Total E&P Danmark

Total Exploration & Production Danmark (TEPDK) is the largest oil and gas operator in Denmark. We are an agile and innovative E&P affiliate leading in safety and operations, contributing with profit, talent and expertise to Total and our partners in the Danish Underground Consortium (DUC).

Total is a broad-based energy company, producing and marketing fuels, natural gas and electricity. The Group is committed to energy that is more affordable, more reliable, cleaner and accessible to as many people as possible. Our ambition is to become the responsible energy major by integrating climate and environmental challenges into our strategy and our operations.

In 2019, a year after the Total Group completed the acquisition of Maersk Oil, we have continued our commitment to reduce our environmental impact by reaching net zero emissions in our operations by 2050 or sooner while safely and responsibly maximizing the recovery of oil and gas resources in the Danish North Sea.

Today, TEPDK has embarked on a new chapter and is half way through the redevelopment of the Tyra field which will reduce the field’s CO₂ footprint by 30%, while recycling more than 95% of the materials of the facilities.

We are looking forward to the project’s completion leading to a newer, better Tyra, which will support energy security and the green transition in Denmark and Europe.
Total E&P Danmark at a glance

No. 1
Oil and gas operator in the Danish North Sea

1,000
Around 1,000 employees

2.2 billion
Barrels of oil produced (1972-2019)

1972
First oil

97%
Of Denmark’s gas production
Not applicable during Tyra Redevelopment

85%
Of the national oil production

21%
Reduction in CO₂ emissions since 2014

38%
Decrease in oil discharged from 2016 - 2019

16
Producing oil and gas fields
8 producing fields during Tyra Redevelopment

50
Offshore installations
30 installations during Tyra Redevelopment

Philippe Groueix
Managing Director,
Total E&P Danmark A/S

I am pleased to present our Environmental Report 2019, which outlines our environmental performance from the past year. As always, we continue to work hard to honor our commitment to protect the environment and reduce our environmental impact. At the same time, we look after the safety of our people while also continuously improving the integrity of our North Sea assets and upholding our principles of sustainable development. These are all high priority areas for Total as we develop and produce hydrocarbons.

One of the 2019 highlights was our contribution to the government-led work to form the Danish Climate Action Plan to which we presented our solutions and initiatives that will contribute to the ambitious national objective to reach 70% CO₂ reduction target by 2030.

It is our ambition to reduce our environmental footprint and GHG emissions from our operations while at the same time increasing operational efficiency and improving our energy efficiency. Work is constantly ongoing to identify and deliver CO₂ reductions through better utilization and simplification of our infrastructure. We are also evaluating several initiatives, including optimized processes, digitalization, electrification and new technologies such as Carbon Capture and Storage (CCS).

Finally, throughout 2020, we will continue to work closely with our partners, suppliers, Government agencies and research institutions to support innovative and sustainable solutions for the future oil and gas production. One example is our longstanding collaboration with the Danish Hydrocarbon Research and Technology Center (DHRTC). Through this partnership, we have carried out new projects and work programs to overcome current and future challenges. For example, ‘Zero harmful discharge’ is one out of 12 ambitious programs, which we look forward to following the impact from, as it has great potential to support us in our improvement efforts.

I hope you will enjoy reading our 2019 environmental report.

Total E&P Danmark Strategy

BE RESPONSIBLE
- Improve health, safety and environmental performance

BE SUSTAINABLE
- Deliver Tyra Redevelopment
- Accelerate digitalization

BE PROFITABLE
- Maximize operational efficiency
- Optimize cost
Total Group Ambition

Total’s ambition is to become the responsible energy major, providing reliable, clean and affordable energy to as many people as possible and integrating the climate challenge into our strategy and our operations.

As we improve energy efficiency at our sites, we are also introducing a range of services to support our customers as they reduce their carbon footprint. They include our Total Ecosolutions label, the energy efficiency solutions available from GreenFlex, Total Owned Energy efficiency business.

To tackle climate issues, we have grouped our initiatives around four strategic focus areas; and we have made substantial progress: growing in natural gas by expanding our presence across the entire chain; stepping up our low-carbon electricity activities by developing an integrated business on the unregulated portion of the value chain, focusing on oil with low break-even and reducing our emissions; promoting both sparing oil use and sustainable biofuels; and contributing to carbon neutrality through energy efficiency and carbon sinks.

NATURAL GAS

Expand our presence across the entire natural gas chain, reduce our methane emissions and make LNG more energy efficient.

LOW-CARBON ELECTRICITY

Expand our operations in the non-regular portion of the value chain (i.e. excluding power transmission), from power generation using renewables and natural gas to sales to end customers and energy storage (batteries and hydrogen).

PETROLEUM PRODUCTS

Avoid expensive oil, reduce emissions at our facilities, and promote both sparing oil use and sustainable biofuels.

CARBON NEUTRALITY

Develop businesses that will help achieve carbon neutrality through providing energy efficiency services to our customers and by investing in natural carbon sinks such as forests and wetlands, and in carbon capture, utilization and storage (CCUS).

Total’s ambition is to reduce greenhouse gas emissions (Scopes 1 and 2) at operated oil and gas facilities to less than 40 million tons of CO₂ equivalent (eq.) in 2025 from 46 million tons of CO₂ eq. in 2015.

PETROLEUM PRODUCTS

Lower CO₂ emissions by at least 50% compared to regular fuels

Consuming less energy at our operated facilities is the first key driver for reducing greenhouse gas emissions. For that reason, we are taking steps to improve energy efficiency at our sites.

To comply with European Union standards, biofuels must emit across their life cycle less than half the CO₂ equivalent of fossil fuel equivalents. Biofuels are made from renewable raw materials or waste materials. For more than 20 years, we have been a leader in biofuels research, production and distribution, constantly working to provide more sustainable and high-performance products.

CARBON NEUTRALITY

Devote 10% of our overall R&D budget to research into CCUS technology

Natural carbon sinks are an effective means of capturing carbon dioxide. In June 2019, we created our new Nature-Based Solutions business unit to fund, develop and manage operations for sequestering carbon or preventing carbon emissions.

We are pursuing our commitment to commercial development of carbon capture, utilization and storage (CCUS), an essential plank of our strategy.

As the fossil fuel with the least carbon emissions, it offers an excellent alternative to coal for power generation and can serve as a flexible and inexpensive partner to intermittent and seasonal renewable energies.

In order to meet rising electricity demand responsibly, we are solidifying our integrated growth model for low-carbon electricity. From upstream to downstream, across solar, wind and hydropower, we continue to seize new opportunities for investment.

Faced with climate challenges and changes in technology and usage, transportation is going through a decisive period of transformation. Total is developing and proposing tangible solutions for light vehicles, trucks, shipping and air transportation.

Natural gas is a cornerstone of our energy mix and our strategy. As the fossil fuel with the least carbon emissions, it offers an excellent alternative to coal for power generation and can serve as a flexible and inexpensive partner to intermittent and seasonal renewable energies.

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Environmental perfomance summary

While we make every effort to explore, develop and produce hydrocarbons from the underground responsibly, the oil and gas industry can be challenging. In 2019, we continued our journey towards having zero Health, Safety and Environmental (HSE) incidents and more stable production, reducing non-routine flaring and minimizing discharge of oil and chemicals into the sea.

OIL AND CHEMICAL SPILLS
In 2019, the number of oil spills decreased by 62%. Spilled oil decreased from 15.2 tons in 2018 to 0.025 tons in 2019. The number of chemical spills was reduced by 46% compared to 2018; however, the volume increased from 2.4 tons to 7.0 tons in 2019 due to various operational incidents. This is not a satisfactory progression and we continue to investigate spills to avoid reoccurrence.

OPERATIONAL EFFICIENCY
Maintaining stability of our operations is a key focus area to ensure minimum CO2 emissions from flaring. During the year, TEPDK focused on reducing unplanned production shortfalls by applying advanced data analytics to identify high frequency low impact events associated themes and an improved event root cause identification. This was also possible through the implementation of the Onshore Operations Centre (OOC) phase II, where daily monitoring of fuel and flare continued to be a key focus area, improving the operational efficiency from 72% in 2016 to 85% in 2019.

ENERGY EFFICIENCY
In 2019, TEPDK’s Environmental Management System, which houses its Energy Management System, was recertified by BUREAU VERITAS to comply with ISO 14001:2015.

Furthermore, the greenhouse gas (GHG) emissions were lower than in 2018, impacted by the shutdown of the Tyra field and various planned shutdowns executed to perform preventive maintenance on safety critical systems. However, the natural decline in hydrocarbon production and the shutdown of the Tyra field resulted in the highest GHG intensity (CO2 eq. emissions per unit of hydrocarbons produced) in the past five years.

To mitigate this impact we continue to focus on reducing emissions and the Energy Efficiency baseline from GreenFlex on Dan will identify opportunities to reduce flaring and fuel gas consumption.

MANAGING WASTE
The business generated less waste than previous years. In 2019, the total waste recycled from our facilities in the Danish North Sea increased by approximately 3% compared to 2018. This was mainly due to the continuous focus and monitoring to ensure that we reuse and recycle certain waste fractions. Most of our waste is reused either through recycling, incineration or biotreatment, so less than 2% of the total waste goes to landfills.

DISCHARGE TO SEA
The amount of oil discharged in produced water was reduced again in 2019. Similarly, the concentration of oil in produced water declined.

Our constant focus in this area has reduced the amount of oil discharge to sea by 38% since 2016 and is now well below the limits set by the Danish Environmental Protection Agency (DEPA) and OSPAR.

The amount of chemicals discharged to sea has decreased in 2019, primarily due to a decrease in drilling activity with only one well drilled. The proportion of green discharged chemicals was maintained at levels above 61%. The amount of red chemicals discharged to sea was remarkably low in 2019 with one red chemical (sodium hypochlorite) discharged.

See page 10 for our environmental data.
The production of oil and gas has been in natural decline for several years as the fields in the Danish North Sea are maturing.

**OIL PRODUCTION AND NATURAL GAS**

Hydrocarbon production fell from 2018 to 2019 due to the Tyra shutdown for decommissioning and preparation for the Tyra Redevelopment, as well as the effect of natural decline in hydrocarbon production (Figure 1). Regarding the produced gas, about 83% was exported to shore for sale, 14% was used offshore as fuel gas to provide energy to the platforms, and around 2% was flared (Figure 2). Flaring of natural gas happens as a safety measure and cannot be completely eliminated. At an operational level, a stable production process helps to minimize flaring.

During 2019, we saw an improvement of the operational efficiency of 5% compared to 2018.

Initially, the production coming from the reservoirs may be mostly hydrocarbons but, over time, the proportion of produced water increases. Produced water (PW) is a normal by-product of oil and gas production.

**PRODUCED WATER**

Water exists naturally in the reservoirs and is extracted along with the hydrocarbons, then separated and cleaned before it is discharged into the sea or reinjected into the reservoirs, thus reducing the associated environmental impact. Water reinjection into the reservoir depends on factors including the volume and quality of produced water and the physical properties of the reservoir.

Produced water reinjection is currently only possible at Gorm and Skjold, where about 86% of the produced water from these two fields was reinjected in 2019. Overall, TEPDK reinjected about 22% of the water back into the reservoirs in 2019 (Figure 3). This represents an increase compared to previous years due to the improved injection efficiency of the produced water reinjection system at Gorm and Skjold.

**OIL IN PRODUCED WATER**

Our laboratory technicians take daily samples of produced water to analyze the concentration of discharged oil. During times of unstable production, the monitoring frequency is increased to three samples a day. Monitoring and treatment processes are subject to regular internal and external verifications and oil in water performance is reported monthly to the Danish Environmental Protection Agency (DEPA).

The marine environment of the North East Atlantic is protected by the OSPAR Convention, which aims to limit the amount of oil discharged into the sea through produced water discharge. Both OSPAR and the DEPA set requirements that regulate the maximum amount of oil discharge to sea by TEPDK.

**DISCHARGES**

The amount of oil discharged in produced water in 2019 was markedly lower compared to previous years; the amount of oil discharged to sea reached a historical low at 123 tons, well below the permitted 202 tons set by the DEPA (Figure 4). This was achieved through a combination of the Tyra field shutdown and an efficient produced water treatment, which resulted in low concentrations of oil in produced water (6.3 mg/l), also well below the OSPAR limit of 30 mg/l (Figure 5). Oil in water continues to be a focus area for our daily operations.
Figure 3
Produced water is reinjected or discharged to sea

- Rejected produced water (mill. m³)
- Discharged produced water (mill. m³)

Table 1: Discharged produced water

<table>
<thead>
<tr>
<th>Year</th>
<th>Rejected</th>
<th>Discharged</th>
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<tbody>
<tr>
<td>2014</td>
<td>7.4</td>
<td>23.5</td>
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<tr>
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<tr>
<td>2016</td>
<td>5.1</td>
<td>22.6</td>
</tr>
<tr>
<td>2017</td>
<td>5.0</td>
<td>24.6</td>
</tr>
<tr>
<td>2018</td>
<td>5.9</td>
<td>22.0</td>
</tr>
<tr>
<td>2019</td>
<td>5.6</td>
<td>19.6</td>
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Figure 4
Oil in produced water discharged to sea

<table>
<thead>
<tr>
<th>Year</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
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<tbody>
<tr>
<td>2014</td>
<td>975</td>
<td>190</td>
<td>198</td>
<td>167</td>
<td>135</td>
<td>123</td>
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Figure 5
Average concentration of oil in produced water discharged to sea

<table>
<thead>
<tr>
<th>Year</th>
<th>2014</th>
<th>2015</th>
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<th>2017</th>
<th>2018</th>
<th>2019</th>
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<tbody>
<tr>
<td>2014</td>
<td>6.6</td>
<td>7.9</td>
<td>8.6</td>
<td>6.8</td>
<td>6.1</td>
<td>6.3</td>
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</table>

Figure 6
Chemicals discharged to sea

<table>
<thead>
<tr>
<th>Year</th>
<th>Red chemicals (tons)</th>
<th>Yellow chemicals (tons)</th>
<th>Green chemicals (tons)</th>
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<tbody>
<tr>
<td>2014</td>
<td>1.8</td>
<td>5.989</td>
<td>6.979</td>
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<tr>
<td>2015</td>
<td>1.7</td>
<td>5.832</td>
<td>7.813</td>
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<td>2016</td>
<td>1.3</td>
<td>6.137</td>
<td>12.351</td>
</tr>
<tr>
<td>2017</td>
<td>1.5*</td>
<td>6.085</td>
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<td>2018</td>
<td>1.2</td>
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<td>2019</td>
<td>0.3</td>
<td>3.477</td>
<td>5.527</td>
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</table>

* The amount of red chemicals discharged in 2017 was corrected after verification of data.

Permitted chemicals

Chemicals are used in our production, maintenance and drilling activities for technical, safety and environmental reasons. Hydrogen Sulphide (H₂S) scavenger chemicals are used to reduce the otherwise potentially dangerous levels of H₂S in the gas coming from the reservoirs. Corrosion control chemicals are used to reduce corrosion on pipelines, facilities and wells, thus reducing the potential risk of oil spill or gas leakage. Biocides are also used to remove bacterial growth that affects the efficiency of the produced water system. Chemicals use and discharge are regulated by the DEPA through a permitting process (Box 1 - page 15).

Prior to use, TEPDK’s production and drilling chemicals are tested by a third-party laboratory to determine whether their bio-accumulated components are toxic or slow to degrade. A certificate, called a Harmonized Offshore Chemical Notification Format (HOCNF), is issued by the chemical vendor and the results are used by our Environmental Advisors to assess the OSPAR chemical classification and environmental risks associated with their use (Box 1). Together with an estimate of expected use and discharge, TEPDK files a permit application to the DEPA, which evaluates the products and decides whether the chemical can be used under the terms described in the application. Applications for red chemicals that can be discharged to the environment require a thorough assessment looking at all technical, health, safety and environmental considerations.

The use of the permitted chemicals is daily monitored by our Production Chemists to ensure that we adhere to the specifications. Annual reports on the use and discharge of chemicals are submitted to the DEPA.

OSPAR APPROACH

Since 2017, we have assessed the use and discharge of our production chemicals through the OSPAR ‘Risk Based Approach’ tool. Based on the estimate of chemical discharges, environmental risk associated with production water discharge is evaluated by combining laboratory toxicity data and 3D hydrodynamic modeling to calculate environmental risk. Our Environmental Advisors work with this data to recommend a special focus on the hazardous chemicals. Concretely, this means that such chemicals are thoroughly evaluated for a substitution or reduction to achieve an acceptable risk level.

Compared to 2017, the amount of chemicals discharged to sea declined by 47% in 2019, marking a new historical low. (Figure 6).
In 2019, a case was recorded in relation to the biocide Biotreat 4632 concerning an apparent name change to include the word “EU” within the chemical tradename. This chemical is provided to TEPDK by Ørsted as operator of the 20” oil pipeline from the platform ‘Gorm E’ to shore for Danish Oil Pipe (DOP).

During TEPDK’s chemical screening process, we found inconsistencies with the product, resulting in an immediate suspension of the biocide and backloading the product onshore for proper disposal. Later, the chemical supplier confirmed an extra component (Glycine) was present in the formulation. TEPDK immediately requested the supplier to carry out a formal investigation and communicate the results. During the investigation period, the authorities were informed by Ørsted. This resulted in a fine to TEPDK due to late notice of the case.

Note: The Biotreat 4632 EU was never discharged into the sea and the additional fourth component (Glycine) is not hazardous to the environment and does not impact the Yellow classification of the chemical.

**CHEMICAL DISCHARGES**

TEPDK discharges reached their lowest in 2019 since 2014 (9,004 tons). The significant decrease in chemical discharge was due to the reduction of drilling activity in the past few years, the daily chemical optimization and a refinement of the methods applied to estimate discharge of production chemicals in 2019. Most chemicals (61%) that were discharged in 2019 posed little or no risk to the environment (OSPAR, green classification).

A significant change on how surfactant chemicals are environmentally assessed was communicated by the DEPA in 2019. As per January 1st, 2020, new chemicals requested for use by TEPDK will be subject to the altered practice for assessment of surfactants. Existing chemicals in use are granted a later date of January 1st, 2021 to enable time to evaluate suitable substitutes to chemicals at threat of moving color classification from yellow to red.

**BLACK CHEMICALS**

Chemicals containing one or more components registered in OSPAR’s List of Chemicals for Priority Action, and their use is prohibited except in special circumstances.

**RED CHEMICALS**

Chemicals containing one or more components that, for example, accumulate in living organisms, are toxic or slow to naturally degrade in the marine environment.

**YELLOW CHEMICALS**

Chemicals that can normally be discharged without specific conditions, although their use is monitored by the DEPA.

**GREEN CHEMICALS**

Chemical components that pose little or no risk to the environment according to OSPAR’s PLONOR classification.

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**Chemical permitting**

Total complies with OSPAR guidelines on the use and discharge of chemicals, which are classified as black, red, yellow or green.

Figure 7:

2019 distribution of black, red, yellow and green chemicals discharged to sea, following the discharge permit process.

0% Black chemicals

0.003% Red chemicals

38.6% Yellow chemicals

61.4% Green chemicals

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Most chemicals (61%) discharged in 2019 were Green chemicals and posed little or no risk to the environment.
Environmental Status Report 2019 – Total E&P Danmark A/S

Drilling

When it is technically viable, TEPDK uses water-based drilling mud. Following strict environmental guidelines from authorities, water-based drilling mud and drill cuttings, which are made of rock drilled from the well, are discharged into the sea after use. The amount of drill cuttings generated also depends on the length and condition of the wells drilled, as well as the technical difficulties encountered while drilling through the reservoir.

The volume of water-based drilling mud discharged decreased from 12,500 m³ in 2018 to 7,100 m³ in 2019. It is a significant decrease directly associated with only one well drilled in 2019. (Figure 8).

Reduction in water-based drilling mud and drill cuttings discharged to sea is highly dependent on the number of rigs operating in the area. Consequently, an increase is expected when the number of activities grows.

Water-based drilling mud and drill cuttings may contain traces of oil from the reservoir. The oil content is monitored to ensure it does not exceed an average of 2% of the oil concentration in water-based drilling mud and drill cuttings. If it does, the mud and cuttings are transported to shore for treatment and disposal.

When it is necessary to use an oil-based drilling mud, cuttings and used mud are also shipped to shore for treatment and disposal.

Spills

We operate a policy of zero tolerance towards spills. To do so, all discharges of oil and chemicals, regardless of volume, must be reported internally and to the Danish authorities. We continue to improve our performance in this area by reducing the volume and number of spills further.

OIL AND CHEMICAL SPILLS

The number of oil and chemicals spills into the sea in 2019 was the lowest in the past five years marking a historical low (Figures 9A, 9B). This is the result of an increased level of awareness from our offshore workforce; nevertheless, we would like to see a further reduction and to eliminate larger volume spills that increase the total tonnage of spills.
Greenhouse gas (GHG) emissions

GHG emissions are measured in kiloton of CO₂ equivalent (kt CO₂ e) and come from flaring, venting, fuel gas and diesel consumption.

GHG is the term for the emissions in our atmosphere that prevent heat from escaping into space. This is the Greenhouse Effect.

We monitor our emissions to air with the aim of managing and reducing the emission levels. TEPDK has managed to reduce 10% of its Greenhouse gas (GHG) emissions since 2015.

More than 90% of CO₂ emissions are covered by the quota system.

Over the past five years, CO₂ emissions have consistently decreased and are now 21% lower than in 2014 (Figure 10). Figures reached their lowest levels in 2019, 83% of the CO₂ emissions released were from combustion of fuel gas, 14% of these emissions were mainly due to safety flaring during production shutdowns and 3% were from diesel combustion (Figure 11).

Another contribution to the reduction in CO₂ emissions is the shutdown of the Tyra and Harald production units for the Tyra Redevelopment project. When the production at Tyra is resumed with its state-of-the-art facility, it is expected that the redeveloped Tyra will produce with a 30% reduced CO₂ footprint - compared to the old installation.

Overall, the decline in CO₂ emissions is due to a decrease in the use of fuel gas and the daily efforts to reduce non-routine flaring.

* The amount of CO₂ emissions non-quota in 2017 was corrected after verification of data.

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** figures:

<table>
<thead>
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<th>Year</th>
<th>CO₂ emissions (mill tons)</th>
<th>CO₂ emissions non-quote (mill tons)</th>
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<tbody>
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</tr>
<tr>
<td>2019</td>
<td>0.05*</td>
<td>11</td>
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** substitutions:

- CO₂ emissions quota
- CO₂ emissions non-quota
- CO₂ emissions quota
- CO₂ emissions non-quota
- CO₂ emissions quota
- CO₂ emissions non-quota
- CO₂ emissions quota
- CO₂ emissions non-quota
- CO₂ emissions quota
- CO₂ emissions non-quota
- CO₂ emissions quota
- CO₂ emissions non-quota
We are constantly looking for ways to reduce flaring, but periods of unstable production can lead to an increase in safety flaring. Our average flaring rate in 2019 was 0.19 MSm³/d, the main flare sources were the Gorm asset (50% of gas flared) followed by Tyra and Dan. We are initiating activities to reduce flaring on Gorm as can be highlighted by the Rolf re-route project performed in 2019.

Fuel gas consumed in our installations in 2019 was lower than previous years as Tyra was shutdown in Q3. The average fuel gas rate was 1.20 MSm³/d.

NOx AND SOx EMISSIONS

Typically, these types of emissions are released from the use of fossil fuels to produce energy, such as fuel gas, diesel fuel or gas flaring for safety purposes.

NOx emissions have decreased over the past four years and reached their lowest level in 2019 (Figure 13), with diesel fuel accounting for 38% of NOx emissions, heli fuel about 1%, and fuel gas contributing the rest of the NOx emissions.

We use the Predictive Emissions Monitoring System (PEMS), which offers more accurate emissions data, to calculate NOx emissions. The PEMS uses a variety of data including gas consumption and speed, to calculate emissions directly in the fuel gas. The PEMS is controlled in a similar way to CEMS by comparing calculated emissions with parallel measurements. An accredited third party carries out measurements using high-quality reference equipment.

SOx emissions decreased by more than 60% in 2019 compared to 2016, primarily due to the lower sulphur content of the fuel gas. The average sulphur content of our diesel in 2019 was 0.04%, compared to a concentration of 0.09% in 2016 and this was mostly due to the atmosphere through the venting system without being flared. This is called cold venting.

VOCs are split into two fractions: methane (CH₄) representing about 80% in weight and non-methane VOCs (nmVOC) about 20%. Methane emissions in 2019 have been relatively low compared to 3,100 tons in the previous year, whereas nmVOC decreased by a 14% in 2019 compared to the previous years (Figure 13).

The new Tyra will offer a significant reduction in venting of CH₄ and nmVOCs due to the fact that the old Tyra installations accounted for over half of TEPDK’s CH₄ and nmVOC emissions by way of venting activities.

We no longer use Hydrochlorofluorocarbon (HCFC) gases, which are greenhouse gases that also deplete the stratospheric ozone layer, including Freon 22. Freon 22 was phased out as a cooling agent in the treatment of gas from wells on the Gorm and Tyra platforms in 2014 (Figure 14).

There was a sharp decline in 2016 when Heating Ventilation Air-Conditioning (HVAC) systems were renewed offshore and more stable and fitted systems were less prone to leakage.

In 2019, the total consumption of Hydrofluorocarbon (HFC) gases, which are greenhouse gases used in gas-based cooling systems such as air conditioning, was 2.0 tons (Figure 14).

We no longer use Hydrochlorofluorocarbon (HCFC) gases, which are greenhouse gases that also deplete the stratospheric ozone layer.
Waste Management
At TEPDK, we consider waste to be a potential resource and put in considerable effort to reuse it to the extent possible. Acknowledging that much of our waste is a result of decisions made decades ago, our actions in relation to the waste are mainly focused on finding the most appropriate solution for the legacy waste fractions.

We consistently have a high recovery of more than 95% of all our waste either through recycling or incineration for energy recovery. All waste from our facilities in the Danish North Sea is transported to shore, where it is recycled, incinerated or landfilled in accordance with the current legislation.

As for our operational waste, there are more options to affect the waste production and treatment by continuously monitoring and assessing all waste streams. As a result, the proportion of recycled operational waste has been steadily increasing from 2017 to 2019 by 5%.

Continuous monitoring is also used to find alternative solutions that can eliminate or significantly decrease certain waste fractions, as well as ensure that we reuse and recycle them. For 2020, TEPDK developed a new Waste Management Plan (WMP) that simplifies our effort to actively reduce production of waste from our operations.

The WMP will be implemented in TEPDK by training all employees involved in waste segregation in order to fulfill their roles in the waste management process. This implementation will be audited by TEPDK HSE department. Furthermore, TEPDK will audit its waste management service contractor on a yearly basis to comply with Total company rules, HSE Management System and Danish authorities’ requirements. TEPDK is focused on an ongoing improvement by sharing the best practices on waste management with the North Sea region and the other Total affiliates.

NORM (Naturally Occurring Radioactive Material) is a well known waste product from oil and gas production, especially in aging oil and gas fields. NORM handled by TEPDK has low levels of radioactivity. Our handling and storage procedures for NORM ensure that it does not pose a risk to our employees, general public and the surrounding environment.

Small amounts of radioactive substances are found in the subsoil of the North Sea. NORM is primarily found in the Gorm Field (80%) and in much lower quantities across our other installations. This material is produced with the mixture of gas, oil and water and eventually is concentrated e.g. in separators. When staying close to equipment covered with NORM deposits, the personnel can therefore be exposed to external radiation.

Since 1999, a regular assessment of NORM in Total’s installations has occurred to ensure areas of exposure are classified accurately, and only staff with the relevant training is permitted to work in areas where there is a NORM exposure risk. Such personnel must always be certified according to the Danish legislation and must follow specific procedures that guarantee their safety.

As a responsible operator, Total applies high quality standards, procedures and personal protective equipment to carry out NORM related work and monitoring. These routines have been established in all Total’s oil and gas fields.

NORM STORAGE
Onshore NORM is packaged in a way that ensures it is securely contained. It is handled by specialized service companies that treat and pack NORM for storage onshore. This involves packing NORM in several layers consisting of liners and multiple drums to ensure the waste cannot leak.

Total’s NORM waste is stored in an approved, inspected and fenced off area with proper signage. Radiation from Total’s NORM storage is regularly monitored to ensure that radiation levels around the perimeter of the NORM yard are below the limits set by the authorities.

TEPDK is currently in a tender process to establish a technical solution for permanent NORM waste disposal. Together with the oil and gas industry Total is also in dialogue with the authorities to find a future and safe solution for permanent disposal.
Biodiversity

In 2019, TEPDK carried out a broad range of scientific studies to increase the understanding of the effects of our projects and operations on offshore biodiversity. Studies have been developed and carried out by academics and environmental specialists with expertise in the field of marine mammal biology, underwater acoustics, metagenomics and ecotoxicology.

TEPDK initiated a three-year investigation on the effect of produced water discharges (see the Discharges section, pages 12-17) on the marine environment. The program, led by experts from DHI A/S, includes a scientific literature review, laboratory ecotoxicity analyses and field experiments (picture on the right). A three-dimensional hydrodynamic model will be used to assess the environmental status of the water column around the monitored platforms. The results of this comprehensive study will be shared with the DEPA and support the development of a national offshore water column monitoring program starting in 2021.

Lately, the TEPDK supported marine mammal research program initiated in 2013 has made another significant scientific contribution by providing data regarding the effect on harbor porpoise of underwater sound generated by seismic surveys. The results were recently published in the peer-reviewed scientific journal Frontiers in Marine Sciences.

TEPDK also supports researchers on the development of new scientific methodologies in the studies of biodiversity.

For example, we collaborated with researchers at DTU-aqua for the offshore deployment and testing of a state-of-the-art technology in remote and automated biodiversity monitoring. The pilot study aimed at testing the use of a second-generation environmental sample processor (ESP) in an offshore environment. The ESP was deployed close to our facilities to sample and analyze environmental DNA of porpoise, dolphin and fish species. The preliminary results are encouraging, and findings will be published in an upcoming scientific publication.

Our Environmental Team arranges dedicated biodiversity awareness sessions with onshore and offshore employees. Our offshore staff is encouraged to report wildlife sightings around platforms and the information is shared with large regional inventory of species like basking sharks or bluefin tuna. Pictures and videos are made public in our office buildings and posted frequently through our social media channels.1

SOURCE

1 To see the videos posted on social media follow us on Facebook Total Denmark.
This year, we continue to explore, develop and produce oil and gas responsibly and with the least impact possible to protect the environment. We are also working hard to reduce CO2 emissions from our operations as part of our commitment to fight global climate change.

We are committed to work with our partners in DUC to lower the North Sea emissions by one third and contribute to deliver our part of the national 70% CO2 reduction target in 2030.

In 2020, we will reduce our carbon footprint by improving our energy and operational efficiency through several initiatives, such as simplifying and optimizing our fields, and through increased digitalization and implementation of new technologies. The ongoing redevelopment of the Tyra field, a 21 billion DKK investment, plays a central role in our climate mitigation plan, as the new Tyra will reduce flaring by 90% and have a CO2 footprint that is 30% lower than the old Tyra field.

In 2020, we will work with GreenFlex, a wholly owned Total affiliate since 2017, that provides expertise to improve energy and environmental performance by combining data intelligence and equipment management. Working together, we will perform an Energy Efficiency baseline on the main platform of the Dan field and shape the energy efficiency strategy for 2021.

In 2020, we will continue to focus on responsible and safe operations in the Danish North Sea in 2020. Our work is focused on protecting biodiversity and the environment through initiatives that will reduce our environmental footprint, recycle more waste, and reduce our emissions with the aim to produce energy with as little environmental and climate impact as possible.

In 2020, we will reduce our carbon footprint by improving our energy and operation efficiency through several initiatives.
### Glossary

#### Units of measurement

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>barrel</td>
</tr>
<tr>
<td>B or G</td>
<td>billion</td>
</tr>
<tr>
<td>Boe</td>
<td>barrel of oil equivalent</td>
</tr>
<tr>
<td>Btu</td>
<td>British thermal unit</td>
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<tr>
<td>eq</td>
<td>equivalent</td>
</tr>
<tr>
<td>Gt</td>
<td>billion tons</td>
</tr>
<tr>
<td>GW</td>
<td>gigawatt</td>
</tr>
<tr>
<td>k</td>
<td>thousand</td>
</tr>
<tr>
<td>M &amp; mil</td>
<td>million</td>
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<tr>
<td>Mboe/d</td>
<td>million barrels of oil equivalent per day</td>
</tr>
<tr>
<td>m³</td>
<td>cubic meters</td>
</tr>
<tr>
<td>mg/l</td>
<td>milligram per liter</td>
</tr>
<tr>
<td>MMSCFD</td>
<td>million standard cubic feet per day</td>
</tr>
<tr>
<td>MWh</td>
<td>megawatt-hour</td>
</tr>
<tr>
<td>t</td>
<td>metric ton</td>
</tr>
<tr>
<td>toe</td>
<td>ton of oil equivalent</td>
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<tr>
<td>DUC</td>
<td>Danish Underground Consortium</td>
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<tr>
<td>CCUS</td>
<td>Carbon Capture, Utilization and Storage</td>
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<tr>
<td>DEPA</td>
<td>Danish Environmental Protection Agency</td>
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<tr>
<td>EU-ETS</td>
<td>EU Emissions Trading Scheme</td>
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<tr>
<td>EU SECAs</td>
<td>EU Sulfur Emissions Control Areas</td>
</tr>
<tr>
<td>HFC</td>
<td>Hydrochlorofluorocarbon</td>
</tr>
<tr>
<td>HOCNF</td>
<td>Harmonized Offshore Chemical Notification Format</td>
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<tr>
<td>HVAC</td>
<td>Heating, Ventilation and Air Conditioning</td>
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<tr>
<td>IEA</td>
<td>International Energy Agency</td>
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<tr>
<td>MARPOL</td>
<td>International Convention for the Prevention of Pollution from Ships</td>
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<tr>
<td>NOx</td>
<td>Nitrogen oxide</td>
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<tr>
<td>OSPAR</td>
<td>Oslo and Paris Convention</td>
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<tr>
<td>PEMS</td>
<td>Predictive Emissions Monitoring System</td>
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<tr>
<td>CEMS</td>
<td>Continuous Emissions Monitoring System</td>
</tr>
<tr>
<td>PW</td>
<td>Produced water</td>
</tr>
<tr>
<td>SOx</td>
<td>Sulphur oxide</td>
</tr>
<tr>
<td>VOC</td>
<td>Volatile Organic Compounds</td>
</tr>
</tbody>
</table>

#### Definitions

- **Bioaccumulation**: The accumulation of a chemical in an organism relative to its level in the ambient medium.

- **Greenhouse gases (GHGs)**: The six gases named in the Kyoto Protocol: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), Sulphur oxide (SOx), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF₆), with their respective Global Warming Potential (GWP), as described in the 2007 IPCC report.

- **Operated facilities**: Offshore facilities operated in Total Exploration & Production in Denmark.

- **PLONOR**: OSPAR list of substances used and discharged Offshore which are considered to Pose Little or No Risk to the Environment.

- **Routine flaring**: Flaring during normal production operations in the absence of sufficient facilities or adequate geological conditions permitting the reinjection, onsite utilization or commercialization of produced gas (as defined by the working group Global Gas Flaring Reduction program as part of the World Bank’s Zero Routine Flaring Initiative). Routine flaring does not include safety flaring.

- **Safety flaring**: Flaring to ensure safe performance of operations conducted at the production sites (emergency shutdown, safety-related operations, etc.).

- **Non-routine flaring**: Flaring other than routine flaring or safety flaring associated with oil production and occurring primarily during occasional or intermittent events.
Total provides a range of communication platforms and publications outlining Total’s corporate social responsibility (CSR). In addition to the materials below, you can find additional information on our Sustainable Performance website, sustainable-performance.total.com. All other publications along with the latest news and reports can be found at www.total.com.

**Total’s environmental publications**

<table>
<thead>
<tr>
<th>Publication</th>
<th>Description</th>
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<tbody>
<tr>
<td>2019 Climate Report</td>
<td>Introducing Climate into our strategy, discover our four Climate-Oriented strategic focuses: natural gas, stepping up our low carbon electricity activities, promoting sustainable biofuels and investing in carbon storage. <a href="http://www.total.com/en/media/media">www.total.com/en/media/media</a></td>
</tr>
<tr>
<td>Total and Biodiversity</td>
<td>Through the act4nature initiative, Total has reaffirmed and broadened its commitment to biodiversity. We adhere to the 10 undertakings, and have added six specific commitments of our own. <a href="https://www.sustainable-performance.total.com">https://www.sustainable-performance.total.com</a></td>
</tr>
<tr>
<td>Sustainable performance</td>
<td>Since 2016, Total has provided transparent information on our CSR strategy and challenges in a dedicated website. The website, regularly updated, introduces the company’s policies, commitments and performance on all sustainability issues relevant to Total, particularly safety, climate, environmental stewardship, business ethics, human rights and community engagement. Environmental, social and governance (ESG) reporting standards and indexes. <a href="https://www.sustainable-performance.total.com">https://www.sustainable-performance.total.com</a></td>
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Total is a broad energy company that produces and markets fuels, natural gas and electricity. Our 100,000 employees are committed to better energy that is more affordable, more reliable, cleaner and accessible to as many people as possible. Active in more than 130 countries, our ambition is to become the responsible energy major.