to the sandbanks and the gullies, provide valuable information on the global evolution of the bathymetry allowing a comparison between extracted and non-extracted areas.

Far fields effects are investigated by looking into dredging-induced sediment plumes both through *in situ* measurements, and modelling of sediment plumes. Furthermore, numerical modelling of changes in bottom shear stress is done to be able to predict impacts of different extraction scenarios on the hydrodynamics in the wider area.

Annex 9: OSPAR National Contact Points for Sand and Gravel Extraction

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