

Oil and gas activities

Innholdsfortegnelse

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Oil and gas activities

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The oil and gas industry is the largest source of greenhouse gas emissions in Norway, and one of the largest sources of emissions of acidifying substances. The discharges of environmentally harmful chemicals are however rather small.



Greenhouse gas emissions from oil and gas production primarily originates from energy production through the use of gas on the platforms.
Photo: iStockphoto

STATE

Slightly increasing oil and gas production

According to the Norwegian Petroleum Directorate, the total production of oil and gas on the Norwegian Continental Shelf amounted to 228 million Sm³ oil equivalents in 2015. Both oil and gas production increased slightly compared to 2014.

Production forecast for the Norwegian continental shelf

Projections indicate that Norwegian oil and gas production will remain relatively stable until around 2020. Towards 2030, production is expected to decrease.

IMPACT

Impacts of the oil and gas industry

Both oil and gas production itself and the use of oil and gas products generate pollutant releases with local, regional and global effects.

Impacts of emissions to air

Emissions to air from the oil and gas industry include greenhouse gases that contribute to global warming as well as other components with more local effects, such as acidification of lakes. Because there are multiple sources of such emissions and because it takes some time before the impacts of these emissions become apparent, it can be difficult to identify direct correlations between impacts and sources. The oil and gas industry is one of the largest sources of emissions to air in Norway. Main sources are energy production, flaring and fugitive emissions, cold venting and oil storage and loading.

Impacts of discharges to the sea

Discharges of oil and chemicals may cause both acute and long term effects on the marine environment. We know more about environmental effects related to acute oil spills and discharges of drilling fluids and drill cuttings, than we do about other kinds of discharges.

Current knowledge indicates that operational discharges to sea from the oil and gas industry do not have serious impacts on the marine environment. Environmental monitoring suggests that marine organisms are seldom exposed to pollutant concentrations that are high enough to cause a negative impact. This applies both to individual organisms and to populations.

As far as we know, oil and chemical spills from the Norwegian oil and gas industry have not caused significant environmental impacts either. This is largely because there have been few major spills and because these occurred at times of the year when there were no large concentrations of sensitive organisms in the affected areas. The environmental monitoring methods that we use may at the same time be insufficient to detect potential negative effects.

› Read more about environmental impacts of oil and gas activities

PRESSURE

Releases to air, sea and the seabed

Large quantities of pollutants are released to air, sea and the seabed during exploration activities and oil and gas production. This happens at all stages from oil and gas field operation to pipeline construction, transport of oil and gas, and onshore processing. When oil fields are exhausted, decommissioning of installations and equipment will result in further releases of pollutants and generate waste that must be properly disposed of.

Large emissions of greenhouse gases and acidifying gases

Oil and gas activities account for a substantial proportion of Norway's emissions to air. In 2015, the industry generated almost a fourth of the country's greenhouse gas emissions, about 5.5 per cent of its NOx emissions and about 28.5 per cent of its nmVOC emissions.

In 2015, CO2 emissions from Norway's oil and gas activities totaled 13.5 million tonnes, which is a slight increase compared to 2014. Emission levels remained fairly stable from 2001 to 2006. In 2007 and 2008, there was a rise as a result of problems in connection with the start-up of the LNG plant at Melkøya near Hammerfest.

As fields age and the volume of produced water rises, more and more energy must be used to separate the water from the oil or gas stream and treat it or inject it into geological formations. As a result, greenhouse gas emissions also increase.

Steep reduction in discharges of environmentally harmful chemicals

Currently it is not possible for the oil and gas industry to operate efficiently without using large quantities of chemicals. Roughly one third of the chemicals used are released to the sea.

As a rule, discharges increase with the age of a field. This is because more energy and more chemicals are needed to extract the resources as a reservoir becomes depleted. Both the use and the discharges of chemicals have increased slightly during the last few years. However, the increase is due to chemicals expected to have little or no effect on the environment.

Discharges of environmentally harmful chemicals on the other hand, have been drastically reduced.

Slight increase in oil discharges

Water in varying quantities – produced water – is always produced along with oil and gas. It contains low concentrations of various naturally occurring substances, including oil components, heavy metals and radioactive substances, as well as production chemicals.

Discharges of produced water and discharges from shipping are the largest sources of oil discharges in the North Sea and Norwegian Sea. Discharges of dispersed oil in produced water on the Norwegian continental shelf totaled 1 820 tones in 2015.

The quantity of produced water generally increases substantially with the age of the oil field. The fields on the Norwegian continental shelf have been producing larger amounts of water than oil since 2004. The decreasing trend in the volume of produced water discharged to sea seen between 2007 and 2013 seems to have shifted in line with prognoses. About 23 per cent of the produced water was injected into geological formations in 2015, while the rest was treated and discharged to sea.

Oil and chemical spills

There has been no major blow-out on the Norwegian continental shelf since the Ekofisk Bravo incident in 1977, and the probability of another accident of this kind is low. However, if a major spill does occur, both the immediate and the long-term impacts may be severe, particularly for the coastal environment and seabirds.

More recently, there have been few major oil and chemical spills, but many smaller spills. No direct impacts have been identified from these spills.

RESPONSE

National regulation and international cooperation

The Norwegian authorities have defined acceptable levels of environmental pressure from oil and gas activities in several white papers. These goals are followed up through laws and regulations, and through requirements in the permits issued to the oil and gas industry.

National regulation of pollution

Through the health, environment and safety regulations for the petroleum sector, and through their permits, the Norwegian Environment Agency sets limits on releases from oil and gas activities.

The Norwegian Environment Agency sets strict requirements for the industry to use less harmful chemicals, reduce releases of pollutants, and at the same time develop new technology. This has brought about reductions in discharges and emissions to the environment. Mandatory environmental monitoring programmes ensure that a watch is kept on the impacts of the oil and gas activities.

The zero-discharge goal, that was introduced in the late 1990's, states that no new petroleum installations on the Norwegian continental shelf can release oil or potentially harmful substances to the sea. On existing fields, steps to achieve this goal were to be taken by the end of 2005. However, there have been delays on some fields.

International cooperation to reduce pollution

Norway is involved internationally to reduce the environmental impacts of oil and gas activities. The most important fora are:

- › OSPAR Convention
- › Kyoto Protocol to the Climate Change Convention
- › Gothenburg Protocol to abate acidification, eutrophication and ground-level ozone
- › EU regulations, including the greenhouse gas emission allowance trading scheme

1. Emissions to air

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The most important components of emissions to air are carbon dioxide (CO₂), nitrogen oxides (NO_x), methane (CH₄) and non-methane volatile organic compounds (NMVOCs). Offshore oil activities are an important source of emissions of all these gases.

STATE

Significant contributor to emissions to air

With the exception of NMVOC, emissions to air from the oil and gas industry have risen since 1997 and have been relatively stable the past few years despite the measures that have been taken to reduce them. Many of the fields on the Norwegian continental shelf have grown older, and more energy is needed to extract the remaining oil and gas. Moreover, there is now more gas and less oil in the reservoirs, and producing gas is more energy intensive than producing oil.

Emissions of CO₂ and NO_x are mainly generated by combustion of natural gas in turbines for electricity production and by flaring, which is a safety system on the platforms. Offloading of oil, particularly at loading buoys on the oil fields, is the main source of nNMVOC emissions.

IMPACT

Contributes to climate change and regional pollution

Emissions of CO₂ and CH₄ contribute to climate change. NO_x emissions contribute to eutrophication and acidification and result in higher background concentrations of NO₂. NMVOC emissions combined with NO_x emissions result in the formation of ground-level ozone.

PRESSURE

Large emissions to air

The offshore oil and gas industry accounts for about 25 per cent of Norway's total CO₂ emissions and 31 per cent of its total NO_x emissions. About 23.5 per cent of the country's total NMVOC emissions are also generated by oil and gas activities. The total emissions of NMVOC from oil and gas activities have however dramatically decreased since 2001.

RESPONSE

Efficiency and coordination in focus

CO₂ emissions can be reduced by more efficient energy production. Energy efficiency can be improved by coordinating energy production on several platforms. The installation of combined heat and power plants (CHP) can also raise efficiency and reduce emissions per unit produced. Both these measures will also reduce NO_x emissions. So far there is little coordination of energy production between platforms, but combined heat and power plants are becoming more widely used.

The use of cold flare offshore, which means that the pilot flame can be extinguished and continuous flaring ceases, is another means of reducing CO₂ and NO_x emissions. NO_x emissions can also be cut by installing low-NO_x turbines and/or treatment equipment. NMVOC emissions can be reduced by installing vapour recovery equipment for use during offloading of crude oil. This has been done on many of the platforms and has resulted in a significant reduction of NMVOC emissions.

2. Waste from oil and gas activities offshore

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Oil and gas activities generate many different types of waste, ranging from ordinary household waste to various hazardous waste fractions. The rules for dealing with waste vary, depending both on its properties and on the risk of environmental damage.

STATE

Drilling generates most waste

Well drilling is the offshore activity that generates the largest quantities of waste. About 465 000 tons of hazardous waste was taken ashore in 2015, which is 38 000 tons more than in 2014. The largest fraction consisted of drilling waste.

About 37 000 tons of non-hazardous waste was generated on the Norwegian shelf in 2015. The different waste fractions are shown in the figure below.

Hazardous waste on the rise

The quantity of hazardous waste from the offshore sector has increased considerably since 2009, mostly because more drilling waste has been taken ashore and treated as hazardous waste. This is largely due to the difficulties the industry has experienced in injecting drill cuttings into the underground on several fields on the continental shelf.

IMPACT

Pollution from drilling waste

Transporting drill cuttings to land and treating drilling waste result in emissions of greenhouse gases and acidifying substances. There is also a risk that soils, rivers and lakes, and coastal waters may be polluted by releases from waste treatment facilities and landfills.

RESPONSE

Drill cuttings require special treatment

The Departments of Environmental Affairs at the County Governor's Office decide which waste treatment facilities are authorised to receive waste from offshore activities for intermediate storage.

- Non-hazardous waste is treated together with household waste.
- Hazardous waste is transported to authorised treatment facilities. Drill cuttings sent onshore can only be treated by facilities that have been approved by the Norwegian Environment Agency.

The offshore sector is obliged to report all generated hazardous waste and trade waste.
