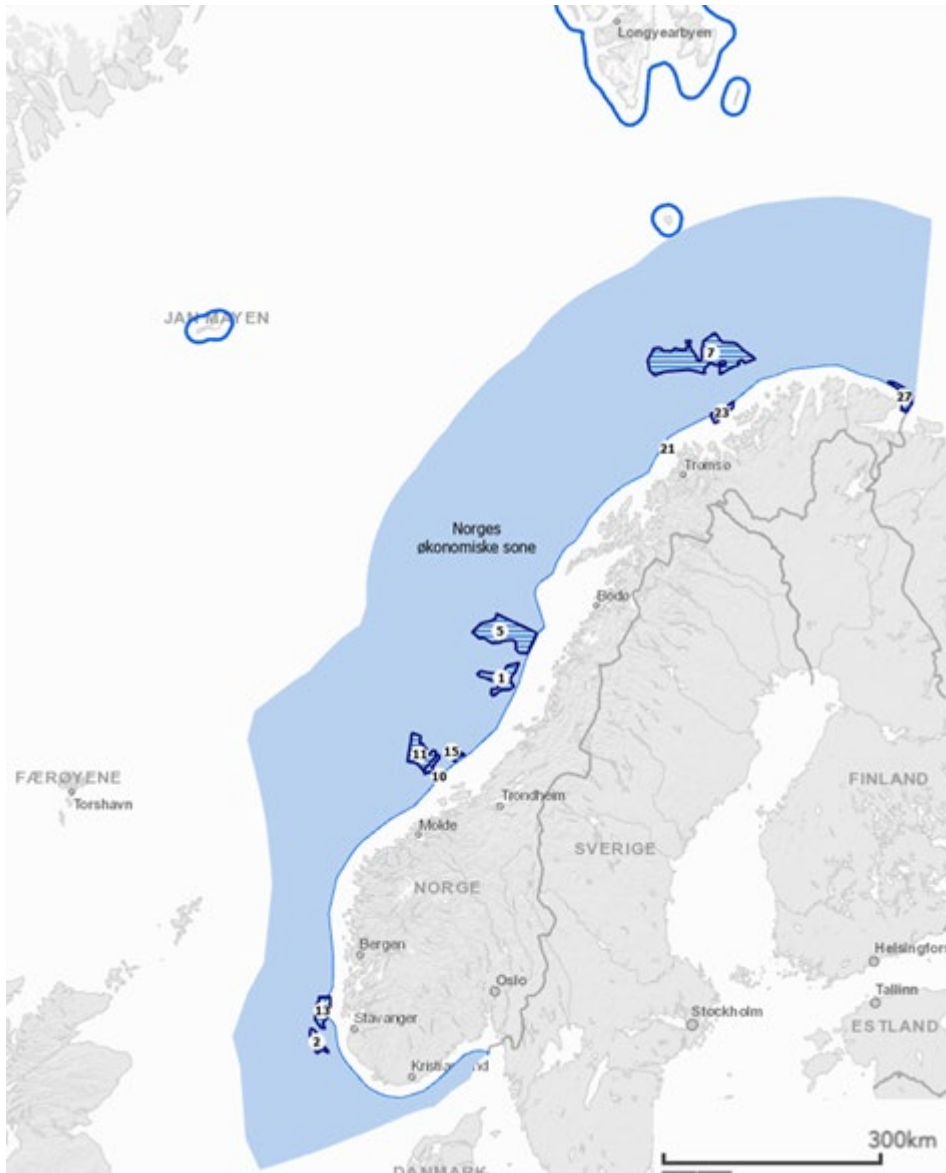





**CAVEAT: This was prepared in support of EIHA’s thematic assessments towards the QSR 2023, however it is not an approved OSPAR publication.**







<b>B-14 Large scale aquaculture 2021</b>		
	<b>Description</b>	<b>References</b>
<b>Distribution</b>	Large scale aquaculture is mainly situated in the northern parts of the OSPAR –region (NO, UK, DK). Attachments show examples of aquaculture spatial planning for new emerging aquaculture.	
<b>Intensity</b>	<p>Recirculation systems technology (RAS) is dominated by finfish. Denmark is the dominant producer within EU.</p> <p>A few offshore or exposed site installations has been granted a permit to operate in Norway.</p>	<p>Draft EIHA (WP) 21/01/02-Add.3Rev2</p> <p>Offshore aqua: Norwegian white paper; Report to the Storting, Meld. ST. 20 (2019-2020)</p>
<b>Pressures/impacts</b>	<p>Impacts from aquaculture may include nutrient enrichment/ removal, addition of chemicals, land use, spread of non-indigenous species, genetic interference, pathogens/parasites, impacts on fishery resources, energy and greenhouse gas emissions. Expansion into large scale is likely to significantly increase these impacts.</p> <p>RAS systems, in particular when combined with renewable energy, might compensate for some affects.</p>	<p>EIHA doc 18/2/10(L)</p> <p>Draft EIHA (WP) 21/01/02-Add.3Rev2</p>
<b>Historic trend (2010-2020)</b>	Marine aquaculture in the OSPAR region has been dominated by finfish (salmon) and – to a lesser extent - shellfish (mussels). Other marine aquaculture productions like algae are small.	Draft EIHA (WP) 21/01/02-Add.3Rev2
<b>Future trend (2020-2030)</b>	Aquaculture production in Europe is expected to increase as part of the EU's Blue Growth strategy. Expansion into large scale is likely to significantly increase environmental impacts in OSPAR countries. Increased interest for shellfish and algae is expected.	EIHA doc 18/2/10(L)
<b>Measures</b>	<p>OSPAR has taken few specific measures on aquaculture: report to the RID program and a new PARCOM reporting round.</p> <p>Possible measures on escapees and pathogens are covered in OSPAR’s recommendation on protection and conservation of the Atlantic Salmon.</p> <p>OSPAR may wish to consider future engagement with ICES to identify and address knowledge gaps on: environmental management of aquaculture, and implications of large scale aquaculture, offshore locations, RAS facilities and RAS with new species</p>	Draft EIHA (WP) 21/01/02-Add.3Rev2

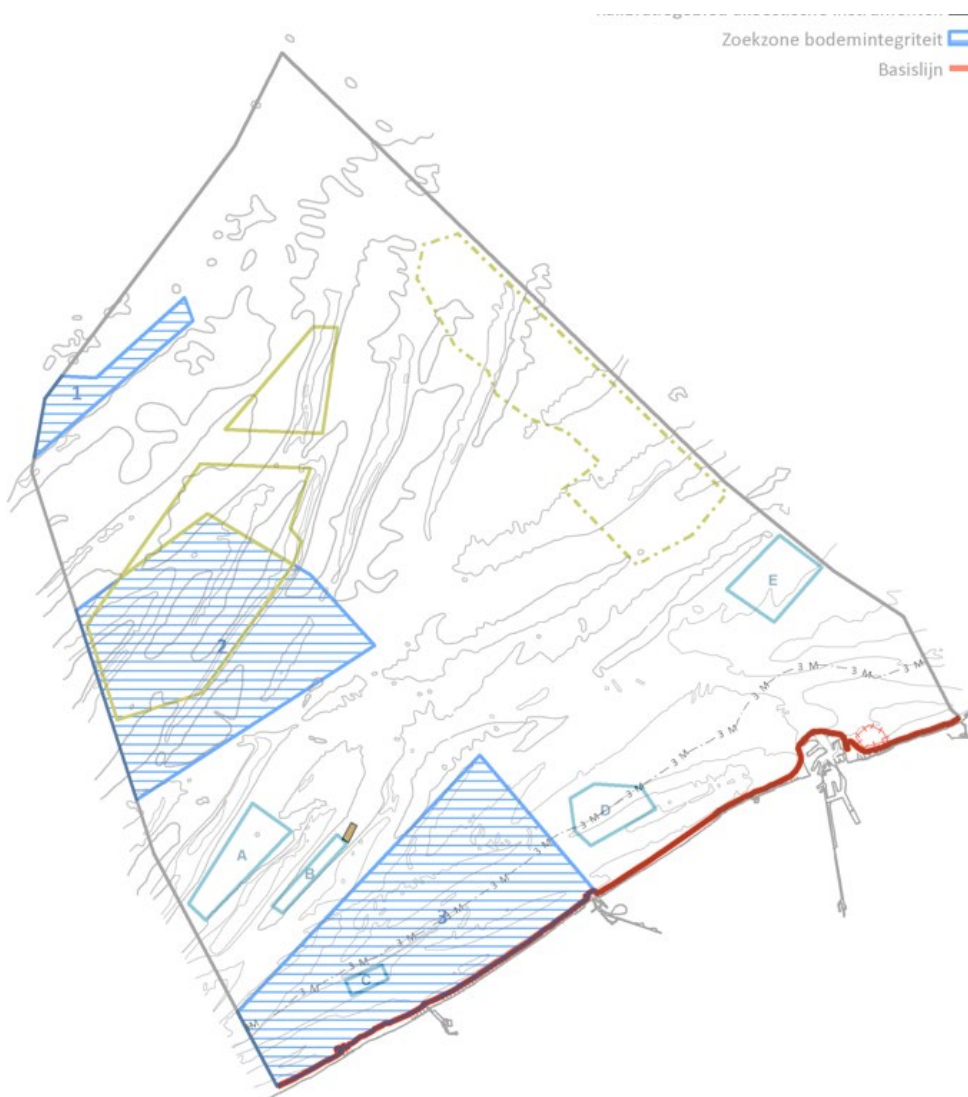
**Suggested areas for future offshore aquaculture in Norway:**



	Possible aquaculture areas
	Norwegian exclusive economic zone
	12nm Norwegian territorial border

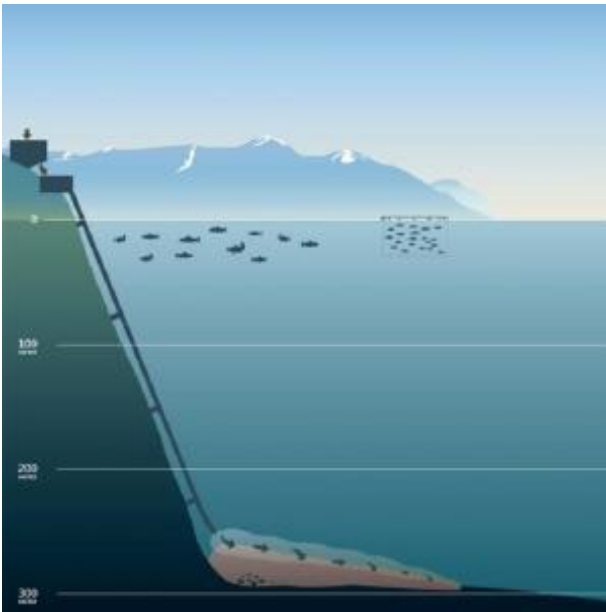
## Example of aquaculture in MSP in Belgium

- Line 3-seamiles — 3 M
- Munition dump Paardenmarkt 
- Zone aquaculture 
- Zone aquaculture and passive fisheries 
- Calbration area for acoustic instruments 
- Searching zone soil integrity 
- Baseline 
- Zones for commercial and industrial activities 



<b>Human activity</b>	Sea disposal of mine tailings	
	<b>Description</b>	<b>References/links</b>
<b>Distribution</b>	See "intensity"	
<b>Intensity</b>	<p>Sea disposal of extractive waste is exceptional practice in OSPAR area. Norway applies sea disposal of mine tailings in specific cases. The Norwegian authorities assess such permits case by case, and place decisive weight in particular on environmental impact assessment and potential user conflicts</p> <p>Projects currently in operation is Rana Gruber, Omya Hustadmarmor and Sibelco. Sydvaranger do also have a license, but not currently in operation.</p> <p>Two mining activities with disposal of mine tailings in the fjords are planned in Norway: Nussir Mine in Repparfjord and Engebø Mine in Fjørdefjorden</p>	<p>Permits from Norwegian Environment Agency</p> <p>[source page 38 rapport <a href="https://www.miljodirektoratet.no/globalassets/publikasjoner/m1335/m1335.pdf">https://www.miljodirektoratet.no/globalassets/publikasjoner/m1335/m1335.pdf</a> Mining industry and tailings disposal].</p> <p><a href="#">NUSSIR ASA - Zero Emission Copper Mining</a></p>
<b>Pressures/impacts</b>	<p>The most significant negative environmental impact is physical loss due to the fact that the disposal area in the fjords will be covered by the mine tailings. The environmental disadvantages will in principle comprise disappearance of the benthic fauna in the deposit area in the fjords due to the discharge of particular matter on the seabed in the deposit area, and a negative impact on benthic fauna in a border area around the deposit.</p> <p>Some mine tailings might also contain heavy metals. Cyanides are not used as a chemical in mining operation in Norway.</p>	OSPAR document EIHA 18/02/10
<b>Historic trend (2010-2020)</b>	No new projects	
<b>Future trend (2020-2030)</b>	Two planned projects	Earliest start will be 2022/23
<b>Measures</b>	<p>To ensure that no particle dispersion takes place upwards through the body of water, it is a condition in the permit that the concentration of particles should not exceed 2 mg/l in the waters more than 40 metres above the discharge point. Additionally, there is a concentration requirement relating to horizontal dispersion, to the effect that concentrations should not exceed 3 mg/l at the boundary of the zoned disposal site area. As long as the disposal takes place, substantial parts of the benthic fauna in the tailings disposal area will be buried and/or disappear. The entire area that has been set aside for the disposal site will not be affected at all times, but the influence on the benthic fauna in the disposal site area will be large.</p> <p>Need for developing BAT: Need further knowledge and</p>	Permits from Norwegian Environment Agency

experience on the effect of Sea Tailings Disposal (EIHA 18/2/10 and 18/4/3). The NYKOS project have been working on increasing this knowledge.



*Figure 1. Deep submarine tailings placement (photo from <http://sciencenordic.com/dilemmas-mining>)*

Human activity	Deep Sea Mining	
	Description	References/links
<b>Distribution</b>	<p>Areas that contain known and predicted seafloor minerals have been identified, but further work would be needed to estimate reserves.</p> <p>Several areas have been identified that could become the target of future mineral exploration/exploitation interests.</p> <p>All potential deep sea mining areas are in OSPAR regions I and V.</p>	<p>OSPAR document paper 1: Deep Seabed Mining Technical Background - <i>Figure 1: Compilation of confirmed and potential metallic deep sea mineral deposits within the OSPAR area.</i></p>
<b>Intensity</b>	<p>Different types of resource (seafloor massive sulfides, manganese nodules &amp; crust) require different mining techniques with varying spatial footprint.</p> <p>Feasibility studies are needed to demonstrate that this activity can be conducted in a technically sound, economically and environmentally viable manner</p> <p>As the technology is still in its infancy despite rapid advances ; more knowledge is needed to properly identify the intensity of this activity.</p>	<p>Feeder report Aggregate extraction OSPAR Document paper 1</p>
<b>Pressures/impacts</b>	<p>Further research is needed to determine the pressures/impacts of deep sea mining. Different types of resources represent different habitats and require different mining techniques, and will therefore likely have different environmental pressures/impacts.</p> <p>The main predicted environmental pressure and impacts are: loss of substrate, changes to seabed integrity, operational suspended sediment and chemical plumes, re-sedimentation from operational plume, discharge plume, increase in light, increase in noise level and potential vibration and release of</p>	<p>OSPAR Document paper 1 Feeder report Aggregate extraction</p>

	<p>sediment-bound or subsurface porewater toxic metals into the water column.</p> <p>There is a lack of knowledge regarding the potential impacts of deep sea mining activities on other sectors, such as fisheries and/or the exploitation of biota for marine genetic resources.</p>	
<b>Historic trend (2010-2020)</b>	There are, and has been, no commercial/exploitation deep sea mining projects in the OSPAR area.	Paper 1: OSPAR Document: Deep Seabed Mining Technical Background
<b>Future trend (2020-2030)</b>	<p>Deep sea mining for resources such as key metals is likely to occur in coming decades but understanding of the environmental impacts is as yet uncertain.</p> <p>Further research and knowledge on the deep sea environment and its resilience are required in order to move from exploration to exploitation.</p> <p>Some OSPAR Contracting Parties are in the process of opening areas for exploration on the continental shelf.</p> <p>Under the current Subsea Minerals Act, the Norwegian Government last year initiated an opening process for offshore mineral activity, including an impact study<sup>1,2,3</sup>. A decision is expected to be made in the beginning of 2023 – at the earliest, possible license applications could be submitted the same year. A data Government acquisition program has been in place since 2018 (geological and geophysical data).</p>	<p>Paper 1: OSPAR Document: Deep Seabed Mining Technical Background</p> <p><a href="#">Konsekvensutredningsprogram for mineralvirksomhet - regjeringen.no</a></p> <p><a href="#">Høring - forslag til konsekvensutredningsprogram for mineralvirksomhet på norsk kontinentalsokkel - regjeringen.no</a></p> <p><a href="#">The Shelf in 2020 - The Norwegian Petroleum Directorate (npd.no)</a></p>
<b>Measures</b>	In order to complete draft OSPAR document paper 2 (OSPAR measures relevant to deep seabed mining), it is important to consider OSPAR's competence in relation to DSM in the OSPAR maritime area, being recalled	Paper 2: Draft OSPAR document: OSPAR measures relevant to deep seabed mining

that the International Seabed Authority is the organization through which States Parties shall, in accordance with Part XI of the UNCLOS, organize and control activities in the Area, particularly with a view to administering the resources of the Area (UNCLOS Article 157).

To do this OSPAR 2021 agreed that the questions set out in Annex A of OSPAR 21/09/04 rev1 should be submitted to JL for their legal consideration.

## GEOENGINEERING – January 2022

Definition of geoengineering: these technics can be divided in two subcategories. One aims at removing carbon dioxide from the atmosphere, the other boosts the reflection of incoming solar radiation to space (albedo modification). In some cases it can be a combination of both. The first is referred as **carbon dioxide removal (CDR)**, the second as **solar radiation management (SRM)** referred as **albedo modification (AM)** in some documents, both commit to “The deliberate large-scale manipulation of the planetary environment to counteract anthropogenic climate change” (as per the Royal Society definition, 2009). The implication of most of these technics are largely unknown as far as feasibility is concerned and their potential impacts will require research to detail and quantify. CDR by means of **ocean fertilization (OF)** has potentially the greater impact on marine environment. The main ocean fertilization technique would be based on artificially supply iron in HNLC (high nutrient low chlorophyll) regions: Southern Ocean, Subarctic North Pacific and Eastern Equatorial Pacific which in turn would enhance carbon sequestration. Alternative OF techniques include macro-algae cultivation for sequestration including artificial upwelling, adding alkaline material directly to the ocean, coastal spreading of olivine and mineralization in rocks under the seabed. Currently, OF techniques are not foreseen in OSPAR areas.

Human activity	“GEOENGINEERING”	
	Description	References/links
<b>Distribution</b>	<p>CDR: currently, the North Sea is a potential sink by means of geological storage (CCS), other technics are currently banned, and OSPAR areas are not a primary target for neither OF nor blue carbon (BC) (see 3). Regarding OF: the Convention on Biodiversity (CDB) restricted its deployment through non-binding adopted decision IX/16C at its 9th conference ((1) p.92)</p> <p>SRM: potentially large scale and no control over the extent of its potential impact. Testing was implemented at a very small scale.</p>	GESAMP Reports & studies No.98 (1) (3)
<b>Intensity</b>	<p>CDR : potential intensity varies with technics: OF seems to have the higher impact on marine environment in HLNC regions primarily.</p> <p>SRM : Potential high intensity (on sunlight) with temporary effect.</p>	GESAMP Reports & studies No.98 (1) (2)
<b>Pressures/impacts</b>	Ocean: Acidification, productivity and fisheries, deoxygenation, altered regional nutrient supply, coverage of sea floor, local anoxia, competition to indigenous biodiversity, disease outbreak, (carbon dioxide release surge in ocean, then surface)	(1) notably page 36

	Coastal areas: change in rainfall pattern	
<b>Historic trend (2010-2020)</b>	<p>CDR:</p> <ul style="list-style-type: none"> <li>- Before 2010: Proposed <u>ocean fertilization</u> off the Galapagos Islands, the North-Pacific, off Canada, and South America off Chile</li> <li>- CCS projects in the North Sea off Norway (Sleipnir and Snohvit), off Australian western coast (Gorgon project) which currently do not strictly contribute to CDR as carbon dioxide come from industries and not from the atmosphere.</li> </ul> <p>SRM: none <i>in situ</i>, lab tests only</p>	GESAMP Reports & studies No.98 (1) 20 years of CCS, IEA, 2018
<b>Future trend (2020-2030)</b>	<p>CDR: CCS is expected to be developed at industrial scale in the North Sea basin: NO, UK, NL</p> <p>LC/LP has expressed concerns on impacts associated with large scale ocean fertilisation, it has published an assessment framework to guide scientific research and is considering proposals on the regulation of geoengineering</p>	IEA, 2020 + (1) See potential EU projects, in particular current (2021) Innovation Fund call for proposal
<b>Measures</b>	<ul style="list-style-type: none"> <li>- Exploring governance issues for both SRM and CDR in marine environment</li> <li>- Distinguish between research and deployment, different approach – see governance</li> <li>- Elaborate on potential “leaks”/risks as coastal ocean may be viewed as an entry-point, avoiding international legislation</li> </ul>	(1) Pages 40

(1) GESAMP Reports & studies No.98

(2) GEOMIP (Geoengineering Model Intercomparison Project): <https://www.wcrp-climate.org/modelling-wgcm-mip-catalogue/cmip6-endorsed-mips-article/1054-modelling-cmip6-geomip>

(3) UNESCO. 2020. UNESCO Marine World Heritage: Custodians of the globe’s blue carbon assets. Paris, France

## Subsea cables mini-assessment

### Overview

Subsea cables fall into two broad categories: Telecommunications and Power (identified as ‘Transmission of electricity and communications (cables)’ in Theme B, [Table 1 of the OSPAR JAMP 2014-2023](#)). It should be noted that there are other types of subsea cable such as military, scientific, oil and gas, dual purpose and other potential future uses in consideration.

Submarine cables have a long history in telecommunication services and are vital for national and international communications. Submarine cables are also required to bring power ashore from offshore renewable energy installations, as well as transferring power between continents and countries using interconnectors. Smaller domestic power and telecommunications cables also provide vital services to island communities.

The interactive map on KIS-ORCA provides an overview of submarine cables throughout the region which is regularly updated with input from cable owners. <https://kis-orca.org/map/>

Submarine cables are considered under three categories:

- a) Telecommunications
- b) Power - interconnector + domestic
- c) Power – renewable energy (export and inter-array)

<b>B-14 Subsea Cables – a) Telecommunications</b>		
	<b>Description</b>	<b>References</b>
<b>Distribution</b>	Telecommunications cables are spread throughout the OSPAR region.	<a href="https://kis-orca.org/map/">https://kis-orca.org/map/</a>  <a href="https://www.submarinecablemap.com/">https://www.submarinecablemap.com/</a>
<b>Intensity</b>	The OSPAR geographic area is strategically significant for global communications, internet, connectivity. Transatlantic cables connecting Europe-US, as well as cables within Europe and national domestic submarine cables for island links.	<a href="https://kis-orca.org/map/">https://kis-orca.org/map/</a>  <a href="https://www.submarinecablemap.com/">https://www.submarinecablemap.com/</a>
<b>Pressures/impacts</b>	Submarine cables are usually buried, where possible, primarily to protect them from other human activities such as fishing and ships anchors, but in areas of deeper water or exposed bedrock they may be laid directly on the seabed or can be covered by a protective structure – this is only generally used for telecommunications cables when crossing third party assets such as pipelines.  Impacts of subsea telecommunications cables are generally recognized to be minimal and	<a href="https://www.unep-wcmc.org/resources-and-data/submarine-cables-and-the-oceans--connecting-the-world">https://www.unep-wcmc.org/resources-and-data/submarine-cables-and-the-oceans--connecting-the-world</a>

	<p>associated only with installation which is short term and temporary.</p> <p>Pressures:</p> <ul style="list-style-type: none"> <li>• Physical disturbance to seabed (temporary or reversible) – associated with cable laying activities (e.g. abrasion, siltation and penetration of the seabed), including any associated burial and protection</li> <li>• Input of other substances (e.g. synthetic substances, non-synthetic substances, radionuclides) - diffuse sources, point sources, atmospheric deposition, acute events – wholly associated with remobilisation of any historic contaminants bound to sediments associated with physical disturbance of the sea bed</li> <li>• Input of anthropogenic sound (impulsive, continuous) – predominantly associated with seismic surveys to assess cable routes prior to installation</li> </ul>	
<b>Historic trend (2010-2020)</b>	<p>This period has seen a steady rate of installation activity, beginning to peak at the end of the decade with higher demands for capacity.</p> <p>Changing ownership models have led to further installation activity towards the end of the period.</p>	<p>Note: Design life for a submarine telecoms cable tends to be 25 years. It should be noted that many cables exceed this. Degradation is not generally an issue – but technology can mean that cables require replacement/upgrade either to cables in-situ or through replacement.</p>
<b>Future trend (2020-2030)</b>	<p>Higher capacity demands mean new cables are likely to be installed within the OSPAR area, with an expected increase in activity.</p> <p>There are also some cables reaching end of service and being decommissioned.</p> <p>There are new telecommunications cables being installed to meet demands for capacity and ensure resilient communications.</p>	<p>Predicting future growth is difficult and the industry is cyclical in nature, but there is expected to be an increase in activity as is seen at present.</p>
<b>Measures</b>	<p>So far, no common programmes or measures for the placement of subsea cables have been developed either by OSPAR or by other organisations, but all OSPAR countries subject the placement and operation of cables to licensing procedures. It should be recognised that the impacts from different types of cables vary</p>	

	<p>significantly, and so cannot all be considered in the same way.</p> <p>Mitigation measures should be used, such as the choice of cable type, appropriate selection of burial or surface laying and scheduling placement according to the sensitivity of local habitats.</p> <p>OSPAR has published a background document describing the potential environmental impacts associated with telecommunications and power cables (<a href="#">OSPAR, 2009</a>). Work commenced in 2020 to review, and if appropriate, update this background document to ensure it reflects advancements in both the technology and our understanding of the associated environmental effects. This review is scheduled to complete in 2022.</p> <p>OSPAR has published best environmental practice guidelines to help OSPAR countries assess the environmental effects of cables (<a href="#">Agreement 2012-2</a>). On completion of the review of the background document it is recommended that these guidelines be reviewed to ensure that they represent the state of the art.</p>	
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<b>B-14 Subsea Cables – b) Power - interconnector + domestic</b>		
	<b>Description</b>	<b>References</b>
<b>Distribution</b>	The plans to export/import energy cross-continent require interconnectors to transfer electricity between countries. Power links could be expected throughout the region.	<a href="https://kis-orca.org/map/">https://kis-orca.org/map/</a>
<b>Intensity</b>	Interconnectors can be expected to increase with North-South European routes, as well as connections to Norway, Sweden, and potentially further afield as technology develops. There are also domestic and smaller subsea power cables connecting islands, or shorter routes across water bodies (fjords etc)	<a href="https://kis-orca.org/map/">https://kis-orca.org/map/</a>
<b>Pressures/impacts</b>	Submarine cables are usually buried, where possible, primarily to protect them from other human activities such as fishing and ships anchors, but in areas of deeper water or exposed bedrock they may be laid directly on the seabed	

	<p>or can be covered by a protective structure.</p> <p>External protection measures are more likely to be used for power cables such as rock placement to prevent damage from external aggression (ie fishing and ships anchors).</p> <p>Pressures:</p> <ul style="list-style-type: none"> <li>• Physical disturbance to seabed (temporary or reversible) – associated with cable laying activities (e.g. abrasion, siltation and penetration of the seabed), including any associated burial and protection</li> <li>• Input of other substances (e.g. synthetic substances, non-synthetic substances, radionuclides) – diffuse sources, point sources, atmospheric deposition, acute events – wholly associated with remobilisation of any historic contaminants bound to sediments associated with physical disturbance of the sea bed</li> <li>• Input of other forms of energy (including electromagnetic fields, light and heat) – associated with the operation of power cables which have the potential to affect marine life</li> <li>• Input of anthropogenic sound (impulsive, continuous) – predominantly associated with seismic surveys to assess cable routes prior to installation</li> </ul>	
<b>Historic trend (2010-2020)</b>	There has been significant growth in installation of interconnectors 2010-2020. Domestic cables continue to be installed/replaced. Design life for submarine power cables tends to be 40 years.	
<b>Future trend (2020-2030)</b>	<p>Increase in interconnectors for renewable energy import/export across Europe and more widely.</p> <p>New technologies to be foreseen – hybrid multi purpose interconnectors connecting wind farm sites to neighboring countries, and more coordinated grid structures.</p> <p>The development of transnational energy networks has led to a significant increase in the number of power cables being installed.</p>	<a href="https://northsearegion.eu/northseee/e-energy/future-interconnector-demand/">https://northsearegion.eu/northseee/e-energy/future-interconnector-demand/</a>
<b>Measures</b>	So far, no common programmes or measures for the placement of subsea cables have been developed either by OSPAR or by other organisations, but all OSPAR countries subject the placement and operation of cables to licensing	

	<p>procedures. It should be recognised that the impacts from different types of cables vary significantly, and so cannot all be considered in the same way.</p> <p>Mitigation measures should be used, such as the choice of cable type, cable route design, appropriate selection of burial or surface laying and scheduling placement according to the sensitivity of local habitats. OSPAR has published a background document describing the potential environmental impacts associated with telecommunications and power cables (<a href="#">OSPAR, 2009</a>). Work commenced in 2020 to review, and if appropriate, update this background document to ensure it reflects advancements in both the technology and our understanding of the associated environmental effects. This review is scheduled to complete in 2022.</p> <p>OSPAR has published best environmental practice guidelines to help OSPAR countries assess the environmental effects of cables (<a href="#">Agreement 2012-2</a>). On completion of the review of the background document it is recommended that these guidelines be reviewed to ensure that they represent the state of the art. Research is needed on the effects of heat emission and electromagnetic fields and the impact of burial and removal operations on marine organisms.</p>	
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<b>B-14 Subsea Cables – c) Power – renewable energy (export and intra-array)</b>		
	<b>Description</b>	<b>References</b>
<b>Distribution</b>	<p>Across Europe, with major development in Northern European countries. Distribution of cables is dictated by location of generation structures.</p> <p>Most power cables are located in Regions II and III, but there are increasing numbers of power cables in other Regions due to the expansion of offshore renewable energy developments (mainly fixed offshore wind) – as well as new technologies such as Floating Offshore Wind allowing development of the renewable energy sector in deeper water leading to developments in new</p>	<p><a href="https://kis-orca.org/map/">https://kis-orca.org/map/</a></p> <p><a href="https://www.4coffshore.com/offshorewind/">https://www.4coffshore.com/offshorewind/</a></p>

	geographical regions.	
<b>Intensity</b>	<p>QSR 2010 noted that energy production by offshore wind farms had emerged as a new use of coastal and shallower offshore waters over the previous decade. In 2009, 17 wind farms, covering over 500 km<sup>2</sup> and involving 713 turbines, were operational or under construction, giving a total capacity of almost 1 900 MW. All development was in the Greater North Sea and the Celtic Seas. By the end of 2019, there was 22 072 MW of installed offshore wind capacity in Europe, produced by over 5 000 turbines (WindEurope, 2020). Almost all – 99% - of this capacity was in five countries: the United Kingdom (45% of all installations), Germany<sup>1</sup> (34%), Denmark (8%), Belgium (7%) and the Netherlands (5%). OSPAR countries with small amounts of offshore wind generation<sup>2</sup> included Spain, France, Sweden, Norway, Ireland and Portugal. The North Sea accounted for 77% of Europe’s installed capacity, and the Irish Sea 13%.<sup>3</sup> A net new offshore wind capacity of 3 632 MW of offshore wind capacity was added in 2019, the highest annual increase ever, nearly half of which was in the United Kingdom. By the end of 2019, Europe accounted for around 75% of global offshore wind capacity installed (European Commission, 2020c).</p> <p>Associated with this increase in offshore wind capacity in the OSPAR region, is an increase in subsea power transmission cables, both to connect each turbine (intra-array) and to export power into domestic power distribution networks.</p>	Extract from the: OSPAR Commission Quality Status Report 2023: feeder report on offshore renewable energy generation
<b>Pressures/impacts</b>	<p>Submarine cables are usually buried, where possible, primarily to protect them from other human activities such as fishing and ships anchors, but in areas of deeper water or exposed bedrock they may be laid directly on the seabed or can be covered by a protective structure.</p> <p>Pressures:</p> <ul style="list-style-type: none"> <li>• Physical disturbance to seabed (temporary or reversible) – associated with cable laying activities (e.g. abrasion, siltation and penetration of the seabed), including any associated burial and protection</li> <li>• Input of other substances (e.g. synthetic substances, non-synthetic substances,</li> </ul>	<a href="https://hub.incc.gov.uk/assets/3c9f030c-5fa0-4ee4-9868-1debedb4b47f">https://hub.incc.gov.uk/assets/3c9f030c-5fa0-4ee4-9868-1debedb4b47f</a>

	<p>radionuclides) - diffuse sources, point sources, atmospheric deposition, acute events – wholly associated with remobilisation of any historic contaminants bound to sediments associated with physical disturbance of the sea bed</p> <ul style="list-style-type: none"> <li>• Input of other forms of energy (including electromagnetic fields, light and heat) – associated with the operation of power cables which have the potential to affect marine life</li> <li>• Input of anthropogenic sound (impulsive, continuous) – predominantly associated with seismic surveys to assess cable routes prior to installation</li> </ul>	
<b>Historic trend (2010-2020)</b>	<p>Significant development of offshore wind as an industry primarily throughout this period. Development of future technologies also taking place.</p>	<p><a href="https://www.iea.org/reports/offshore-wind-outlook-2019">https://www.iea.org/reports/offshore-wind-outlook-2019</a></p>
<b>Future trend (2020-2030)</b>	<p>Generally confined to shallower water depths for fixed turbines, this may change with geographic area extending as floating wind developments could move to deeper water. Development of floating wind technologies towards the end of this period, due to the greater distance from shore will require longer cables.</p> <p>The development of offshore renewable energy infrastructure has led to a significant increase in the number of power cables being installed.</p>	<p><a href="https://www.iea.org/reports/offshore-wind-outlook-2019">https://www.iea.org/reports/offshore-wind-outlook-2019</a></p>
<b>Measures</b>	<p>So far, no common programmes or measures for the placement of subsea cables have been developed either by OSPAR or by other organisations, but all OSPAR countries subject the placement and operation of cables to licensing procedures. It should be recognised that the impacts from different types of cables vary significantly, and so cannot all be considered in the same way.</p> <p>Where practical (and in line with best environmental practice guidelines, mitigation measures should be used, such as the choice of cable type, appropriate selection of burial or surface laying and scheduling placement according to the sensitivity of local habitats. OSPAR has published a background document describing the potential environmental impacts associated with telecommunications and power cables (<a href="#">OSPAR, 2009</a>). Work commenced in 2020</p>	

	<p>to review, and if appropriate, update this background document to ensure it reflects advancements in both the technology and our understanding of the associated environmental effects. This review is scheduled to complete in 2022.</p> <p>OSPAR has published best environmental practice guidelines to help OSPAR countries assess the environmental effects of cables (<a href="#">Agreement 2012-2</a>). On completion of the review of the background document it is recommended that these guidelines be reviewed to ensure that they represent the state of the art. Research is needed on the effects of heat emission and electromagnetic fields and the impact of burial and removal operations on marine organisms.</p>	
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