

# Coastal waters

## Innholdsfortegnelse

# Coastal waters

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Norway's coastline is long, with dramatic fjord landscapes and thousands of islands and skerries. It is characterised by a rich diversity of plant and animal life. It is important to ensure that the long-term cumulative effects of human activities do not exceed sustainable levels and disrupt natural ecosystem dynamics.



Bunes Fjord in Lofoten, Northern Norway. Norway's coastline is more than 100 000 kilometers long. It has a varied landscape, with fjords, steep mountains and numerous islands and islets. Photo: Kim Abel, naturarkivet.no



A typical coastal landscape from the inner Oslofjord, with wooden houses and a shoreline that is ideal for outdoor activities. Photo: Bård Bredeesen, naturarkivet.no



Mølen, Southern Norway. The evening sun shining on a pebble beach. Photo: Kim Abel, naturarkivet.no

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## STATE

### Good ecological condition in many areas, but several are negatively affected

Norwegian coastal waters support a varied flora and fauna that functions as a rich storehouse of biodiversity. It also provides areas with great potential for commercial aquaculture and fisheries. Moreover, coastal waters and the coastline itself are important recreational areas for many people. Approximately 80 per cent of the Norwegian population live less than ten kilometres from the sea.

The state of the environment along the coast is for the most part good, but several areas are heavily influenced by human activities. The southern half of the country is most strongly affected, especially along the Skagerrak and North Sea coastlines. The coast bordering on the Norwegian Sea and the Barents Sea is not as heavily affected.

Northwards from Møre og Romsdal county, the state of the environment is generally satisfactory, and inputs of pollutants to coastal waters are lower in the Norwegian and Barents Seas than further south. However, even here there is growing pressure from human activities.

As a result of global warming, the oceans are becoming more acidic, and more species that originally lived south of Norway are spreading northwards to Norwegian habitats.

A common definition of good ecological and chemical status has been developed under the EU's Water Framework Directive. More than 60 per cent of Norwegian coastal waters qualifies as having good or very good ecological status in accordance with this definition.

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The Water Framework Directive is based on the assumption that the ecological status in untouched areas is good unless there is reason to think otherwise. This is not the case for chemical status and measurements are required in order to define the chemical status of a water body. Large areas of the Norwegian coast have not been classified, due to a lack of chemical measurements.

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Nature types and key-areas for certain species and populations are mapped and monitored. These include kelp forests, soft-bottom areas near beaches, underwater fields such as eelgrass beds, areas with shell sand, areas with large scallop occurrences and spawning grounds for fish. We still lack information about the condition of many nature types along the coastline.

## Endangered species and nature types

The most recent edition of the Norwegian Red List for Species (2015) includes 557 species in coastal and littoral zones that are endangered or classified as near threatened.

Several of the nature types along the Norwegian coast are endangered, and have been placed on the Norwegian Red List for Ecosystems and Habitat Types (2011). Sugar kelp forests, which are vital living areas for many species, is an example of an endangered nature type. Sugar kelp forests have been classified as endangered along the Skagerrak coast, and as vulnerable along the coast of the North Sea. Coral reefs, sand dune fields and active marine deltas are vulnerable. Southern beach fields and southern sand dune fields are endangered.

## Destructive grazing of kelp forests

Kelp forests of *Laminaria hyperborea* are vital habitats for juvenile, adolescent and adult fish. During the last thirty years, kelp forests in Nord-Trøndelag and further north have been subjected to devastating grazing by sea urchins. In recent years, the pressure from urchins seems to have been reduced, and the kelp is recovering in Nord-Trøndelag and the Helgeland coast in Nordland. *Laminaria hyperborea* is harvested in regions where harvesting is considered sustainable.

## Eelgrass beds are important

There are many eelgrass beds along the coast. These are important living areas for a range of species. The conservation of eelgrass beds is at times in conflict with construction work, dredging and marinas. Good processes for identifying eelgrass beds make it easier to safeguard such habitats. Eelgrass beds are not threatened in Norway, but they are in strong decline globally. They have therefore been proposed as a selected habitat type, which would give it a stronger protection status.

Dwarf eelgrass (*Zostera noltii*), which is closely related eelgrass, but much more rare, has been designated a priority species under the Nature Diversity Act. This implies that all types of removal, damage or destruction of the species are prohibited.

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## IMPACT AND PRESSURE

# Many major impacts along the coast

Species diversity along the coastline is affected by a variety of human activities:



- **Eutrophication** occurs when too much phosphorous and nitrogen run-off reaches aquatic ecosystems. Both phosphorous and nitrogen are essential nutrients for marine life, but when too much is added detrimental effects may occur. Major sources for these nutrient emissions are aquaculture, sewage runoff, municipal drains, agriculture and industry. Emissions of nutrients transported by ocean currents from European countries south of Norway also affect our coastline.
- **Fish farms** are the largest source of nitrogen and phosphorous emissions to the sea in Norway. Fish farming also affects the environment along the coast by proliferation of salmon parasites like sea lice and chemicals used to combat fish parasites. Juvenile salmon perish when attacked by too many sea lice. Another problem is escaped farmed salmon, which can have a deleterious effect on the genetic diversity and survival of wild salmon. Sometimes the farming installations themselves and transportation to and from them may also disturb wild species.
- **Hazardous substances** end up in Norwegian coastal waters from local sources such as contaminated soil, industrial emissions and run-off from urban areas. They are also transported with winds and ocean currents from other parts of the world. Sediments in many fjords have been heavily contaminated by releases of hazardous substances over many years. Such pollution harms the environment and also limits the use of such areas for fish farming and fishing.
- **Construction**, urban development and other changes to areas can fragment the habitats of animals and plants, and threaten their survival and prevalence. This can be especially harmful to endangered and near threatened species.
- **Fishing** has led to overexploitation of many species. Recreational fishing by local people and tourists accounts for a significant proportion of the total catch of fish along the coast. Coastal cod, halibut and lobster are overexploited. New regulations for lobster and cod fishing are in place, and there is a minimum size requirement for many species. The objective of these regulations is to allow small fish to survive so that they can mature enough to reproduce. Species with healthy populations must also be fished in moderation, since history has shown that it does not take long to deplete even sizeable fish stocks. Knowledge about the population status and trends for different species is therefore vital.
- **Climate change** leads to higher temperature in both terrestrial surface and in oceans. Calculations have shown that over the course of the next 100 years, the average temperature in coastal waters may rise up to 2 °C, and precipitation may increase by thirty per cent. Some parts of the country may also experience an increase in sea level. Emissions of CO<sub>2</sub> also lead to ocean acidification, which can lead to problems for species of plankton, shrimp, lobster, snails, mussels, sea stars, sea urchins and corals. Rising temperatures, heavier rainfall and more runoff from land may alter circulation patterns in fjords, especially those where inflow from rivers is high. Climate change may lead to a change in the distribution of both indigenous and invading species. Climate change may also reinforce the effects of other factors like nutrient runoff, and migration of southerly species.
- **Alien species** – that arrive in ballast water, due to increases in sea temperature or are introduced intentionally – have already caused changes. Red king crab and pacific oyster are two alien species that have firmly established themselves along the coast. The red king crab was introduced to the Murmansk fjord by Soviet scientists in the sixties, and has subsequently spread to the Norwegian coast along the Barents Sea. It has become an important food resource, but can also cause deleterious ecological side effects. The pacific oyster has established itself in many locations along the coast of southern Norway. It has probably migrated to Norway as larvae following ocean currents from Europe. Increased sea temperature has led to its flourishing in Norway.

## Numerous factors in unison

Flora and fauna along the coast are often subject to numerous pressures simultaneously. One example is sea birds, many of which have been in decline in recent years. The causes may be reduced access to food, that they end up as bycatch, oil pollution and other environmental contaminants, competing alien species, climate change and destruction or other changes to their habitats.

The decline in sugar kelp forests is another example. It is probably a result of higher sea temperatures and eutrophication. When the sugar kelp disappears, this leads to an ecosystem change where many fish and other marine organisms lose habitats that are important to their survival and prevalence.

## Consequences for outdoor recreation

The opportunity to use the coast for outdoor recreation is ensured through the right of public access, but is affected and sometimes restricted by area usage and developments along the shoreline. Pollution has led to warnings against consumption of seafood from areas with high levels of hazardous substances. Rising sea temperatures may result in more frequent blooms of toxic algae. This can affect humans if the toxins are taken up in mussels that are used as food.

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## RESPONSE

## Surveys, monitoring and a sustainable harvesting

Responsibility for spatial management and environmental and resource management in Norway's coastal waters is shared by a number of authorities. The overall objective is to ensure that these waters are clean and achieve good ecological status.

Surveys and monitoring programmes are important because they enable us to detect any marked changes in biodiversity and to assess whether they are related to human pressure on the environment. They must be combined with a suitable framework for sustainable fisheries and other industries, that harvest resources in coastal waters.

### Surveying and monitoring

It is important to survey and monitor biodiversity. This allows us to notice serious changes in the environment, and to understand whether they are due to human activity.

The Norwegian Environment Agency has initiated the monitoring programme Ecosystem Monitoring in Coastal Waters. The programme will gather knowledge about important ecosystems and species along the Norwegian coast. It will also investigate species living on marine hard-bottom and soft-bottom as well as in pelagic marine environments. Unwanted influence from eutrophication and particle run-off will also be examined.

Skagerrak, Hordaland, Møre and Romsdal, Trøndelag, Helgeland and Finnmark are regions covered by the monitoring programme.

### Aim to secure good ecological status

The Norwegian Water Management Regulations incorporate the EU Water Framework Directive into Norwegian law. The objective is to achieve good ecological and chemical status for all water bodies by 2021.

The regulations apply to inland and coastal waters. Management plans are being drawn up. Close cooperation between the authorities responsible for different sectors is necessary in order to achieve good ecological and chemical status.

### Several important acts in coastal management

Applications for development projects in coastal waters and along the shoreline are dealt with under several different acts. The most important are the Planning and Building Act, the Harbour Act, the Pollution Control Act and the Aquaculture Act.

Sometimes areas are given a protection status in order to protect ecosystems and natural resources. They can for example be declared national parks, nature reserves, or marine protected areas. Decisions on introducing various degrees of protection status are made in accordance with the Nature Diversity Act.

The Pollution Control Act is important for reducing or stopping ongoing emissions of pollution, and in cleaning up polluted sediments and soil along the coast. Aquaculture, such as fish farming, is also regulated in accordance with the Pollution Control Act.

## Norway's coastal waters and coastline



- The coastline is one of the longest in the world, with deeply indented fjords and thousands of islands.
- Norway's coastal waters (here meaning the territorial sea, inside the baseline) cover around 100 000 km<sup>2</sup>, five times the area of all the country's freshwater bodies.
- Norway's coastal waters are productive, with a rich flora and fauna.