OEUK OFFSHORE ENERGIES UK

ENVIRONMENTAL INSIGHT 2025

An analysis of environmental trends observed in the UK Continental Shelf (UKCS)

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1 Executive summary

This report provides an analysis of environmental trends observed in the UK Continental Shelf (UKCS) oil and gas sector in 2024 and over the past decade. It focuses on both permitted and unintentional discharges to the sea and atmosphere, including greenhouse gases, produced water, oil, chemicals, and waste.

The UKCS oil and gas sector has demonstrated a strong commitment to enhancing environmental sustainability and operational efficiency alongside the energy transition commitments of the North Sea Transition Deal (NSTD). Continued progress has been made against NSTD targets of reducing GHG emissions against the 2018 baseline. Industry is meeting those targets earlier than expected, with a total reduction of 34% delivered between 2018 and 2024 against the NSTD target of 25% reduction by 2027. Additionally, methane emissions have reduced by 57% since 2018.

Industry is meeting the NSTD targets while also making progress in reducing other environmental impacts, as evidenced by a decrease in produced water discharges and a slight increase in re-injection efforts. Additionally, there has been a reduction in dispersed oil within produced water discharges as well as the overall volume of chemicals discharged, with the majority being classified as posing little or no risk (PLONOR).

While the number of unintentional releases of oil and chemicals rose compared to last year, the total volume from these releases to the sea decreased. Efforts to reduce accidental discharges through improved management of equipment, processes, and personnel remain ongoing. The permit application process also plays a key role in environmental protection by requiring operators to assess impacts and outline mitigation measures.

Sustained focus in these areas will be essential for further improving the sector's environmental performance.

2 Key insights

2.1 Permitted discharges and emissions

All year-on-year comparisons are between 2023 and 2024 unless otherwise stated.

Greenhouse Gases (GHG)

- Sector GHG emissions decreased by 6% and 34% overall since 2018
- Installation emissions reduced by 5% and 34% overall since 2018
- Methane emissions decreased by 8% and 57% overall since 2018

Produced Water (PW):

- PW discharged decreased by 14%
- PW re-injected increased by 2%
- Dispersed oil in PW discharged decreased by 8%
- Naturally Occurring Radioactive Material (NORM) in PW discharged decreased by 14%

Chemicals:

- Chemicals discharged decreased by 7%
- Increase of 28% in chemicals discharged that are flagged for substitution (SUB)
- 69% of chemicals discharged were classed as posing little or no risk (PLONOR)

Drill Cuttings:

- Decrease of 19% in drill cuttings discharged

Waste:

- Total waste decreased by 1%

2.2 Unintentional oil and chemical releases

- Number of PON1's reported increased by 46%
- Overall volume of reported oil and chemicals released decreased by 78%

3 Permitted discharges and emissions

The Offshore Petroleum Regulator for Environment and Decommissioning (OPRED), under the Department for Energy Security and Net Zero (DESNZ), oversees offshore emissions and discharges for the UKCS. Operators must obtain permits for air emissions and sea discharges, reporting them through the Environmental Emissions Monitoring System (EEMS). Monitored emissions and discharges include produced water, chemicals, drill cuttings, greenhouse gases, flared and vented natural gas, and waste from upstream oil and gas operations.

3.1 Greenhouse gas emissions

Greenhouse gas emissions from the offshore oil and gas sector are primarily driven by the power requirements of off-grid infrastructure. Installations generate their own power, often by using the hydrocarbons they produce to fuel turbines, or with fuel oils brought in by vessel from shore. The combustion of these fuels releases carbon dioxide as well as a proportion of unburned hydrocarbons in the exhaust, the most prevalent of which is methane.

Many installations also vent or flare natural gas for production and safety reasons, again releasing atmospheric carbon dioxide and methane.

In addition to these main sources, there are also emissions related to other processing equipment onboard from associated activities such as construction and intervention activities, support vessel movements, and personnel transfer by helicopter.

This section describes the actual performance of the sector in 2024. Operators also provide forecasts of their expected future emissions performance. This future pathway of emissions reductions, 2030 and 2050 targets, will be explored in further emission forecasts to be published by OEUK later in 2025.

3.1.1 Overall NSTD sector GHG emissions

The North Sea Transition Deal (NSTD) is a strategic initiative between the oil and gas industry and government to manage the transition of the North Sea sector toward a low-carbon future in line with the UK's climate change goals. It recognises the crucial role the sector has in maintaining the UK's energy security through to net zero 2050. The NSTD supports decarbonisation using the skills and technology gained from the past 50 years of oil and gas production, with set goals for emissions reduction.

Total greenhouse gas emissions for the sector in 2024 were 12.4 million tonnes of CO_2e (carbon dioxide equivalent), down 6% year on year and over 34% lower than in the baseline year of 2018. The NSTD emissions goals include a commitment from industry to reduce total emissions by 10% by 2025, 25% by 2027, and 50% by 2030, relative to the 2018 baseline, and subject to progress on shared actions.

Figure 1 below shows that the industry is ahead of its interim 2027 target and demonstrating its ability to keep progressing and hitting challenging targets, having reduced emissions by 34%. The majority of the GHG emissions are from the offshore installations themselves, with 9.8 million tonnes of CO_2e out of a total 12.4 million tonnes.

Figure 1: Total NSTD emissions by industry source

3.1.2 Installation emissions

Figure 2 shows the sources of emissions from the offshore installations. Emissions fell in 2024, down 5% compared to 2023, and 34% against the 2018 baseline year. The reduction curve remains shallow, albeit ahead of targets. The reduction between 2019 and 2020 was around 10%, followed by a 15% reduction in 2021. Reductions have remained steady at around 5% a year since then.

Power generation remains the major source of installation emissions, making up almost 79% of the total at 7.7 million tonnes of CO_2e. Flaring and venting caused 16% and 4% respectively, the source of 2 million tonnes of CO_2e.

Figure 2: Total installation emissions by source

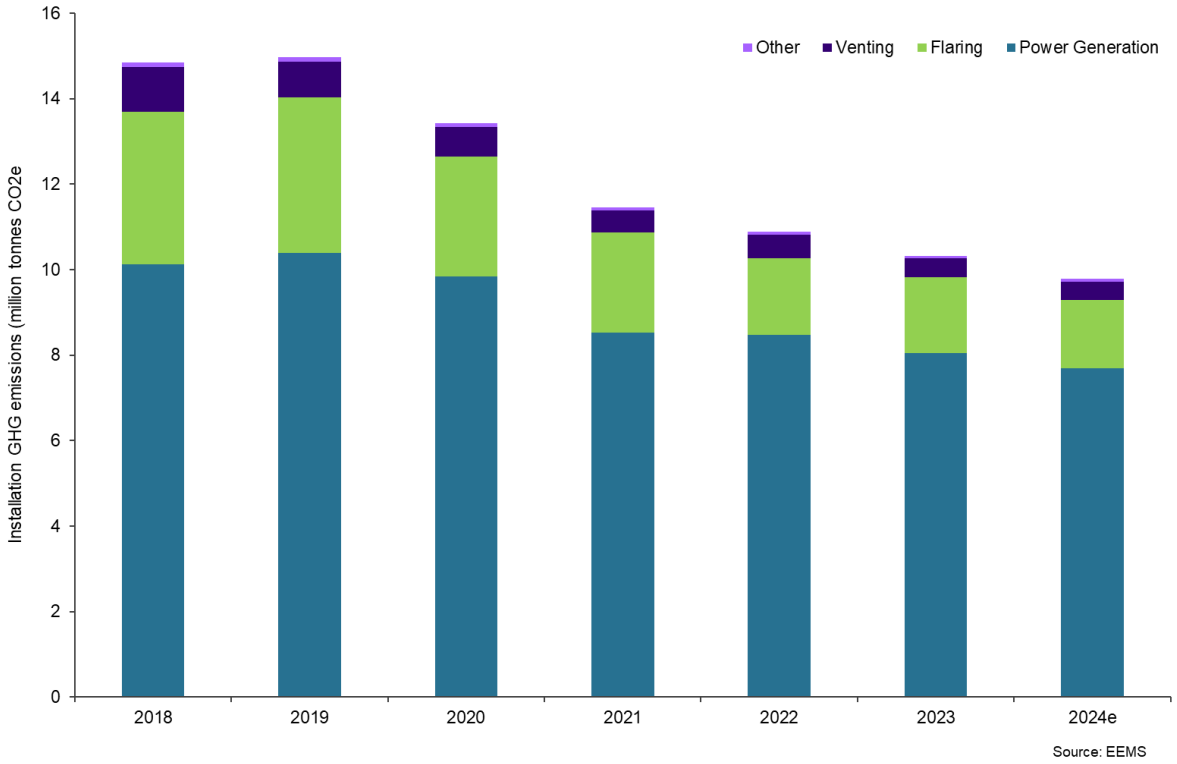
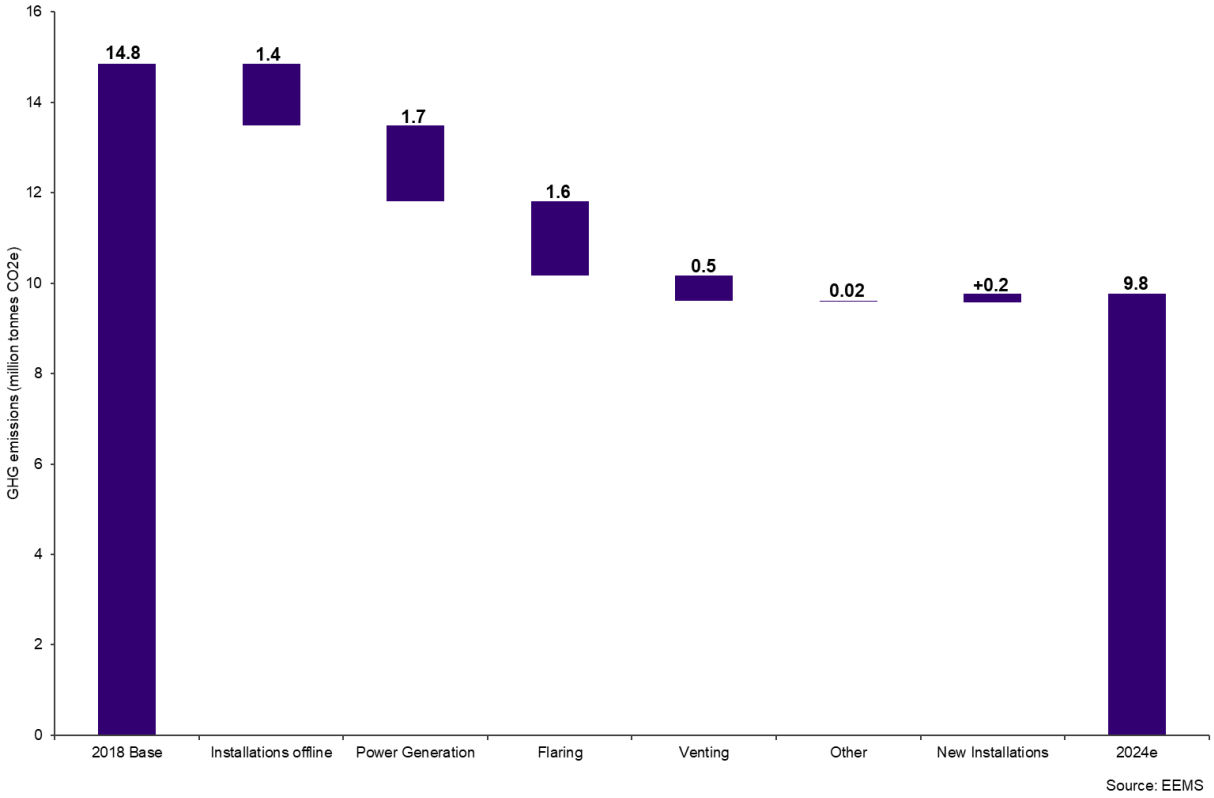


Figure 3 shows the reduction in installation emissions since the baseline year, where data has been analysed to attribute reductions to source category, including accounting for installations that have reached end-of-life.

Improvements in power efficiency and management are delivering reductions in this largest source of emissions, with a reduction against the 2018 baseline of 1.7 million tonnes of CO_2e. Reduced venting and flaring have also delivered a significant reduction, totalling 2.1 million tonnes of CO_2e taken together.

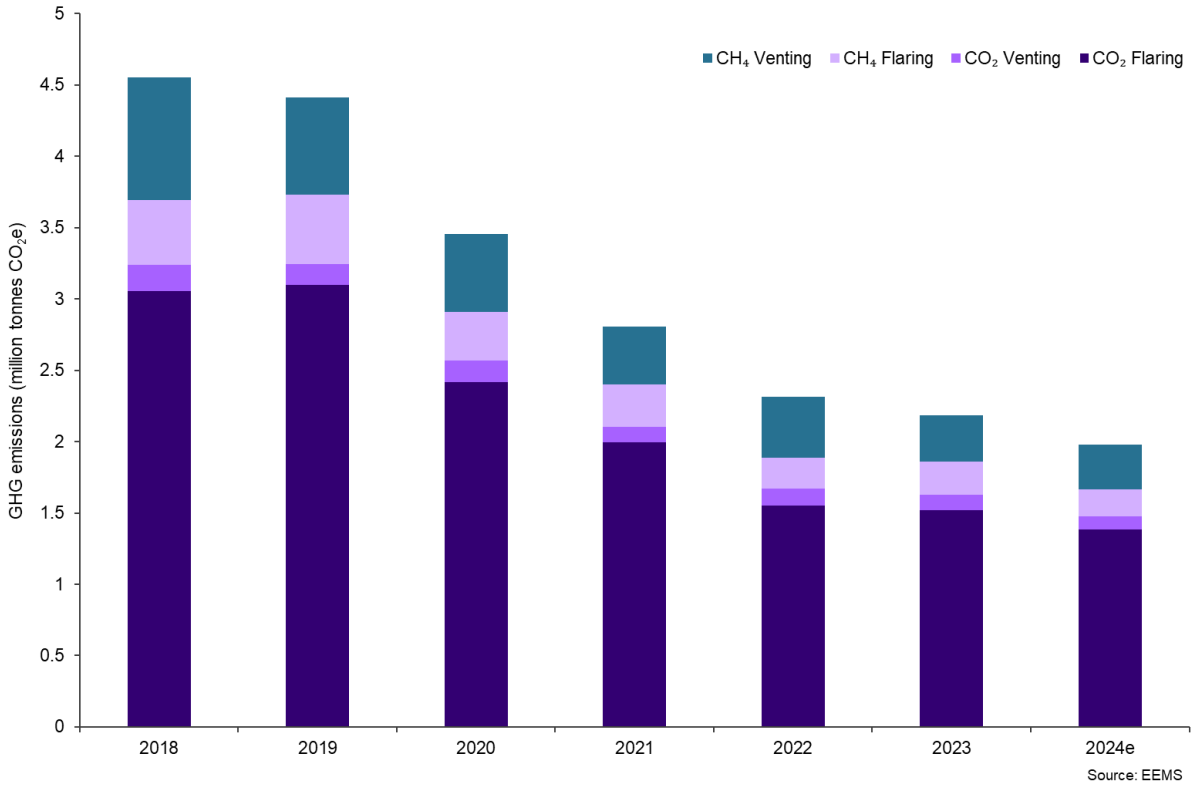
Figure 3: Installation emissions reduction by source



3.1.3 Flaring and venting

Significant reductions in venting and flaring have been achieved since 2018, with the total GHG associated with these practices reducing by more than half. Flaring has been reduced by 55% and venting by 61%. Venting of gas causes primarily methane to be released to the atmosphere, while flaring, which involves combusting gases as they are released, produces mostly CO_2.

Figure 4: Installation flaring and venting emissions



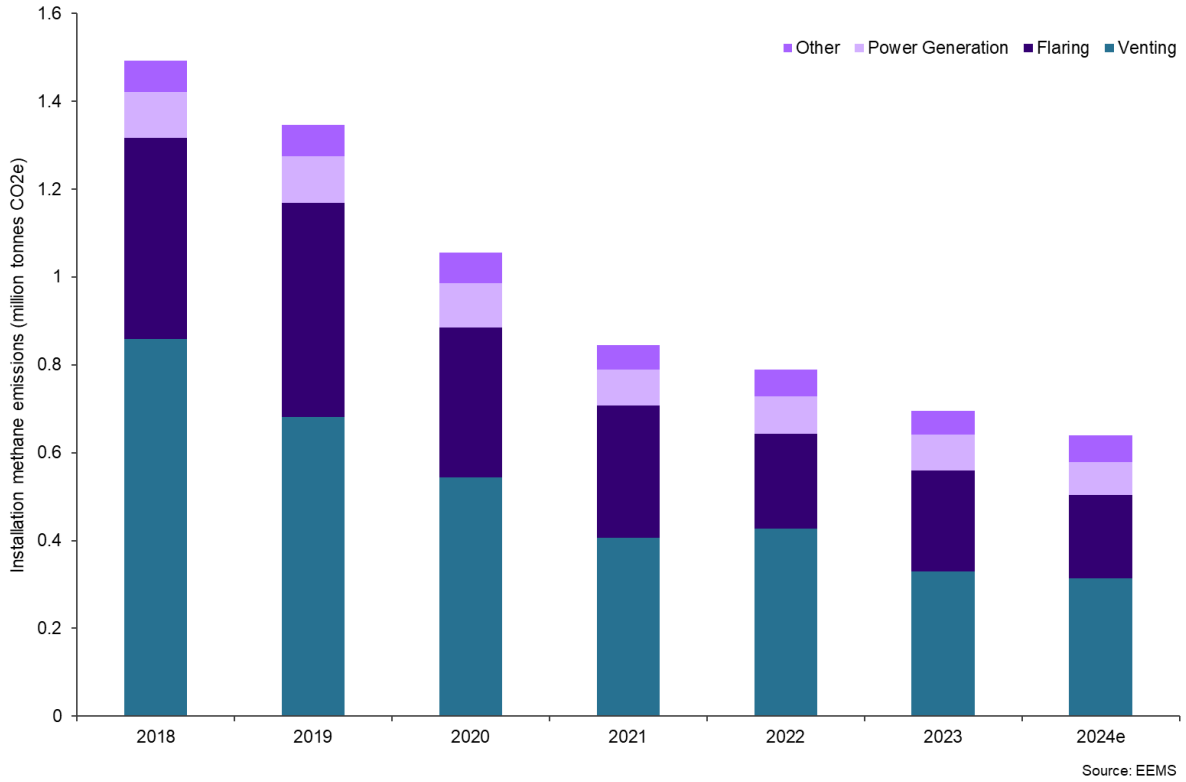
3.1.4 Methane emissions

The industry has separate targets for methane emissions because of the short-term importance of methane when it comes to climate change. With its shorter atmospheric life, reductions in methane emissions will have an impact on reducing GHGs present in the Earth's atmosphere much sooner than equivalent reductions in CO2.

Overall, methane emissions from offshore installations have been reduced by more than half, down 57% since 2018, and delivering a reduction of 0.85 million tonnes of CO2e. The original target for methane reductions was 50% by 2030, but industry is pushing on to deliver greater reductions.

Although there are small amounts of methane emissions associated with the combustion of fuel in equipment, the single largest source of methane is from the venting of natural gas. Methane emissions from venting have reduced substantially since the NSTD was agreed, down by nearly two-thirds (64%) to 0.3 million tonnes of CO2e.

Figure 5: Installation methane emissions by source



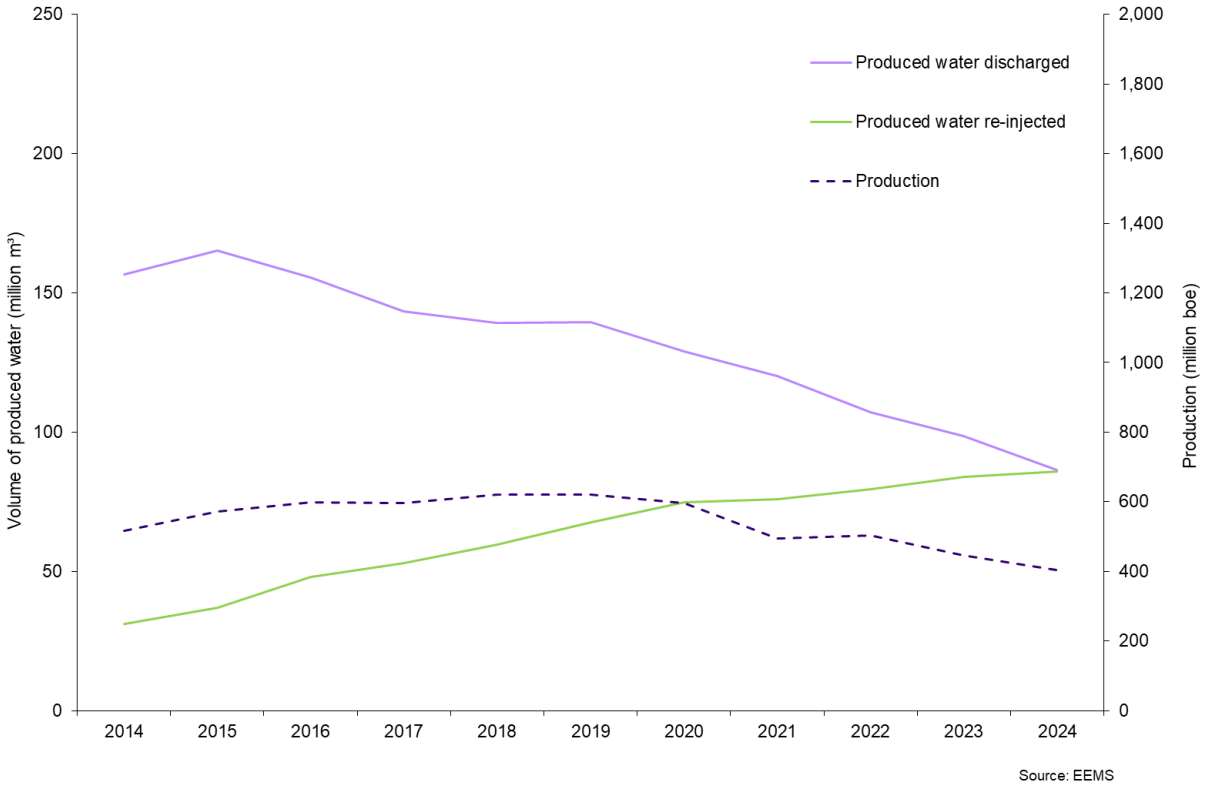
3.2 Produced water

When oil and gas are produced, water from the hydrocarbon reservoir is also brought to the surface, containing dispersed oil, dissolved organic compounds, NORM and production chemicals. The composition of this produced water is influenced by reservoir geology and the production stage. It is separated from hydrocarbons and either re-injected into the reservoir or treated and discharged to sea. A permit issued by OPRED is required for both discharge and reinjection.

3.2.1 Produced water volumes

The total amount of produced water discharged in the UKCS has generally declined since 2014, reflecting production trends. In 2024, 86 million m³ were discharged to sea, a 14% decrease from 99 million m³ in the previous year (*see Figure 6*). Meanwhile, the volume of re-injected produced water increased by 2%, from 83 million m³ to 85 million m³ and is considered a more environmentally friendly disposal method.

Figure 6: Total produced water discharged to sea and re-injected versus production



3.2.2 Dispersed oil in produced water

In 2024, approximately 1,500 tonnes of dispersed oil was discharged to sea with produced water, an 8% decrease from 1,600 tonnes in 2023 (*see Figure 7*). OSPAR recommendations limit the dispersed oil in water concentration to 30 milligrammes per litre (mg/l). In 2024, the industry average was 17 mg/l, slightly up from 16 mg/l in 2023. At such low concentrations, it is quickly broken down by naturally occurring bacteria.

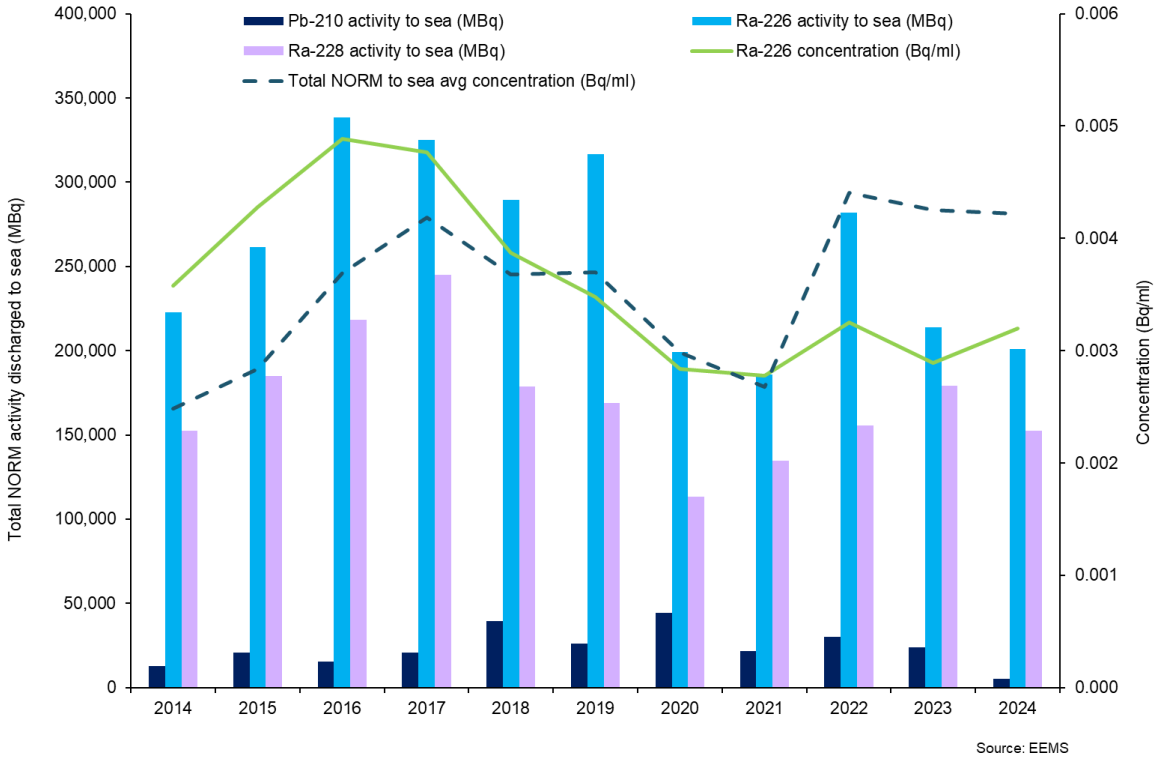
Figure 7: Dispersed oil discharged to sea with produced water

3.2.3 NORM in produced water

Naturally Occurring Radioactive Material (NORM) refers to radioactive substances that naturally exist in the earth's crust and are brought to the surface during the extraction of oil and gas, including isotopes such as radium-226, radium-228, and their decay products, which can become concentrated in produced water. Operators are required to notify the regulating environmental agency if Ra-226 concentrations exceed 0.1 Becquerels (Bq)/ml.

Figure 8 shows the activity and concentration of NORM discharged to sea by isotope. There was a 14% decrease in the total NORM activity (Pb-210, Ra-226, Ra-228) discharged to sea compared with 2023, and the average concentration of Ra-226 remained below the 0.1 Bq/ml limit.

Figure 8: NORM discharged in produced water



3.3 Chemicals

The offshore oil and gas industry uses chemicals for hydrocarbon exploration and production, ensuring minimal use to avoid waste and maintain environmental responsibility. All discharges must be permitted by OPRED, and operators must regularly review chemical volumes and types. Chemicals must be registered with the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) Offshore Chemical Notification Scheme (OCNS), which follows the Oslo/Paris Convention for the protection of the marine environment of the Northeast Atlantic (OSPAR) Harmonised Mandatory Control Scheme (HMCS). This scheme categorises chemicals as PLONOR or requiring substitution if less harmful alternatives are available. The UK reports chemical discharges based on a worst-case scenario.

Year-on-year variations in the discharge of offshore chemicals and drill cuttings in the UKCS are influenced by changes in drilling activity, operational practices, environmental regulations, and field-specific characteristics. Factors such as the number and type of wells drilled, advancements in technology, and stricter permit conditions can all contribute to these fluctuations.

3.3.1 Mass of chemicals discharged

Figure 9 indicates that slightly over 72,000 tonnes of chemicals were discharged to the sea in 2024, a decrease of 7% from the previous year.

Figure 9: Total discharged chemicals

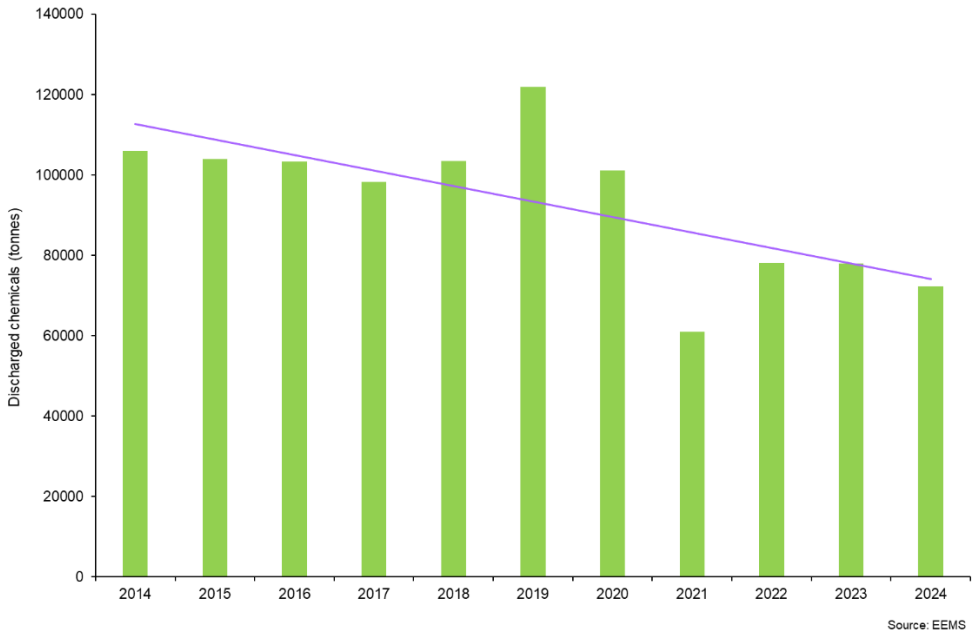
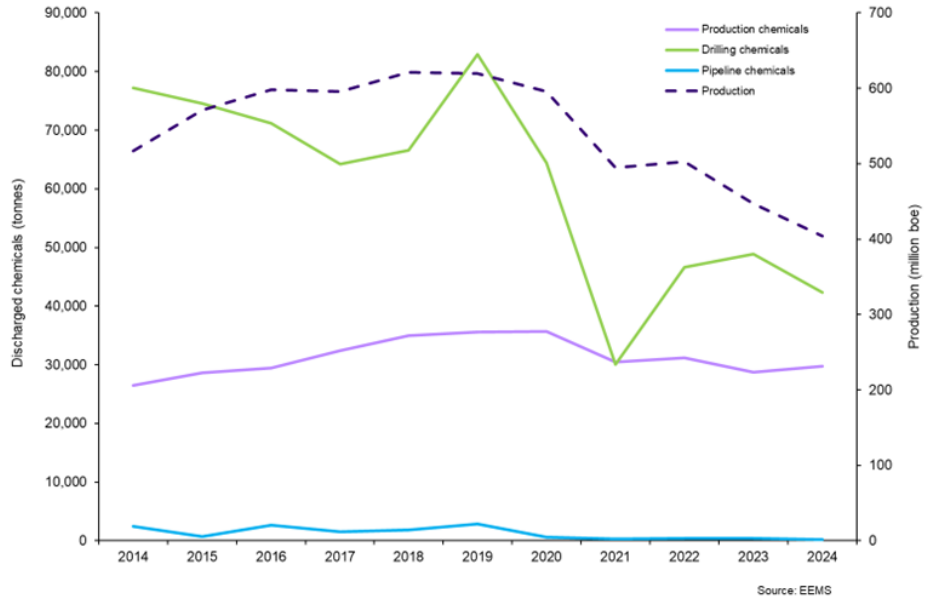


Figure 10 illustrates the quantity of chemicals discharged to the sea by operation in relation to overall production. In 2024, drilling chemical discharges to the sea decreased by 13% to approximately 42,000 tonnes. Production chemical discharges rose slightly by 3% to around 30,000 tonnes, and pipeline maintenance chemicals decreased to around 200 tonnes from 400 tonnes the previous year.

Figure 10: Total chemicals discharged by operation type



3.3.2 Composition of chemicals discharged

Last year, 69% of chemicals discharged to the sea from offshore oil and gas operations were classified as PLONOR, while 14% were SUB chemicals. The discharge of SUB chemicals increased by 28% in 2023. Figure 11 illustrates the total volume of chemicals discharged by classification type and Figure 12 shows the classification type for production and drilling chemicals.

Figure 11: Total chemicals discharged by classification type

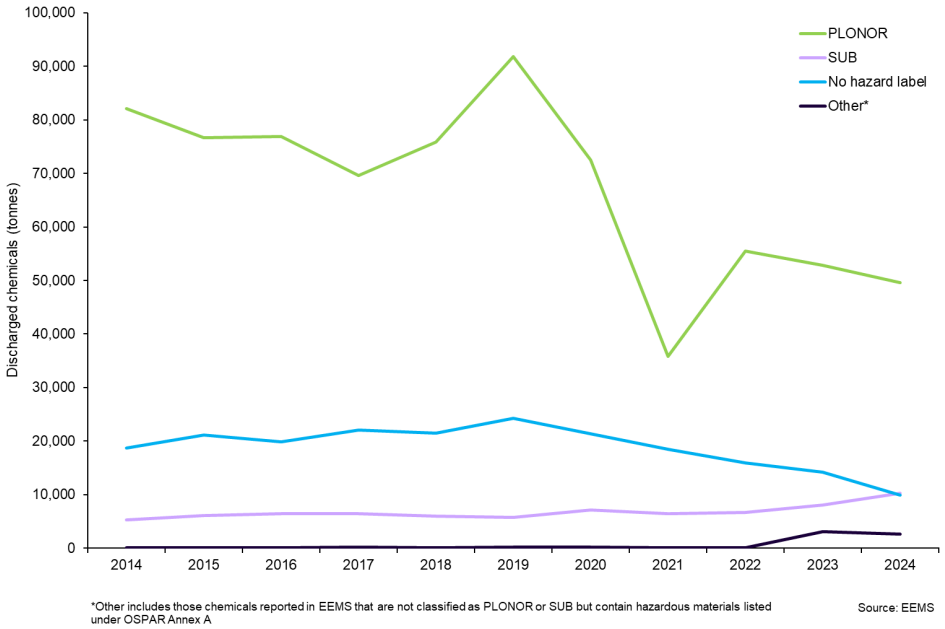
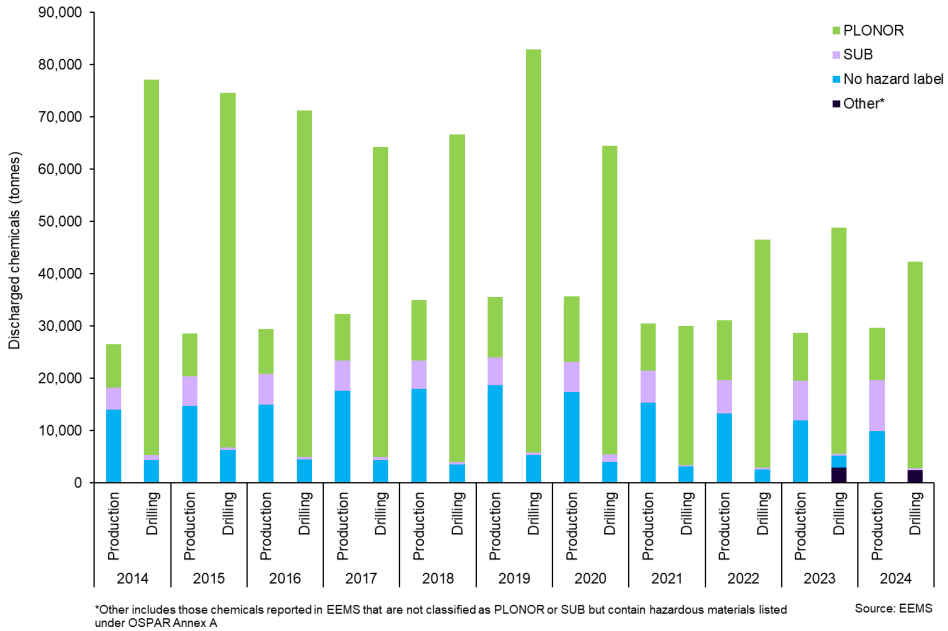


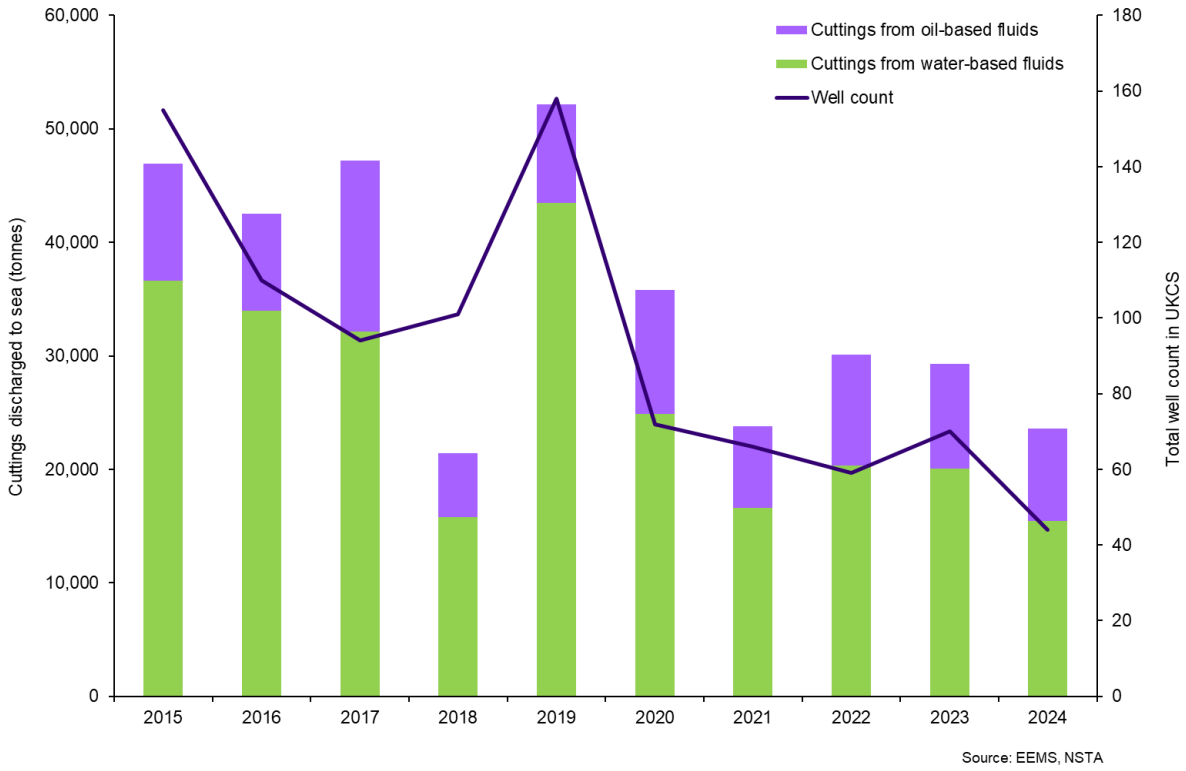
Figure 12: Total chemicals discharged by operation and classification type



3.4 Drill cuttings

Drill cuttings are rock fragments from well drilling, mixed with either water-based or oil-based drilling fluids. Water-based cuttings, posing lower environmental hazards, are generally permitted by the regulator for sea discharge. Oil-based cuttings can be discharged only if the oil content is reduced to below 1% of the total mass. As illustrated in Figure 13, the volume of discharged cuttings decreased in 2024.

Figure 13: Total drill cuttings discharged to sea in relation to well count



Note: corrections were made to the oil-based cuttings data for 2022 and 2023, resulting in lower discharge figures than previously reported.

3.5 Waste

Oil and gas production generates various types of waste, both solid and liquid, hazardous and non-hazardous, which must be properly managed. Modern disposal methods, such as engineered landfill, incineration, and oil recovery, enhance environmental performance, and as landfill is costly and unsustainable in the long term, the sorting of waste to maximise reuse and recycling is preferred.

Total waste fell by just under 1% last year to 101,700 tonnes compared with just over 102,000 tonnes in 2023. The overall percentage of waste being reused or recycled was 52% and the amount of waste being disposed of by other routes, including landfill, was 48% (*see Figures 14 and 15*).

Figure 14: Waste streams generated by offshore activities

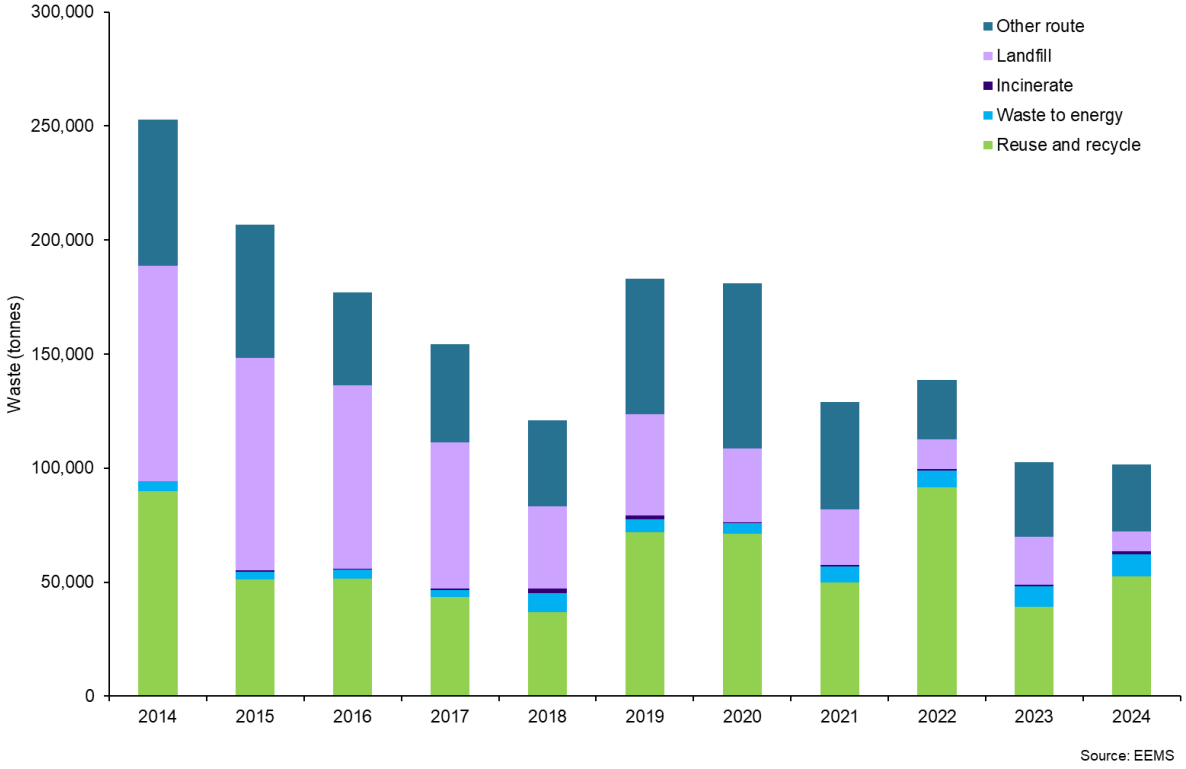


Figure 15: Comparison of percentage of waste routes by year

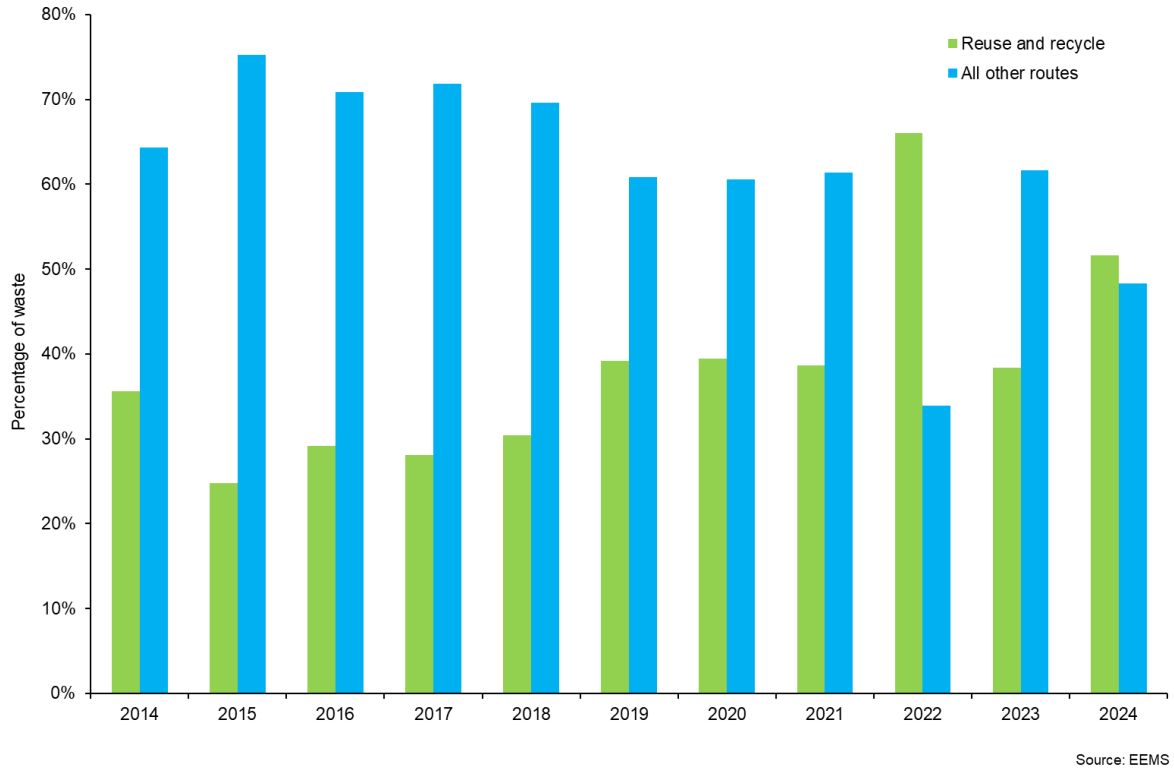


Figure 16 shows the amount of waste generated by operation type and Figure 17 breaks down the types of waste generated by all offshore activity in 2024.

While waste from operational and drilling activities has generally declined, decommissioning waste rose in 2024 due to increased activity levels, the majority of which was generated by scrap steel.

Figure 16: Waste generated by offshore activity type

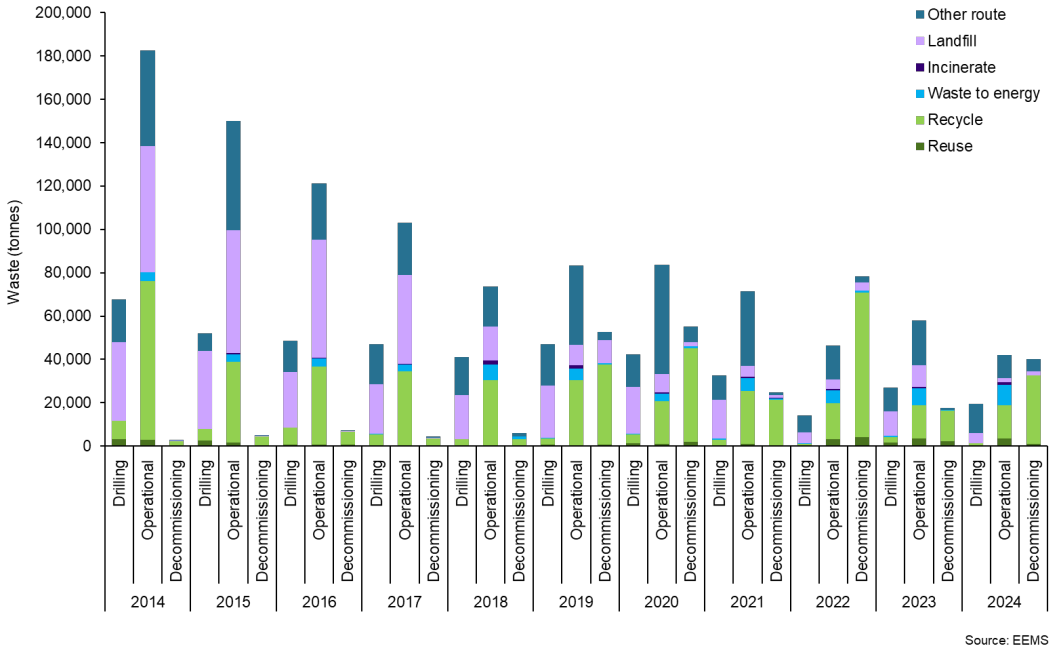
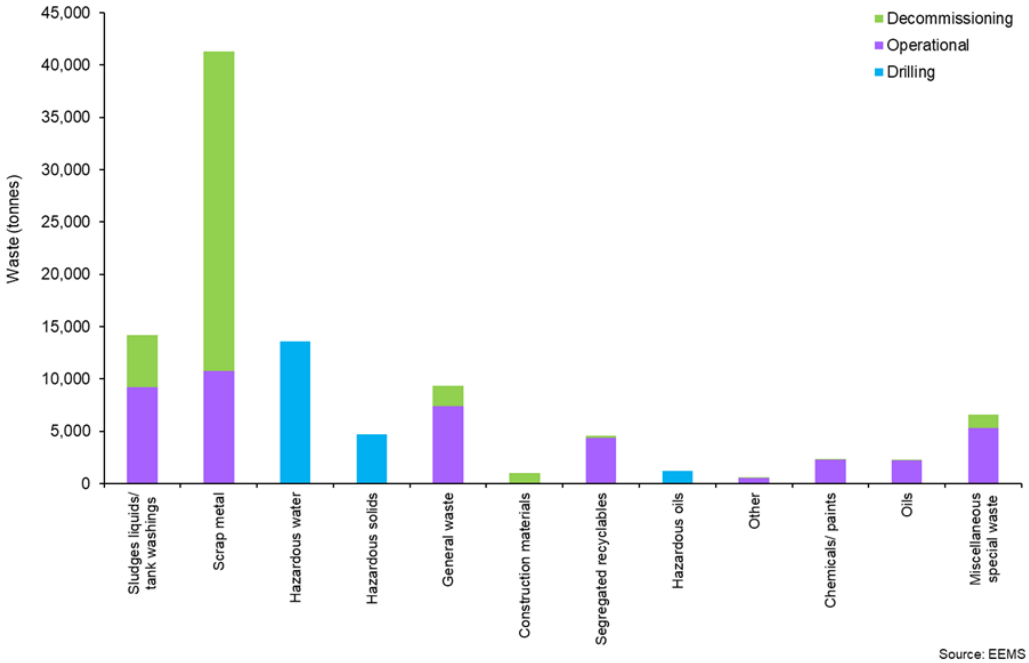


Figure 17: Types of waste generated by offshore activity 2024

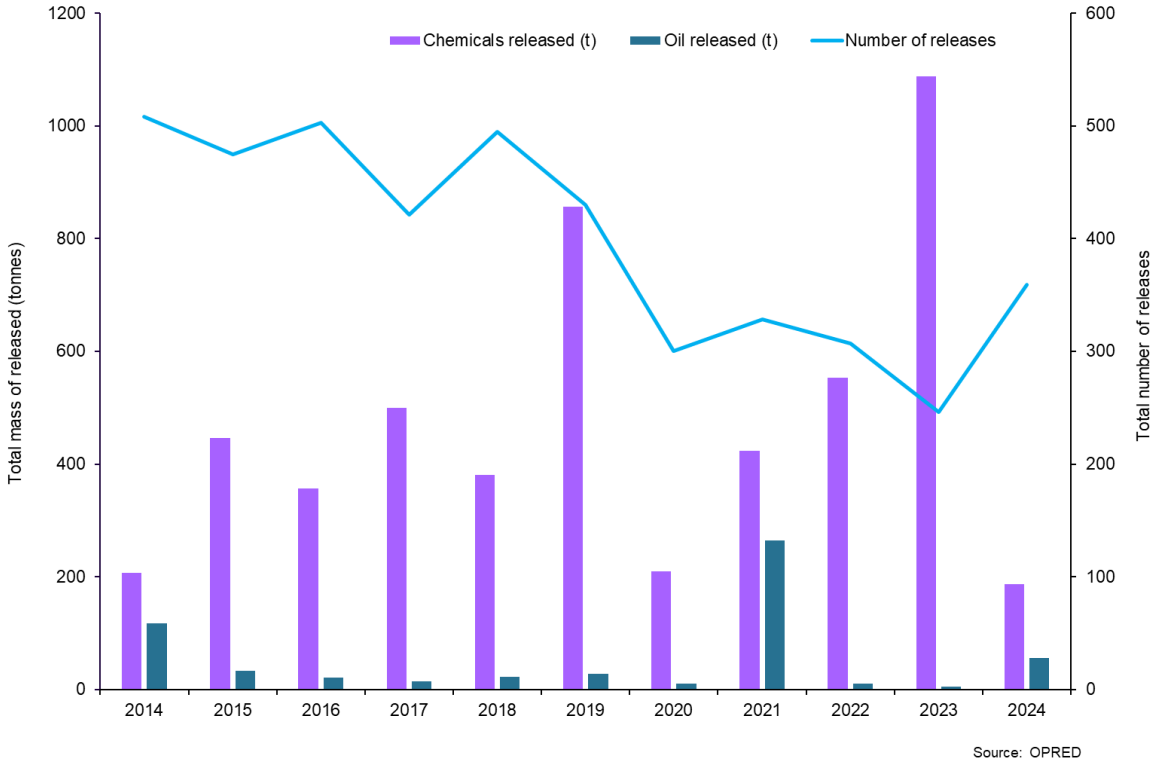


4 Unintentional releases

Unintentional oil and chemical releases are minimised through effective management of equipment, processes, and personnel. However, releases to the marine environment still occur, and they must be reported to OPRED via a Petroleum Operations Notice 1 (PON1), regardless of size. Each offshore installation has an OPRED-approved oil pollution emergency plan (OPEP) to address incidents, considering factors like oil type, well-flow rates, environmental sensitivities, and potential shoreline impact.

As shown in Figure 18, although the number of PON1s submitted has generally fallen since 2014, the total mass of chemicals and oil unintentionally released to the marine environment has continued to vary over the last ten years[1]. The mass reported on a PON1 can vary significantly due to the unpredictable nature of unintentional releases. These variations are influenced by several factors, including the type and quantity of the substance released, the specific circumstances of the release, and the response measures taken. 2024 saw an uptick in the number of unintentional releases reported; however, the volume released was significantly lower than the previous year. The 2023 Environmental Report (published in 2024) initially recorded 73 tonnes of chemical releases. Since then, the closure of several PON1s has revised this figure upward to 1,087 tonnes — an increase of over 1,000 tonnes. The majority of this increase is attributed to the release of Monoethylene Glycol, a chemical classified as PLONOR.

Figure 18: Unintentional oil and chemical releases by mass and number



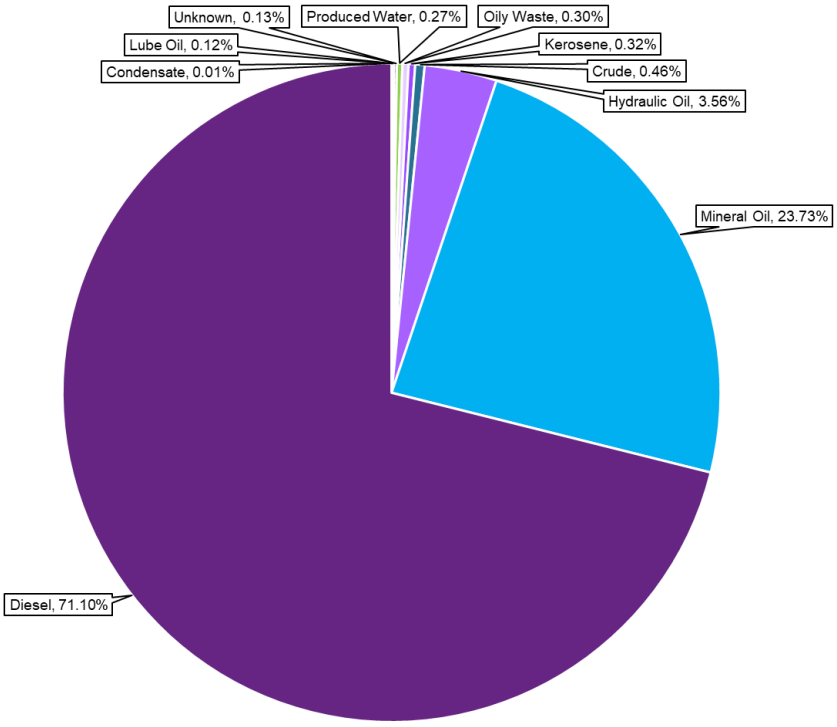
[1] Analysis is based on PON1 data provided by OPRED. Further analysis has been carried out to categorise PON1 data by product type released and by hazard category. Please note the data includes a number of releases that are currently under review by the regulator, in which case the volumes are not available and therefore will be subject to change year on year.

4.1 Unintentional oil releases

In 2024, the mass of unintentional oil releases to the marine environment was 56 tonnes. To put this into context, in the same year, about 1,500 tonnes of oil were discharged to sea in produced water, under permit. This means that unintentional oil releases represented approximately 4% of the total oil that entered the sea. Figure 19 shows that diesel accounted for the largest percentage of oil unintentionally released in 2024 at 71%, followed by mineral oil (24%) and hydraulic oil (3.5%).

Determining the oil product type is key to effective spill response, as it will affect the way in which it will behave in the marine environment under a variety of conditions. Diesel and light oils quickly break up and evaporate due to wind and waves, while heavier hydrocarbons require monitored clean-up operations as outlined in the installation's OPEP. Clean-up methods may include natural degradation by bacteria, mechanical recovery, and the use of dispersants. If these are not feasible, operators may protect sensitive shorelines and recover any oil that reaches the shore.

Figure 19: Percentage of unintentional oil releases by product type 2024



Source: OPRED

4.2 Unintentional chemical releases

Most offshore chemicals are diluted, so reporting releases by mass often overstates the quantities of potentially harmful substances. Frequently, the largest component of these unintentional releases is the water used as a solvent. In 2024, 187 tonnes of chemicals were unintentionally released in the UKCS.

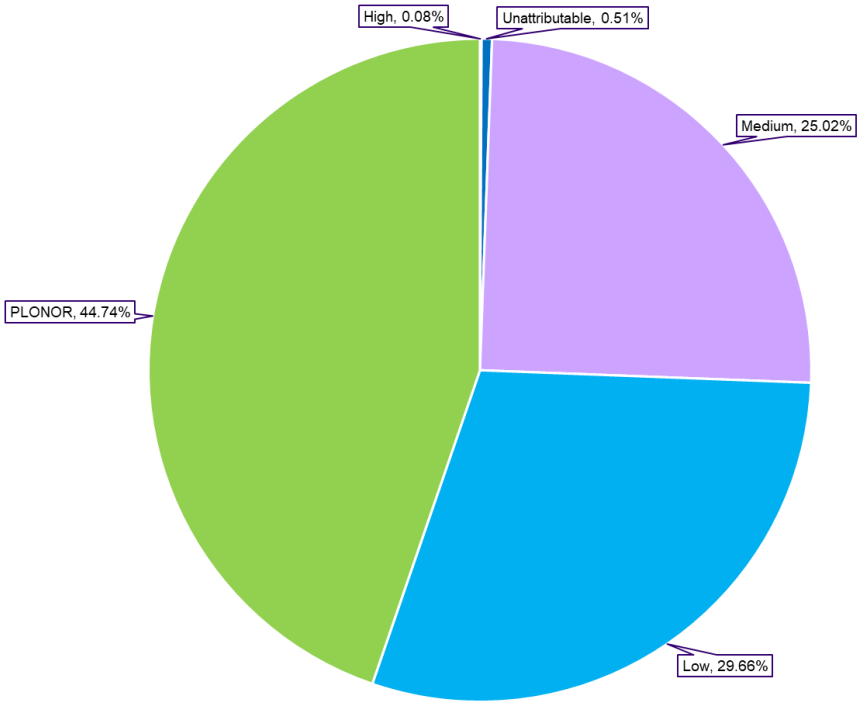
The CEFAS OCNS data 5 was used to produce the classifications detailed below in Table 1.

Table 1: Hazard ranking used to categorise unintentional chemical releases

Hazard Ranking	Components
PLONOR	All those products for which PON1s were submitted that have been designated PLONOR status.
Low	OCNS groups D and E, gold and silver as the lowest ecotoxicity groupings. This excludes products that have official PLONOR rankings.
Medium	OCNS groups B and C, white and blue as medium ecotoxicity groupings.
High	OCNS group A, orange and purple as the highest ecotoxicity grouping.
Unattributable	All those products for which sufficient description is not given and therefore cannot be classed in this model.

In 2024, the majority of chemicals released to the sea had a hazard ranking of low or PLONOR, accounting for 74% of all unintentional releases. Only 0.08% of the total mass released was classified as high hazard. (*see Figure 20).*

Figure 20: Percentage of total mass of chemical releases by hazard ranking 2024



Source: OPRED, CEFAS

List of abbreviations

Abbreviations	Definitions
Bq	Becquerel
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CO_2e	Carbon dioxide equivalent
DESNZ	Department for Energy Security and Net Zero (formally BEIS)
EEMS	Environmental Emissions Monitoring System
GHG	Greenhouse gases
HMCS	Harmonised Mandatory Control Scheme
Mbq	Megabecquerel (one million becquerels)
mg/ l	Milligrammes per litre
mn boe	Million barrels of oil equivalent
NORM	Naturally occurring radioactive materials
NSTD	North Sea Transition Deal
OCNS	Offshore Chemical Notification Scheme
OPEP	Oil Pollution Emergency Plan
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OSPAR	The Oslo/Paris Convention for the protection of the marine environment of the Northeast Atlantic
PLONOR	Pose Little or No Risk – used by OSPAR to classify substances used and discharged offshore
PON1	Petroleum Operations Notice 1
PW	Produced water - water that comes to the surface with hydrocarbons during production, either naturally from the reservoir or after injection into the reservoir to displace oil and lift it to the surface
SUB	SUB chemicals are those classified under OCNS as harmful and should be phased out and substituted with a less harmful substance
UKCS	UK Continental Shelf

Working together, we are a driving force of the UK's energy security and net zero ambitions. Our innovative companies, people and communities add value to the UK economy.

Join us today and help strengthen the UK offshore energy industry and your business.

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