

Sector Fiche:

Marine Aggregates and Marine Mining

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1 Basic Facts

Gross Value added	State of the sector	Presence across sea basins
€625 million in Europe (in 2015) ¹ .	Mature (for marine aggregates extraction) ² ; Growing (for marine mining) ³ and Emerging (for deep-sea mining) ⁴ .	Dispersed throughout all sea basins ⁵⁻⁶⁻⁷⁻⁸ . Commercially-viable resources spatially limited and linked to the discrete geological processes that formed them ⁹⁻¹⁰ .
Land-sea interaction	Temporal aspect	Lifetime of installations
Through ports as materials need to be landed after extraction ¹¹ .	Activity happening all throughout the year. Due to the presence of ice the activity might be seasonal at some places. The nature of dredging protocol used can affect the recovery time of marine ecosystems following aggregate dredging ¹² .	Operational activity lasts between 30 to 40 years depending on maintenance and working life of extraction vessels ¹³ .
Interaction with other uses		
Conflicts mostly at the extraction phase ¹⁴ for example with small-scale fisheries, tourism, recreational activities, conservation measures and aquaculture activities ¹⁵⁻¹⁶ .		

¹ EEA (2015).

² UEPG (2016).

³ Ahnert, A.; Borowski, C. (2000).

⁴ Ibid.

⁵ EEA (2015).

⁶ Velegrakis et al. (2010).

⁷ EMODnet database (2014).

⁸ Otay et al. (n.d.).

⁹ Velegrakis et al. (2010).

¹⁰ Comment from M. Russell (British Marine Aggregates Producers Association)

¹¹ Klinger et al. (2018).

¹² Cooper et al. (2008).

¹³ Interview with Blue Mining Project coordinators on 02nd August 2017.

¹⁴ See Section 4 of this sector fiche for further information.

¹⁵ Ramirez-Llodra et al. (2011).

¹⁶ BMAPA (n.d.).

2 Composition of the Marine Aggregates and Marine Mining sector

The activities of the marine aggregates and marine mining sectors can be broken down by: i) the extracted materials; ii) the location where the activity takes place. Shipping operational and service activities to/from the delivery place (i.e. ports) are not considered in this sector fiche.

Marine Aggregates	By material	Sand and gravel	Considers the exploration, exploitation, extraction and dredging of sand and gravel from the seabed, primarily for the purpose of construction and beach nourishment ¹⁷⁻¹⁸⁻¹⁹ . Potential for increasing demand of aggregates also for coastal defense works to safeguard dunes, beaches, coastal areas and even whole islands ²⁰⁻²¹ .
		Marine Mining	By location
		Shallow Mining	Considers the exploration, exploitation and extraction of marine minerals, such as iron ore, tin, copper, manganese and cobalt ²² . Occurring mostly at shallow depths around 15-60m water depth ²³ . Activity at a nascent phase and a continued growth in an effort to meet the demands of high-tech industries for materials ²⁴ . By 2020, 5% of the world's minerals, including cobalt, copper and zinc could come from the ocean floors ²⁵ .
		Deep-sea Mining	Occurs in waters depths from 800-6000m where mineral deposits of polymetallic nodules, manganese crust and sulfide deposits might be found ²⁶ . Activity at the exploratory phase.

Figure 1: Composition of the marine aggregates and marine mining sector

¹⁷ EEA (2015).

¹⁸ The Crown Estate (2015).

¹⁹ BMAPA (2014).

²⁰ The Crown Estate (2015).

²¹ BMAPA (2014).

²² Ahnert, A.; Borowski, C. (2000).

²³ Comment from M. Russell (British Marine

Aggregates Producers Association).

²⁴ Ahnert, A.; Borowski, C. (2000).

²⁵ European Commission (2015).

²⁶ Ahnert, A.; Borowski, C. (2000).

3 Relationship between Marine Aggregates and Marine Mining and MSP

3.1 What are present spatial needs of the Marine Aggregates and Marine Mining sector?

The marine aggregates and marine mining sectors are locked in physically to the specific location where geological processes lead to those materials to be extracted. Thus, the spatial aspect is of the greatest importance for these sectors, as the spatial availability of the resource cannot be altered²⁷. At the same time, a re-allocation of the activity would therefore not be possible.

The material transport to ports also follows a linear structure connecting the collection point to the point of delivery, which will follow the most direct route in order to minimize shipping costs.

In other to avoid potential spills, during extraction all other uses are to be spatially avoided so that focus remains on a safe exploration (especially for deep-sea mining development). For example, each cargo takes about 3-6 hours to dredge²⁸.

Maritime spatial plans and mapping can identify potential geological resources allocated zones that are far bigger than the locations where eventually the actual dredging may will take place in the future (through "mineral safeguarding"), but this also means that large areas might appear as being excluded to other uses by the marine aggregates industry²⁹.

3.2 Which anticipated future developments of the industry are relevant to MSP?

Construction material	Coastal defense ³¹	Mineral value
Increasing demand for construction materials to maintain and develop transport, energy and water infrastructures and built environment that society relies upon ³⁰ . The availability of aggregate resources is becoming constrained on land so more people are looking to marine resources.	Climate Change and coastal defense . In a world where most beach and coastal areas are suffering from an increase in erosion due to morphological changes of their environments together with unprecedented sea level rises and climate change impacts, the need for replenishing beaches (beach nourishment) ³² and improving coastal defenses ³³ (see Netherlands and the Rijkswaterstaat which have undertaken a strategic planning to forecast the resources required to protect the coast up to 2100 ³⁴). Thus, the marine aggregates sector is likely to become increasingly relevant because of the need for new extraction sites.	The availability and value of minerals such as tin and rare earth minerals are going up ³⁵ .
High tech industry	Deep-sea mining	Cost-Benefit Ratio
Marine mining for high-tech metals driven by the increasing demand for materials by high-tech industries. Increasing demand for high-tech metals is driven by technological developments that require precious metals. Thus, global annual turnover of marine mineral mining can be expected to grow from virtually nothing to €5 billion in the next 10 years and up to €10 billion by 2030 ³⁶ .	The increasing scarcity over the supply of raw and non-living material, tends to push some countries (i.e. UK, Belgium, Netherlands and France) out into deeper waters further offshore to look for new material's supply zones. This pushes the technological capacity of boats that will have to operate at deeper waters (larger boats) with more powerful equipment. Important technological challenges still exist for marine mining in deeper waters.	For deep-sea minerals, the future remains uncertain regarding to what extent the seabed will be tapped of its resources on a commercial scale. Industry players active in the field are generally confident that it is a matter of time before mining will begin as current technology already allows for extraction up to about 150 meters water depths. However, since the costs are known to be very high while the benefits are still uncertain for some deposits (e.g. seabed massive sulphides), the business case is not always there, there are no commercial activities to date and prospects have been delayed repeatedly.

²⁷ Comment from M. Russell (British Marine Aggregates Producers Association)

²⁸ Ibid.

²⁹ EU MSP Platform (2017).

³⁰ MPA (2017).

³¹ Ibid.

³² The Dorset Coast Strategy (n.d.).

³³ Ibid.

³⁴ EU (n.d.).

³⁵ Zhou, B., Li, Z., Chen, C. (2017).

³⁶ European Commission (2012).

4 Interaction with other sectors

The resource requirements of the marine aggregates industry can be very specific, depending on the geological characteristics (grain size) and the requirements of the market/end use being supplied. This may mean that the industry isn't always interested in the typical sand bank, but may be often more interested in the resources that are located near to the sandbanks as the sand used for construction purposes needs to be of a certain granularity. Consequently, there are actually many opportunities for combinations with other maritime activities. However, the marine aggregates and marine mining extraction might bring MSP implications with various other marine users of the ocean space such as the followings:

Shipping and ports	Tourism and recreation	Oil and gas
 <ul style="list-style-type: none"> • Additional risk of collision if extraction sites are on/near shipping lanes³⁷⁻³⁸. • Onshore conflict for space with ports. 	 <ul style="list-style-type: none"> • Conflicts while beach nourishment and sand extraction. Thus, nature-based solutions to beach nourishment are being researched such as sandscaping-a potential solution as it is an innovative coastal management concept which is designed to use nature processes (wind, waves and tide) to distribute marine aggregates to nourish and create new beaches (e.g. Netherlands³⁹). 	 <ul style="list-style-type: none"> • Use of same seabed space⁴⁰.
Pipelines and cables	Marine aquaculture	Offshore wind
 <ul style="list-style-type: none"> • No conflicts unless at the extraction site where no cables can be laid⁴¹. • In order to promote synergies with sand extraction, laying routes could be determined, based on the availability of extractable sand (i.e. routes through areas where extractable sand has been depleted or where sand extraction is less attractive)⁴². 	 <ul style="list-style-type: none"> • Conflict for use of the same seabed space. 	 <ul style="list-style-type: none"> • Can share space with the marine aggregates sector if you consider the multi-use also from a temporal perspective (i.e. a zone allocated to dredging in a plan might also be reserved for the development of an offshore wind park. The marine aggregates industry will only dredge there after the wind park has been decommissioned).

³⁷ Klinger et al. (2018).

³⁸ Nordquist et al. (2013).

³⁹ Hofherr, J., Natale, F., Trujillo, P. (2015).

⁴⁰ The Dorset Coast Strategy (n.d.).

⁴¹ Veidemane, K., Ruskule, A., Sprukta, S. (2017).

⁴² Government of the Netherlands. (2015).

Fishing	Conservation
	
<ul style="list-style-type: none"> • During dredging activity (aprox. 3-6 hours)⁴³, conflicts exists in what regards to access to fishing grounds and deployment of fixed fishing gear⁴⁴. However, outside extraction, fishing is not excluded from accessing and using the areas. • Potential for seabed extraction to impact on fish and shellfish populations through disturbing habitats (increased turbidity and fall out of dredged material)⁴⁵. • Synergies may occur with the fishing sector (i.e. after the dredging has taken place, often localised depressions are created, which on land always have to be restored, but in the marine environment it might prove more beneficial to leave these as they are, as it has been noticed that these depressions often attract fish species, which could be interesting for the fisheries sector). 	<ul style="list-style-type: none"> • Marine aggregate extraction has the potential to disturb sites of marine archaeological importance. Aggregates companies have agreed a voluntary code of practice, which requires archaeological assessment of licensed areas, and sets a framework for the protection of remains (see archaeological exclusion zones)⁴⁶. • Marine mining potentially causes environmental damage to the biological diversity and ecosystems. Damage may arise from: contamination (release of metal ions into the water column either in the benthic plume created by mining vehicles or, following dewatering on the surface vessel, in a mid-water plume)⁴⁷, changes in siltation at the seabed, underwater noise and the extraction of species⁴⁸. • Aggregates extraction may exacerbate the erosion that generates the need for nourishment in the first place. Deposited material might be of a different granularity than the original material and biological communities might be disturbed in the places where sand is deposited⁴⁹. • Dredging activity liberates the sand from the seabed; there are certain types of worms that are attracted to this and will start to form biogenic reefs, attracting more biodiversity in the dredged area (potential link between the dredging industry and building with nature)⁵⁰.

5 Recommendations for MSP processes in support of the sector⁵¹

<p>Align planning cycles</p> <p>Planning cycle needs to be able to provide operators with sufficient certainty to be able to support investment decisions. An effort must be made to ensure that the planning cycles of MSP are more aligned with the temporal scope of the sector, i.e. the marine aggregates sector looks towards 30 years based on investment planning cycles and the duration of regulatory permissions, while MSP cycles are around 6 years. MSP processes could introduce longer term planning perspectives as to accommodate for the sector temporal scale needs.</p>	<p>Multi-use planning</p> <p>The marine aggregates sector can be included in multi-use planning, and it can be combined with marine protected areas as well as offshore renewable energy, military activities or the fisheries sector, as long as there is proper assessment and management. Multifunctional layering and combinations that take into account the temporal aspect are possible and welcomed by the sector, but a substantial evidence base must be created.</p>	<p>Sustainable extraction</p> <p>For the marine mining sector, the greater driver is to ensure that extraction is sustainably managed and minimizes potential effects on the environment and other marine uses⁵².</p>
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⁴³ Comment from M. Russell (British Marine Aggregates Producers Association)

⁴⁴ The Dorset Coast Strategy (n.d.).

⁴⁵ Ibid.

⁴⁶ Ibid.

⁴⁷ Maritime Executive (2017).

⁴⁸ Koss et al., (2011).

⁴⁹ European Commission (2015).

⁵⁰ Comment from M. Russell (British Marine Aggregates Producers Association)

⁵¹ EU MSP Platform (2017).

⁵² Durden et al. (2017).

6 Resources⁵³

6.1 Legal framework

Organisation	Title	Link	Short explanation
International Seabed Authority	Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area, ISBA/6/A/18 (13 July 2000), amended by ISBA/ 19/A/9; ISBA/19/A/12 (25 July 2013) and ISBA/20/A/9 (24 July 2014) (Nodules Exploration Regulations), 2014.	https://www.isa.org.jm/files/documents/EN/Regs/PN-en.pdf	In accordance with the United Nations Convention on the Law of the Sea ("the Convention"), the seabed and ocean floor and the subsoil thereof beyond the limits of national jurisdiction, as well as its resources, are the common heritage of mankind, the exploration and exploitation of which shall be carried out for the benefit of mankind as a whole, on whose behalf the International Seabed Authority acts. The objective of this first set of Regulations is to provide for prospecting and exploration for polymetallic nodules.
International Seabed Authority	Regulations on Prospecting and Exploration for Polymetallic Sulphides in the Area, ISBA/16/A/12/ Rev.1 (15 November 2010), amended by ISBA/19/A/12 (25 July 2013) and ISBA/20/A/10 (24 July 2014) (Sulphides Exploration Regulations), 2014.	https://www.isa.org.jm/files/documents/EN/Regs/PolymetallicSulphides.pdf	In accordance with the United Nations Convention on the Law of the Sea ("the Convention"), the seabed and ocean floor and the subsoil thereof beyond the limits of national jurisdiction, as well as its resources, are the common heritage of mankind, the exploration and exploitation of which shall be carried out for the benefit of mankind as a whole, on whose behalf the International Seabed Authority acts. The objective of this set of Regulations is to provide for prospecting and exploration for polymetallic sulphides.
International Seabed Authority	Regulations on Prospecting and Exploration for Cobalt-rich Ferromanganese Crusts in the Area, ISBA/18/A/11 (27 July 2012), amended by ISBA/19/A/12 (25 July 2013), regulation 1(3)(a)-(b) (Crusts Exploration Regulations), 2013	https://www.isa.org.jm/sites/default/files/files/documents/isba-16c-wp2_4.pdf	Draft regulations on prospecting and exploration for cobalt-rich ferromanganese crusts in the Area proposed by the Legal and Technical Commission are attached to the present document.

⁵³ The information provided under this section is non-exhaustive. The intention is to provide the reader with basic information on the sector.

Organisation	Title	Link	Short explanation
International Marine Minerals Society	Code for Environmental Management of Marine Mining, 2011	http://www.immsoc.org/IMMS_downloads/2011_SEPT_16_IMMS_Code.pdf	The Code consists of a statement of Environmental Principles for marine mining, followed by a set of Operating Guidelines for application as appropriate at specific mining sites. These Guidelines are designed to serve industry, regulatory agencies, scientists and other stakeholders, as benchmarks for development, implementation and assessment of environmental management plans and as advice on best fit-for-purpose practices at sites targeted for marine minerals research, exploration and extraction. The Principles and Guidelines set broad directions in a context of shared values rather than prescribing specific practices. It is important to note that this is a VOLUNTARY code which marine mineral companies/entities/other stakeholders are encouraged to strive towards and use.

6.2 Actors

Name	Link	Short explanation
British Marine Aggregate Producers Association (BMAPA)	http://www.bmapa.org/	The representative trade body for the British marine aggregate industry. BMAPA is a constituent body of the wider Mineral Products Association, the trade association for the aggregates, cement and concrete industries.
European Aggregates Association (UEPG)	http://www.uepg.eu/	<p>UEPG stands for "Union Européenne des Producteurs de Granulats" (European Aggregates Association, Europäischer Gesteinsverband). Aggregates are sand, gravel (including marine aggregates), crushed rock, recycled and manufactured aggregates.</p> <p>UEPG represents the European Aggregates Industry in Brussels, now with Members in 27 countries. On behalf of its Members, UEPG actively lobbies the European institutions and other stakeholders on issues key to the industry.</p>
European Dredging Association (EuDA)	https://www.european-dredging.eu/	The European Dredging Association ("EuDA") was founded in 1993 as a non-profit industry organisation for European dredging companies and related organisations to interface with the various European Union's ("EU") Institutions and also some International Organizations (such as IMO, HELCOM or ILO). EuDA members employ approximately 25,000 European employees directly "on land and on board of the vessels" and more than 48,300 people indirectly (through the suppliers and services companies). The combined fleet of EuDA's members counts approximately 750 seaworthy EU-flagged vessels.

Name	Link	Short explanation
European Association of Mining Industries, Metal Ores & Industrial Minerals _ EUROMINES	http://www.euromines.org/mining-europe/main-mineral-deposits-europe	Euromines is the recognised representative of the European metals and minerals mining industry. The association's main objective is to promote the industry and to maintain its relations with European institutions at all levels. Euromines provides services to its members with regard to EU policy and serves as a network for cooperation and for the exchange of information throughout the sector within Europe. The association also fosters contacts with the mining community throughout the world. Euromines represents large and small companies and subsidiaries in Europe and in other parts of the world which provide jobs to more than 350,000 people. Through the activities and operations of these members, more than 42 different metals and minerals are produced. For some metals and minerals, Europe is the world's leading producer.
European Innovation Partnership on raw materials (EIP)	https://ec.europa.eu/growth/tools-databases/eip-raw-materials/en	<p>Its mission is to provide high-level guidance to the European Commission, Members States and private actors on innovative approaches to the challenges related to raw materials. The EIP plays a central role in the EU's raw materials policy framework:</p> <ul style="list-style-type: none"> • It reinforces the Raw Materials Initiative by translating the strategic policy framework into concrete actions and by mobilising the stakeholder community to implement them; • It has been instrumental in securing R&I funding: while Framework Programme 7 (the R&I funding tool for the period 2007-2013) only included approximately €180 million for raw materials R&I, Horizon 2020 (the R&I funding tool for 2014-2020) reserved €600 million for research on the challenges related to raw materials.

6.3 Initiatives

Name	Link	Short explanation
Blue Mining Project	http://www.bluemining.eu/	The overall objective of Blue Mining is to provide breakthrough solutions for a sustainable deep sea mining value chain. This means to develop the technical capabilities to adequately and cost-effectively discover, assess and extract deep sea mineral deposits up to 6,000m water depths as this is the required range where valuable seafloor mineral resources are found. The control over these three capabilities is the key for access to raw materials, for decreasing EU dependency on resource imports and for strengthening Europe's mining sector and their technology providers.
Irish Sea Marine Aggregate Initiative (IMAGIN)	http://oar.marine.ie/bitstream/10793/277/1/No_36_Marine_Environment_and_Health_Series.pdf https://data.gov.ie/dataset/irish-sea-marine-aggregates-initiative	The IMAGIN study has concluded that a number of areas with potential to support marine aggregate extraction exist within the Irish Sea and that marine aggregates can contribute to the sustainable management of demand and future use of aggregates in Ireland.

Name	Link	Short explanation
ERA-MIN (Network on the industrial handling of raw materials for European industries) & ERA-MIN 2	https://www.era-min.eu/system/files/call_text_era-min_joint_call_2017_0.pdf	ERA-MIN 2 aims to support the European Innovation Partnership on Raw Materials, the EU Raw Materials Initiative and further develop the raw materials sector in Europe through funding of transnational research and innovation (R&I) activities. This will be achieved through one co-funded call in 2017, as well as two additional calls in 2018 and in 2019, designed and developed specifically for the non-energy, non-agricultural raw materials sector.
Sustainable Intelligent Mining Systems - SIMS	http://www.simsmining.eu/	Our vision is to create a long lasting impact on the way we test and demonstrate new technology and solutions for the mining industry. With a selected consortium ranging from mining companies, equipment and system suppliers to top-class universities, the SIMS project will boost development and innovation through joint activities aiming at creating a Sustainable Intelligent Mining Systems.
Viable Alternative Marine Operating Systems - VAMOS	http://vamos-project.eu/	To enable the exploitation and rehabilitation of underexploited and abandoned European deposits of mineral raw materials
Marine Aggregates Prospecting and Exploitation - MARE	http://excellence.minedu.gov.gr/thales/en/thalesprojects/375655	The proposed research project aims to investigate the Greek continental shelf, including the Cyclades Plateau, in terms of MA identification, prospecting, dredging, and usage.
The Raw Materials Initiative	https://ec.europa.eu/growth/sectors/raw-materials/policy-strategy_en	The strategy covers all raw materials used by European industry except materials from agricultural production and materials used as fuel. Ensuring sustainable access to these raw materials is crucial to the competitiveness and growth of the EU economy and to the objectives of the Europe 2020 strategy. The Commission also regularly publishes a list of critical raw materials in the EU.

6.4 Selected literature

Author	Title	Link	Short explanation
The Crown State	Marine aggregates: capability & Portfolio 2015 report	https://www.thecrownstate.co.uk/media/389767/ei-marine-aggregates-capability-and-portfolio.pdf	The Capability & Portfolio 2015 report outlines the significant demand and range of uses for marine aggregates in the UK.
BMAPA	16th Annual Report: Marine aggregate extraction	http://www.bmapa.org/documents/BMAPA_16th_Annual_Report.pdf	This report contains summary information relating to The Crown Estate area of seabed licensed, dredged and surrendered during 2013 based on GIS data and from analysis of dredger Electronic Monitoring System records. Information on dredged area and intensity has been derived from variable grid analysis. A set of regional charts has been prepared to show the extent and intensity of dredging operations. Additional facts and figures on marine aggregate extraction activity by region are also presented.
ICES WGEXT	Report of the Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem (WGEXT). ICES WGEXT REPORT 2016	http://www.ices.dk/community/groups/Pages/WGEXT.aspx http://ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/SSGEPI/2016/01%20WGEXT%20-%20Report%20of%20the%20Working%20Group%20on%20the%20Effects%20of%20Extraction%20of%20Marine%20Sediments%20on%20the%20Marine%20Ecosystem.pdf	ICES Working Group on the Extraction of Sediments from the Seabed. They produce an annual report and 4/5 year summary detailing the status of marine aggregates activities in the North East Atlantic (including the Baltic, but excluding the Mediterranean).
European Commission	EU stakeholder survey on seabed mining: summary of responses	https://ec.europa.eu/info/sites/info/files/consultation-seabed-mining-results-swd-2015-119_en_1.pdf	Results coming from a consultation made by the EU Maritime affairs and Fisheries department. There were 206 replies with a representative selection of private bodies, public authorities, and researchers. Another 515 respondents, rather than replying to the questions, sent individual e-mails.
International Seabed Authority	Recommendations for the guidance of contractors for the assessment of the possible environmental impacts arising from exploration for polymetallic nodules in the Area, ISA Legal and Technical Commission document ISBA/16/LTC/7, Kingston, Jamaica, 2010		

Author	Title	Link	Short explanation
International Seabed Authority	Environmental Management Needs for Exploration and Exploitation of Deep Sea Minerals, ISA Technical Study: No. 10, Nadi, Fiji, 2011.		

7 List of acronyms

Acronym	Full title
MSP	Maritime Spatial Planning

8 List of references

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BMAPA (2014). <i>16th Annual Report: Marine aggregate extraction</i> .	http://www.bmapa.org/documents/BMAPA_16th_Annual_Report.pdf
BMAPA (n.d). <i>Aggregates Levy</i> .	http://www.bmapa.org/issues/aggregates_levy.php
BMAPA (n.d). <i>Other sea users</i> .	http://www.bmapa.org/issues/other_sea_users.php
Cooper, K. M., Bario Forjan, C. R. S., Defew, E., Curtis, M., Fleddum, A., Brooks, L., & Paterson, D. M. (2008). <i>Assessment of ecosystem function following marine aggregate dredging</i> . Journal of Experimental Marine Biology and Ecology, 366(1-2), 82-91.	10.1016/j.jembe.2008.07.011
Durden, J.M., Murphy, K., Jaeckel, A., Van Dover, C.L., Christiansen, S., Gjerde, K., Ortega, A., Jones, D.O.B. (2017). <i>A procedural framework for robust environmental management of deep-sea mining projects using a conceptual model</i> . Marine Policy, 84: 193-201. ISSN 0308-597X.	http://www.sciencedirect.com/science/article/pii/S0308597X17300465 doi 10.1016/j.marpol.2017.07.002
EEA (2015). <i>State of Europe's Seas, Technical report No. 2/2015</i> . Copenhagen: European Environment Agency.	https://www.actu-environnement.com/media/pdf/state-of-seas.pdf
EU (n.d.).	https://ec.europa.eu/maritimeaffairs/sites/maritimeaffairs/files/docs/body/netherlands_climate_change_en.pdf
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European Commission (2012). <i>Blue Growth—opportunities from the marine and maritime sustainable growth</i> . European Commission. Communication from the Commission to the European Parliament, the Council, the European Economic and social Committee and the Committee of the Regions: COM(2012) 494.	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0494:FIN:EN:PDF
European Commission (2015). <i>EU stakeholder survey on seabed mining: summary of responses</i> . Maritime Affairs and Fisheries consultation results.	https://ec.europa.eu/info/sites/info/files/consultation-seabed-mining-results-swd-2015-119_en_1.pdf
Government of the Netherlands. (2015). <i>Policy Document on the North Sea 2016-2021 (printversie): Including the Netherlands' Maritime Spatial Plan appendix 2 to the National Water Plan 2016-2021</i> .	https://www.government.nl/binaries/government/documents/policy-notes/2015/12/15/policy-document-on-the-north-sea-2016-2021-printversie/nz-eng-printversie.pdf
Hofherr, J., Natale, F., Trujillo, P. (2015). <i>Is lack of space a limiting factor for the development of aquaculture in EU coastal areas?</i> . Ocean & Coastal Management, 116: 27-36. ISSN 0964-5691.	http://www.sciencedirect.com/science/article/pii/S0964569115001635 doi 10.1016/j.ocecoaman.2015.06.010.

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