

Ocean INSTITUTE

Extraction of marine aggregates

■ POLICY HIGHLIGHTS





Key findings

- **Extraction of marine aggregates has increased significantly**

Extraction of aggregates such as sand, gravel, and pebbles from the seabed has increased by approximately 80% since 1990: from around 6 million m³ per year in 1990 to an average of approximately 11 million m³ per year between 2020 and 2024.

- **Extraction has consequences for the marine environment**

Marine aggregate extraction physically removes and disturbs the seabed. When the seabed is disturbed or removed, habitats for animals and plants are also destroyed, which can result in long-lasting local negative impacts on the marine environment.

- **Demand for marine aggregates is increasing**

Demand for marine aggregates is projected to rise towards 2040. Increased extraction of marine aggregates will place additional pressure on the marine environment.

- **A new strategy for managing marine aggregate extraction is needed**

Security of supply and protecting the marine environment can be achieved through a change in how aggregates are extracted, regulated and used.



Scope, trends and geographical distribution

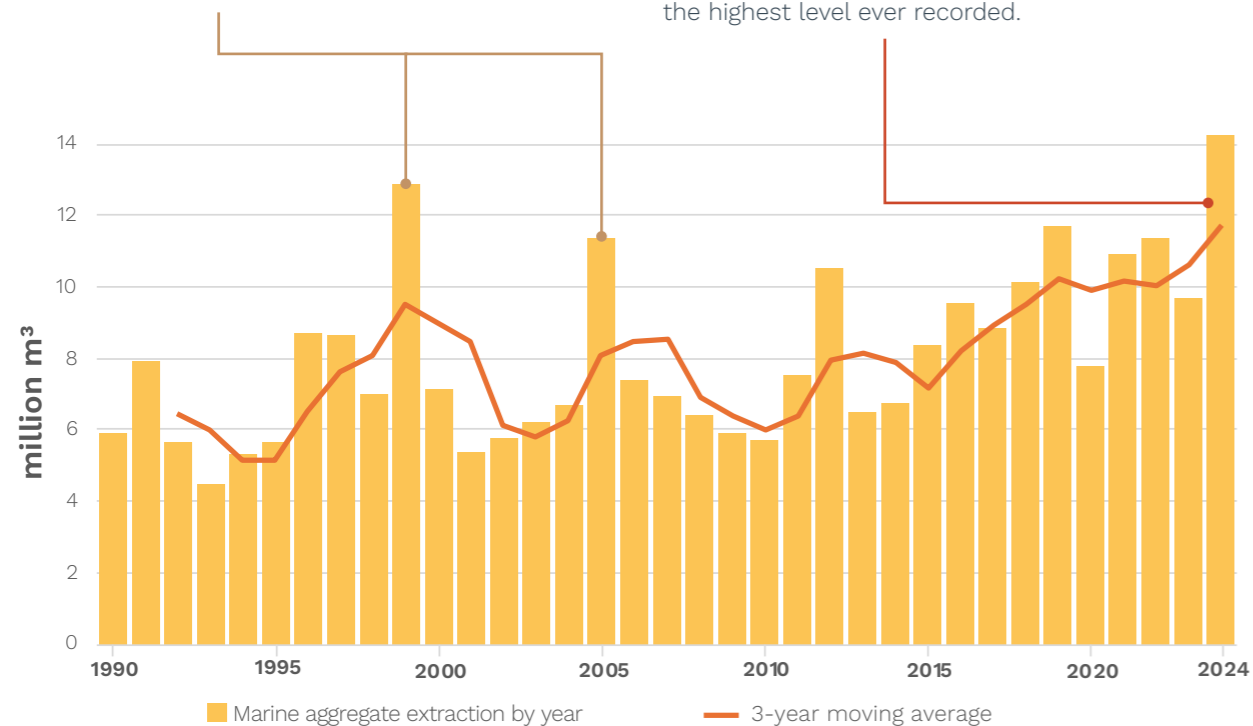
Aggregates such as sand, gravel, and pebbles are essential materials for coastal protection, construction and the build-out of green infrastructure including the development of district heating and wind turbines. Aggregates are extracted both on land and from the seabed. The annual volume of aggregates extracted from the seabed has increased significantly since 1990.

Large fluctuations in demand

Major infrastructure projects (e.g. the Øresund Bridge in 1999) and cyclical fluctuations in the construction sector (e.g. high activity in 2005) contribute to significant temporal variation in marine aggregate extraction.

Trend: Increasing marine aggregate extraction

Since 2010, marine aggregate extraction has increased significantly and persistently. In 2024, 14 million m³ were extracted—equivalent to 700,000 fully loaded trucks of sand, gravel, and pebbles extracted from the seabed—representing the highest level ever recorded.



Geographical distribution

Extraction of marine aggregates in 2024

The North Sea

By far the largest share of marine aggregates was extracted in the North Sea in 2024 – including for beach nourishment as part of coastal protection.

Belt Sea

There is a relatively high level of extraction in the Belt Sea, which is generally characterised by varying levels of current and is heavily affected by other pressures including widespread annual hypoxia events.

Baltic Sea

0,4

Øresund

Øresund has a high level of extraction relative to the size of the water body, meaning that marine extraction has a pronounced impact in this area.

Kattegat

0,6

Limfjorden

0,1

Skagerrak

0,3

The North Sea

7,6
mio. m³

Belt Sea

3,3
mio. m³

Øresund

2
mio. m³

Significant increase

The annual extraction of aggregates from the seabed has risen by approximately 80% since 1990.¹

With growing demand for aggregates and decreasing availability of land-based gravel pits in some parts of Denmark, there is a risk that offshore extraction will increase further unless demand is reduced.

About 40–50% of aggregates extracted at sea are used on land, and about 50–60% are used for beach nourishment as part of coastal protection.²

Climate change and the demand for sand and gravel

Climate change plays an increasing role in increasing the demand for aggregates – both for their use in the green transition, for example in the expansion of district heating and wind turbines, and for coastal protection. At the same time, climate change increases pressure on marine ecosystems by reducing resilience.

The geographical distribution of marine aggregate extraction reflects regional differences in the need for coastal protection through beach nourishment, and that demand for aggregates for onshore use also varies regionally.³



Environmental impacts of the extraction of marine aggregates

The extraction of aggregates from the seabed can locally cause significant and long-lasting negative effects.

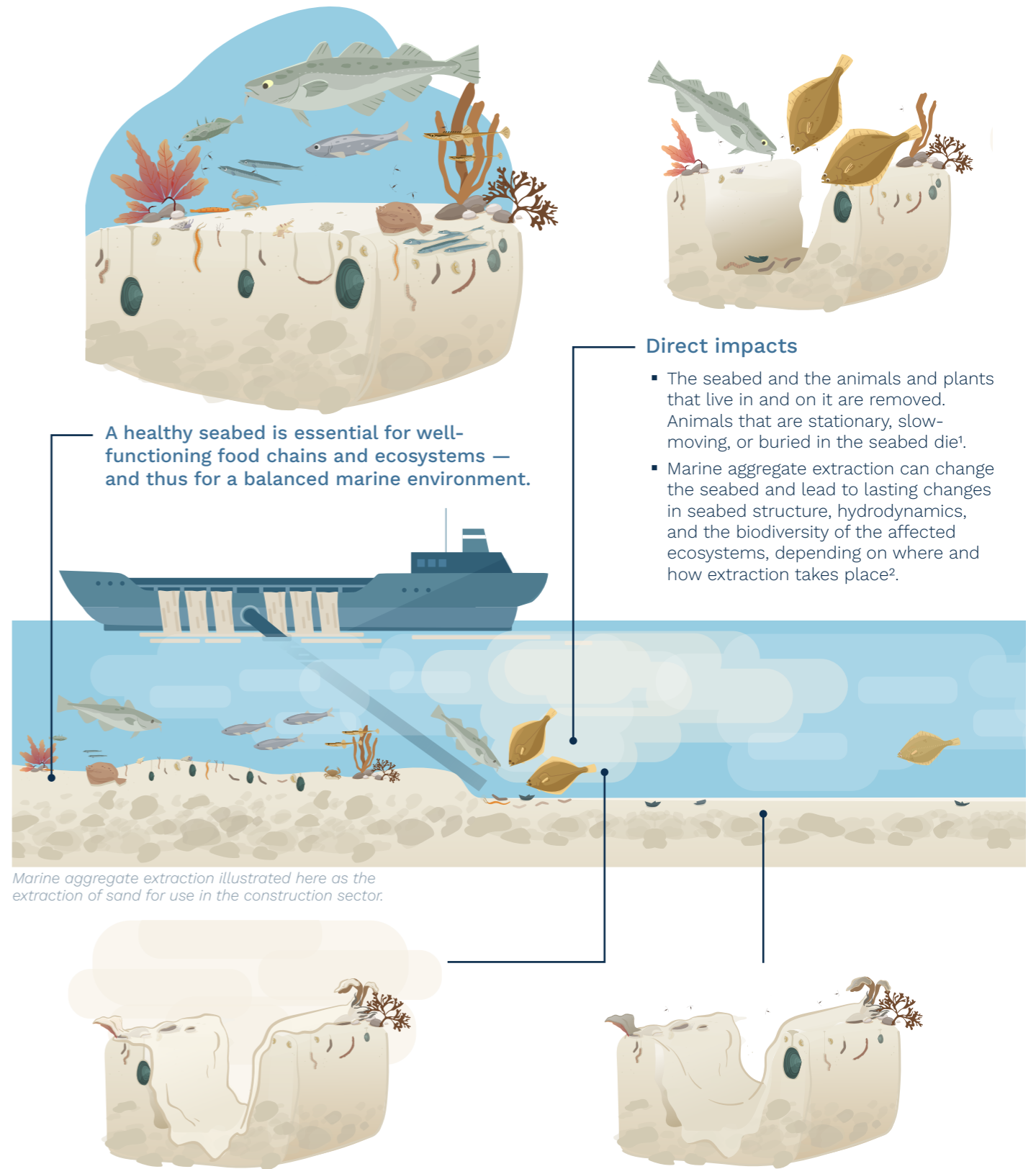
A healthy seabed provides habitat for a wide range of benthic animals and plants, that interact closely with the surrounding marine environment. When the seabed is in good condition, marine organisms thrive, and sufficient sunlight reaches the seabed, providing the basis for seaweed and eelgrass growth.

Aggregate extraction involves the removal of benthic organisms and the disturbance or destruction of the physical habitats on which the remaining species depend. In Denmark, aggregate extraction typically takes place at depths of 6–30 metres, and often relatively close to the coast, in areas of great importance to the marine environment.

Many coastal areas are already heavily impacted by other human activities and are therefore particularly vulnerable to additional pressures¹.

Aggregate extraction from the sea for onshore use often requires the material to be sorted on board the vessels. Grain sizes that cannot be used are discharged as overflow, which can lead to increased sedimentation and further degradation of the seabed.

Overall, marine aggregate extraction contributes additional pressure to the marine environment, especially in already vulnerable areas.



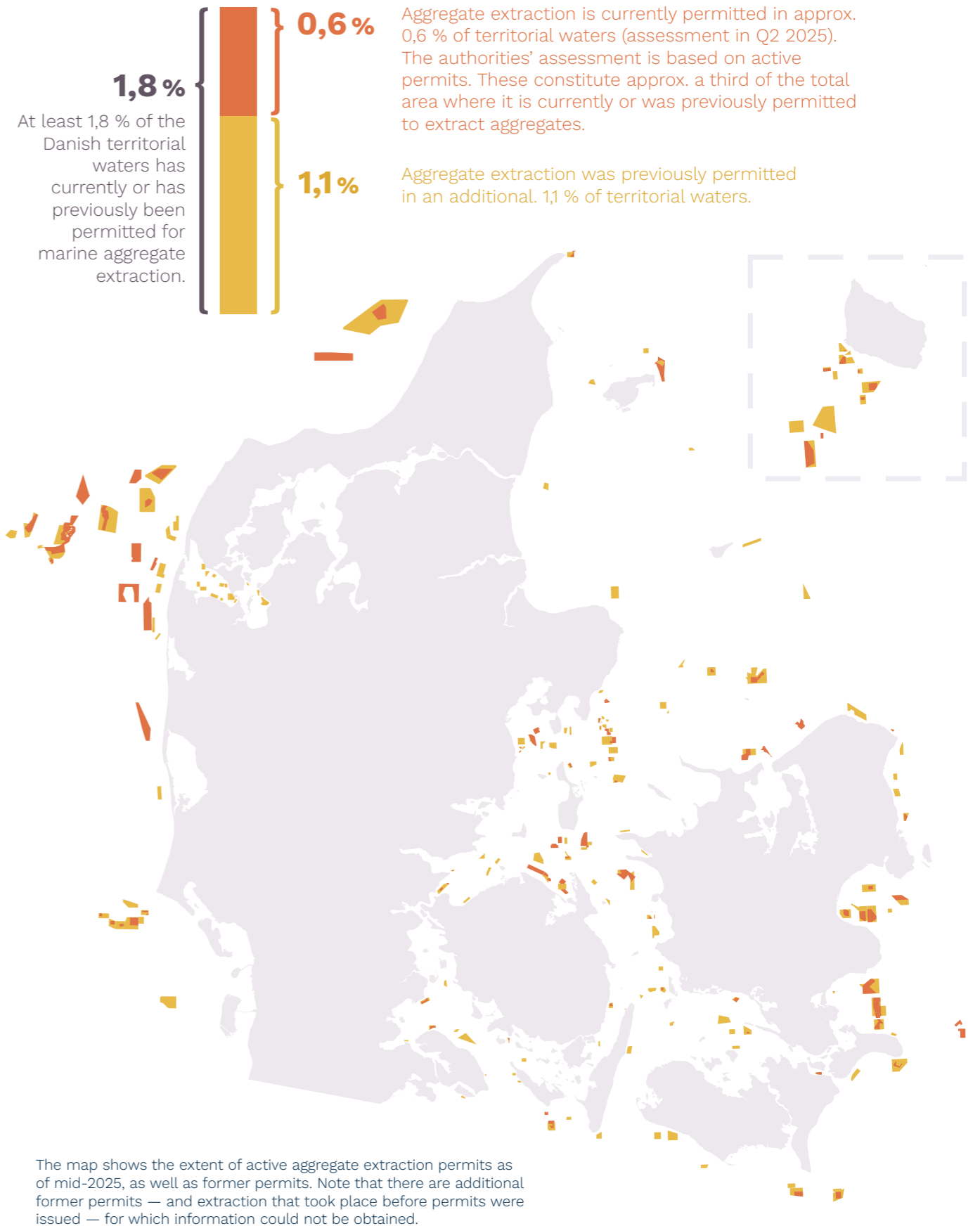


Denmark risks exceeding key threshold value for physical loss of seabed

Under the EU Marine Strategy Framework Directive, Denmark is obliged to achieve and maintain good environmental status in Danish waters. Good environmental status for the seabed is assessed on a number of criteria including the extent of physical loss of natural seabed, for which the EU has set a threshold of no more than 2% loss per habitat type. In Denmark, aggregate extraction is identified as the main cause of physical seabed loss.^{1,2}

- The authorities' assessment (Q2 2025) of physical seabed loss from marine aggregate extraction, shows that the 2% threshold was exceeded for habitat types infralittoral coarse sediment and infralittoral rock and biogenic reefs in the Baltic Sea, and circalittoral coarse sediment in the North Sea.
- The authorities' assessment is solely based on active permit areas. However, marine aggregate extraction rarely occurs across the entire permit area. At the same time, former extraction areas are not included in the assessment. Changes to the seabed may also have occurred in these former permit areas, which should be included in the assessment of the physical loss of seabed for each habitat type. As a result, current assessments do not accurately capture the extent of physical seabed loss.
- More robust data and improved data processing are needed to accurately determine whether, and where, the threshold for physical seabed loss has been exceeded, considering actual extraction activities and their impacts in both current and former extraction areas.

Past and present: Permits to extract sand, gravel and rock



Charting a new course for marine aggregates in Denmark

Demand for marine aggregates is projected to increase towards 2040. This is driven, among other things, by activity in the construction sector, sand for coastal protection, and decreased availability of extraction on land. There is a need for a national plan for aggregates that ensures a better balance between supply and the protection of the marine environment - a need also acknowledged in the government's policy platform.

Barriers to reducing the demand for aggregates

- **The aggregate extraction tax has not kept pace with inflation**
Since 1990 the tax has increased from DKK 5 → DKK 5.56 per m³. If it had kept pace with inflation¹, it would now be around DKK 11 per m³.
- **Lack of financing for environmental measures**
The aggregate tax was originally intended to finance environmental and aggregates activities, but revenues are now channeled into the general state budget, despite ongoing financing needs for new initiatives.
- **Recycling is too costly and burdensome**
Recycled aggregates of the same quality as newly extracted aggregates are often more expensive, which reduces the incentive to reuse materials instead of using new ones¹.
- **Limited incentive to reduce purchase of primary materials**
The use of new aggregates has limited economic visibility for the construction sector, as the purchase of aggregates accounts for only about 1% of the sector's total costs.¹

PROJECTION OF RISING DEMAND

The demand for aggregates in the construction sector is expected to rise from **36 million m³ per year** in 2021 to **40 million m³ per year** in 2040¹.

This projection does not include the extraction of sand for coastal protection, which is also expected to rise.

Plan for aggregates set out in the government's policy platform

From the government's policy platform:

- ” *The government will develop a plan for aggregates that supports sustainable extraction of sand and gravel, as well as increased recycling of construction materials. It must be ensured that sufficient materials are available for energy islands and construction projects—without compromising nature and the marine environment².*



The way forward: Great potential for better resource use – and broad agreement on the need for action

There is broad agreement that substantial potential exists to reduce environmental impacts, restore marine habitats, and strengthen security of supply for aggregates. This can be achieved through:

- **Decrease impact of marine extraction through use of** new technologies and extraction designs, combined with restoration of relevant marine areas where extraction activities have formerly taken place.
- **Clearer prioritisation of where and how construction takes place**, particularly in relation to new infrastructure projects, with a focus on minimising the use of new marine aggregates and increasing recycling.
- **Reform of regulatory and economic frameworks** to create conditions suitable for long-term investment, strengthen incentives to reduce the use of new aggregates, and secure financing for nature restoration and new technologies that reduce climate and environmental impacts.

Recommendations

Ocean Institute, together with a number of its members, has recommended 11 concrete measures that should be incorporated into the government's forthcoming plan for aggregates.

<p>Priority area 1 Low-impact extraction and restoration of former extraction areas</p>	<p>1.1 Introduce minimum standards for the extraction of marine aggregates based on assessment of technical possibilities to limit environmental impact</p> <p>1.2 Introduce environmental criteria in licenses and new requirements for environmental impact assessments</p> <p>1.3 Establish projects to actively restore seabed, as well as post-extraction processes</p>
<p>Priority area 2 Improved planning through a national overview of aggregate supply and use</p>	<p>2.1 Collect data in a national aggregates database</p> <p>2.2 Introduce a requirement to share data and publish it via the Danish Environmental Portal</p> <p>2.3 Develop a more detailed assessment of seabed loss under the Marine Strategy Directive and monitoring of environmental impacts and restoration time after extraction</p>
<p>Priority area 3 Economic incentives for circular resource use</p>	<p>3.1 Raise the tax on extraction of aggregates</p> <p>3.2 Earmark revenue from the tax on extraction of aggregates to finance knowledge building, nature restoration projects, etc.</p>
<p>Priority area 4 Policy changes aimed at reducing the demand for primary aggregates in the construction sector</p>	<p>4.1 Introduce mandatory budgeting of aggregates use in major construction projects</p> <p>4.2 Strengthen supply of recycled materials through the introduction of national standards and mapping of availability</p> <p>4.3 Reduce use of primary materials and increase demand for secondary materials through review of legal requirements</p>

Extraction of marine aggregates Policy highlights

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Hermit crab and turbot, Tim Dencker

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Figures and maps

Page 4:

Marine aggregate extraction 1990-2024

Figure: Tænketanken Hav, 2026, based on data from Danmarks Statistik (2025): RST03: Råstofindvinding (1000 m3) efter farvandsområde og råstofstype.

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Geographical distribution of marine aggregate extraction in 2024

Infographic: Tænketanken Hav, 2026, based on data from Danmarks Statistik (2025): RST03: Råstoffer indvundet fra havet (1000 m3) efter farvandsområde og råstofstype.

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Extraction of sand for the constructon industry

Illustration: Mads Lundgård, Tænketanken Hav

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Former and current permits for aggregate extraction

Infographic: Tænketanken Hav, 2026, Based on data from GEUS' database: MARTA - Marin råstofdatabase, Miljø- og Energiministeriet (1996): Bekendtgørelse om udlæg af overgangsområder for indvinding af sand, grus og ral fra havbunden og Bekendtgørelse om udlæg af overgangsområder for stenfiskeri fra havbunden, Skov- og Naturstyrelsen (2003): Råstofindvinding på Havbunden: Hvor, hvordan og hvor meget. Fysisk påvirkning og omfang.

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