



ENVIRONMENTAL INSIGHT

September 2024



Offshore Energies UK

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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 2023 and over the past decade. It focuses on both permitted and unintentional discharges including produced water, oil, chemicals, and waste.

The UKCS oil and gas sector has shown a strong commitment to enhancing environmental sustainability and operational efficiency. Continued progress has been made in reducing environmental impacts, evidenced by an 9% decrease in produced water discharges and a 5% increase in re-injection efforts. Additionally, there has been a notable 15% reduction in dispersed oil within produced water discharges and the majority of discharged chemicals have been classified as either posing little or no risk (PLONOR).

While the sector saw a 26% reduction in total waste generated in 2023, as the basin matures, addressing the growing volume of decommissioning waste will become a challenge. Effective recycling and reuse of decommissioned materials are essential to minimising environmental impacts, reducing landfill use, conserving resources, and promoting sustainability.

While unintentional releases of oil and chemicals to the marine environment still occur, they are minimised through the management of equipment, processes, and personnel. The permit application process further supports environmental protection by requiring companies to assess potential impacts and propose mitigation measures. Continued focus on these areas will be vital for maintaining and improving the sector's environmental performance in the future.

2 Key insights

2.1 Permitted discharges

Produced Water (PW):

- 📉 PW discharged decreased by 9%
- 📈 PW re-injected increased by 5%
- 📉 Dispersed oil in PW discharged decreased by 15%
- 📉 NORM in PW discharged decreased by 11%

Chemicals:

- ↔️ Chemicals discharged remained stable
- 📈 Increase of 21% in chemicals discharged that are flagged for substitution (SUB)
- ➡️ Majority of chemicals discharged were classed as posing little or no risk (PLONOR) (68%)

Drill Cuttings:

- 📈 Slight increase of 2% in drill cuttings discharged

Waste:

- 📉 Total waste decreased by 26%

2.2 Unintentional oil and chemical releases

- 📉 Number of PON1's reported decreased by 19%

3 Permitted discharges

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. Note, atmospheric emissions are not covered in this report; they are detailed in OEUK’s Emissions Reduction Report which can be found on the OEUK website.

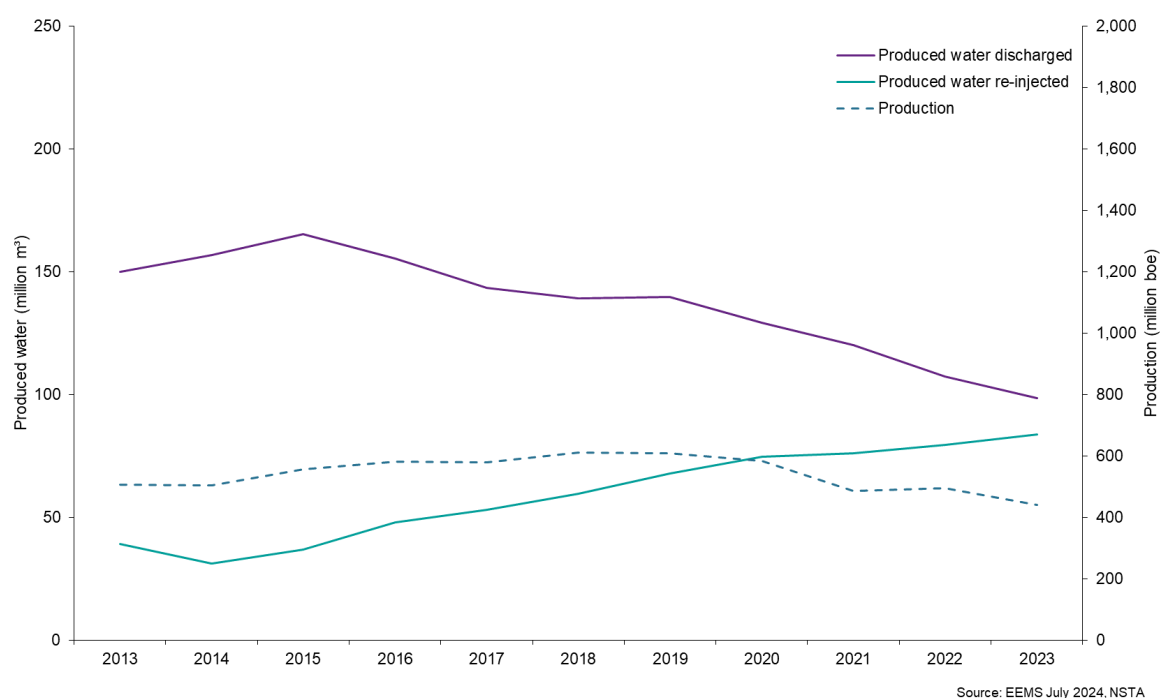
3.1 Produced water

When oil and gas are produced, water from the hydrocarbon reservoir is also brought to the surface, containing dispersed oil, dissolved organic compounds, naturally occurring radioactive matter (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.

3.1.1 Produced water volumes

The total amount of produced water discharged in the UKCS has generally declined since 2013, reflecting production trends. In 2023, 99 million m³ were discharged to sea, a 9% decrease from 107 million m³ in the previous year (see Figure 1). Meanwhile, the volume of re-injected produced water increased by 5%, from 79 million m³ to 83 million m³ and is considered as a more environmentally friendly disposal method.

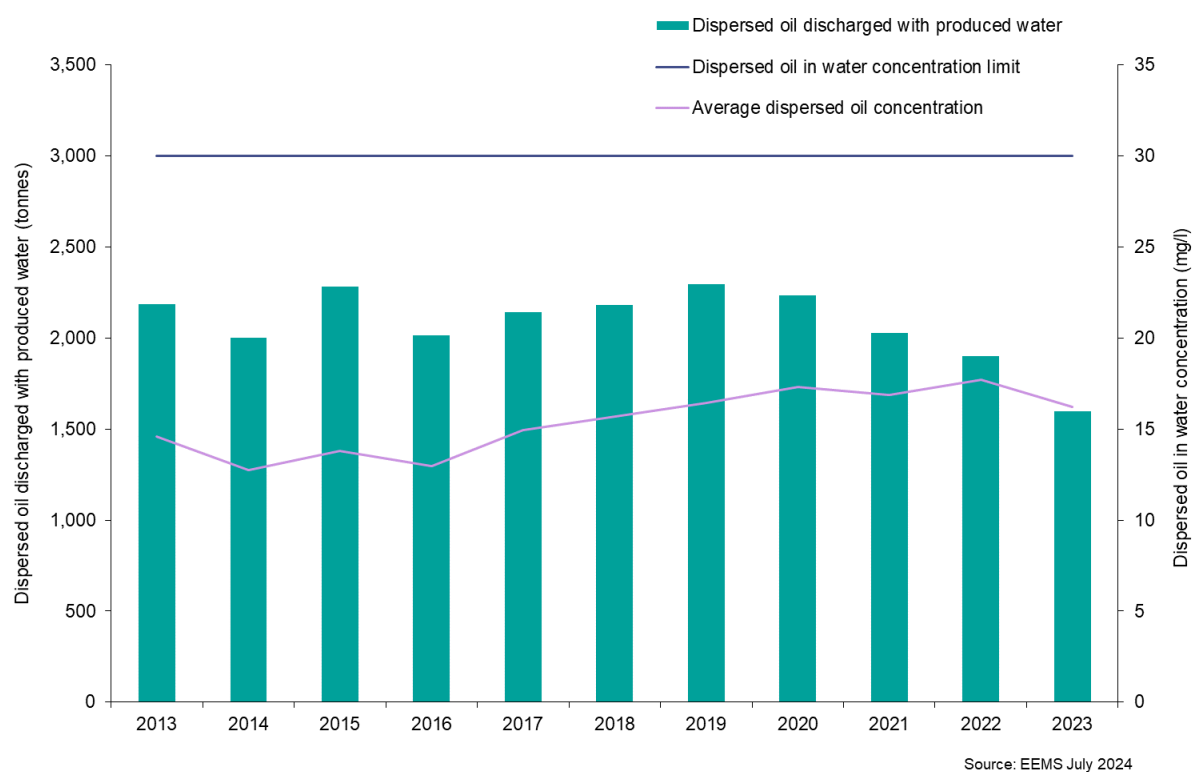
Figure 1: Total produced water discharged to sea and re-injected versus production



3.1.2 Dispersed oil in produced water

In 2023, approximately 1,600 tonnes of dispersed oil was discharged to sea with produced water, a 15% decrease from 1,900 tonnes in 2022 (see Figure 2). OSPAR recommendations limit the dispersed oil in water concentration to 30 milligrammes per litre (mg/l). In 2023, the industry average was 16 mg/l, down from 18 mg/l. At such low concentrations, it is quickly broken down by naturally occurring bacteria.

Figure 2: Dispersed oil discharged to sea with produced water

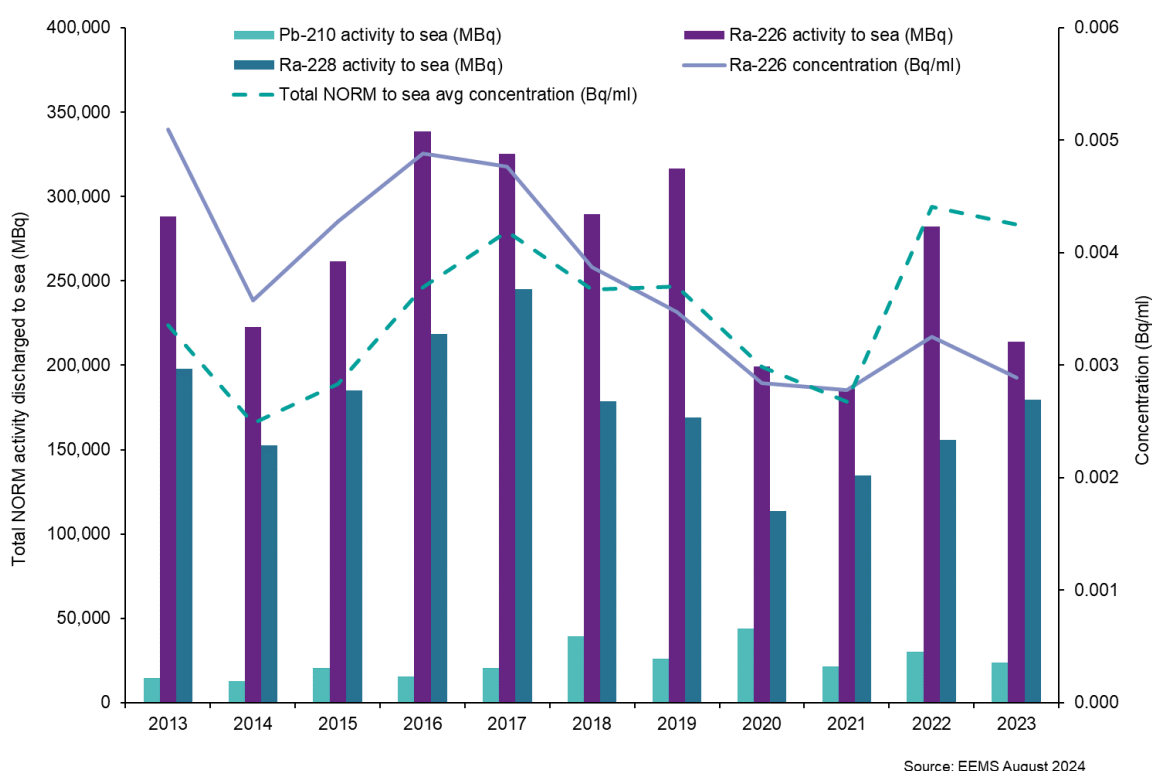


3.1.3 NORM in produced water

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 3 shows the activity and concentration of NORM discharged to sea by isotope. There was an 11% decrease in the total NORM activity (Pb-210, Ra-226, Ra-228) discharged to sea compared with 2022 and the average concentration of Ra-226 remained below the 0.1 Bq/ml limit.

Figure 3: NORM discharged in produced water



3.2 Chemicals

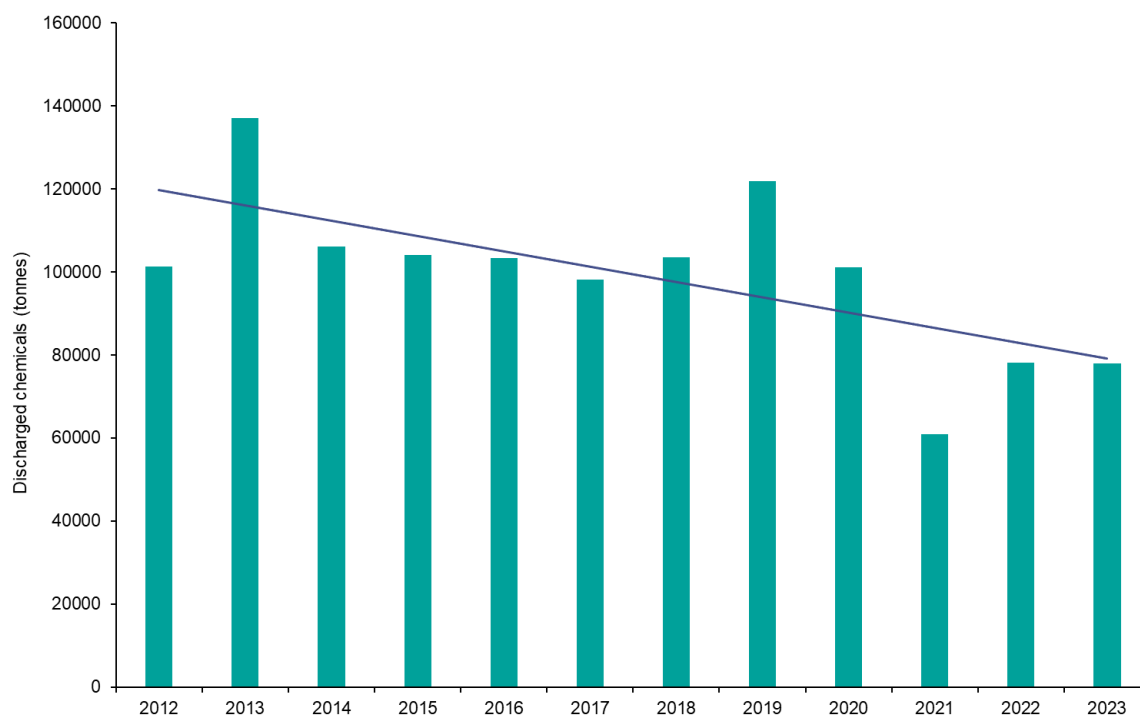
The offshore oil and gas industry uses chemicals for hydrocarbon exploration and production, ensuring minimal use to avoid waste and maintain environmental responsibility. All discharges must be permitted by OPRED, and operators must regularly review chemical volumes and types. Chemicals must be registered 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.

3.2.1 Mass of chemicals discharged

Figure 4 indicates that slightly over 78,000 tonnes of chemicals were discharged to the sea in 2023, remaining unchanged from the previous year.

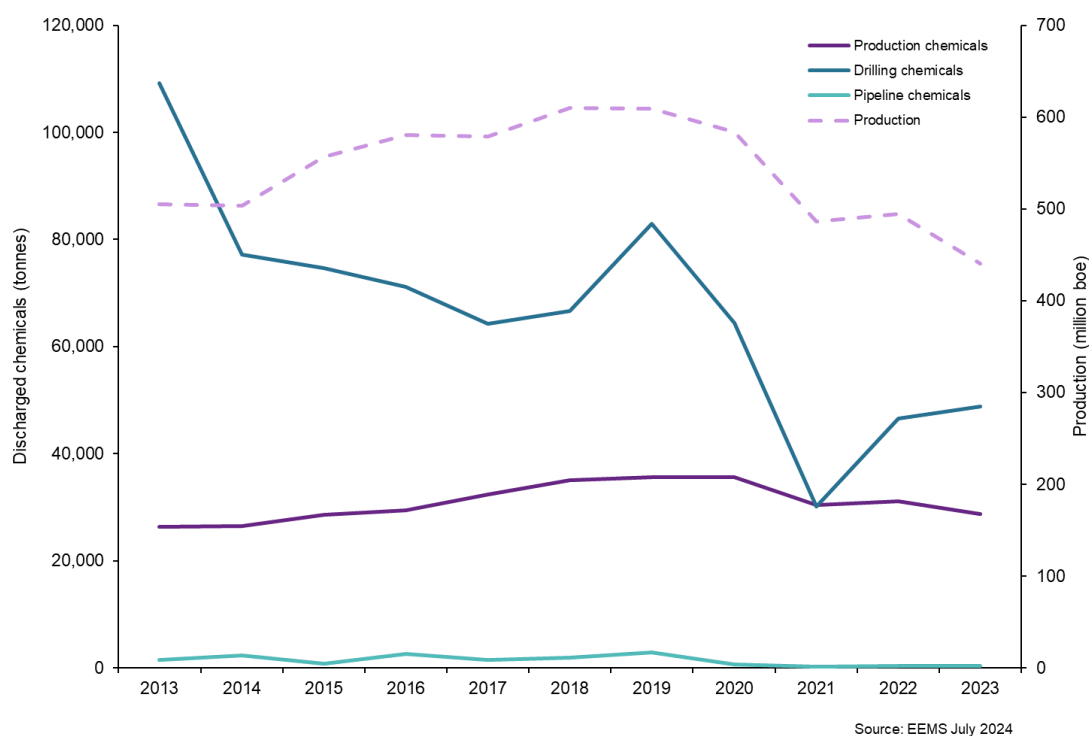
Figure 4: Total discharged chemicals



Source: EEMS July 2024

Figure 5 illustrates the quantity of chemicals discharged to the sea by operation in relation to overall production. In 2023, drilling chemical discharges to the sea rose by 5% to approximately 49,000 tonnes, though still lower than previous years. Production chemical discharges dropped by 8% to around 29,000 tonnes and pipeline maintenance chemicals remained steady at around 400 tonnes, accounting for 0.5% of the total.

Figure 5: Total chemicals discharged by operation type



3.2.2 Composition of chemicals discharged

Last year, 68% of chemicals discharged to the sea from offshore oil and gas operations were classified as PLONOR, while 10% were SUB chemicals. The discharge of SUB chemicals increased by 21% from 2022. Figure 6 illustrates the total volume of chemicals discharged by classification type and Figure 7 shows the classification type for production and drilling chemicals.

Figure 6: Total chemicals discharged by classification type

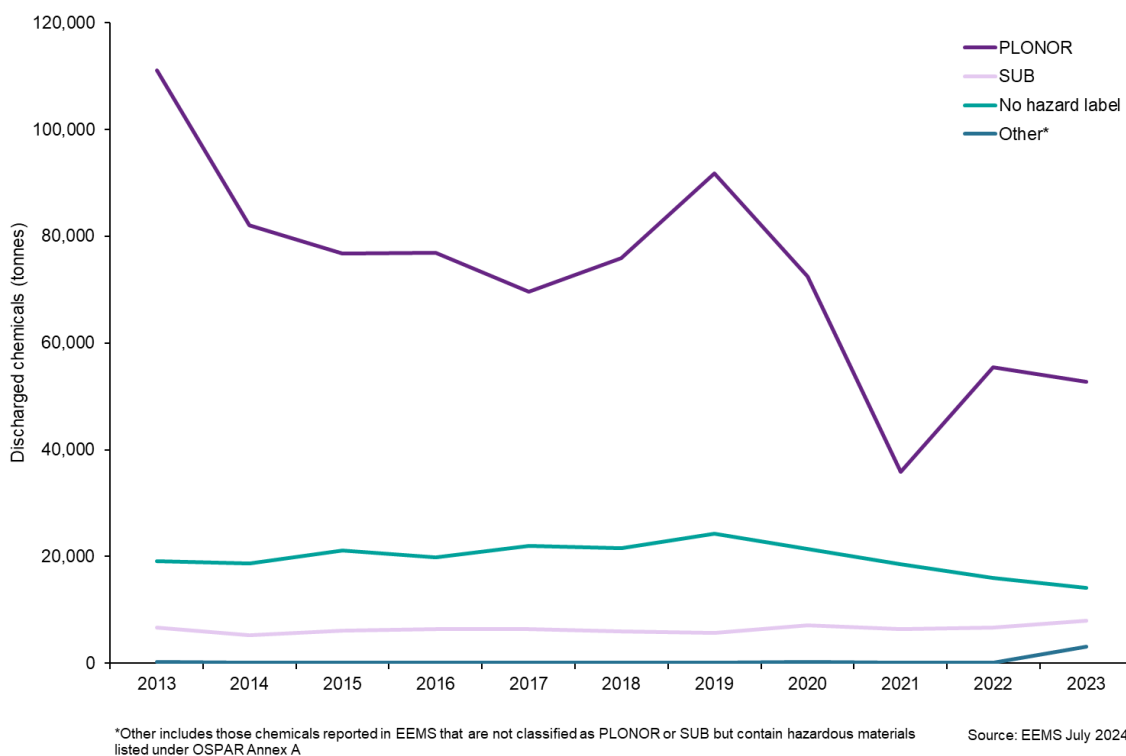
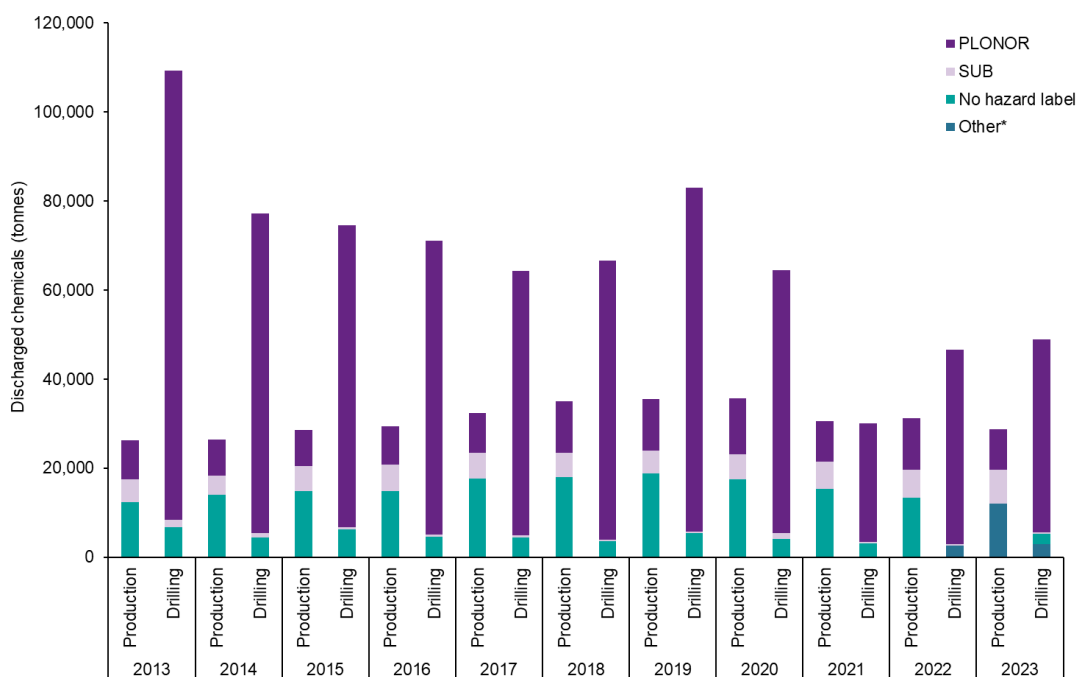


Figure 7: Total chemicals discharged by operation and classification type



*Other includes those chemicals reported in EEMS that are not classified as PLONOR or SUB but contain hazardous materials listed under OSPAR Annex A

Source: EEMS July 2024

3.3 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. In 2022 and 2023, there was an increase in the discharge of oil-based cuttings, as shown in Figure 8. This can be attributed in part to a decrease in cuttings being shipped ashore as waste, instead being cleaned and discharged.

Figure 8: Total drill cuttings discharged to sea in relation to well count



3.4 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 in order to maximise reuse and recycling is preferred.

Total waste fell by 26% last year to 102,000 tonnes compared with 139,000 tonnes in 2022. The overall percentage of waste being reused or recycled was 38% and the amount of waste being disposed of by other routes, including landfill, was 62% (see Figures 9 and 10).

Figure 9: Waste streams generated by offshore activities

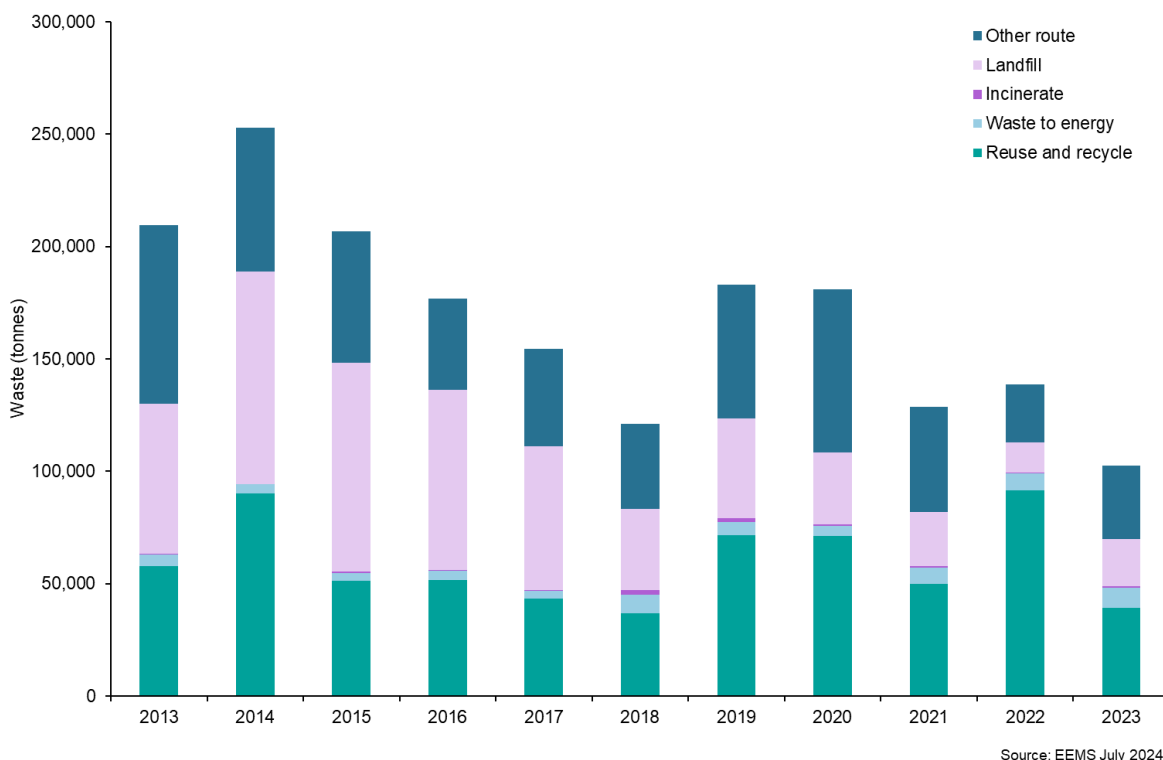


Figure 10: Comparison of percentage of waste routes by year

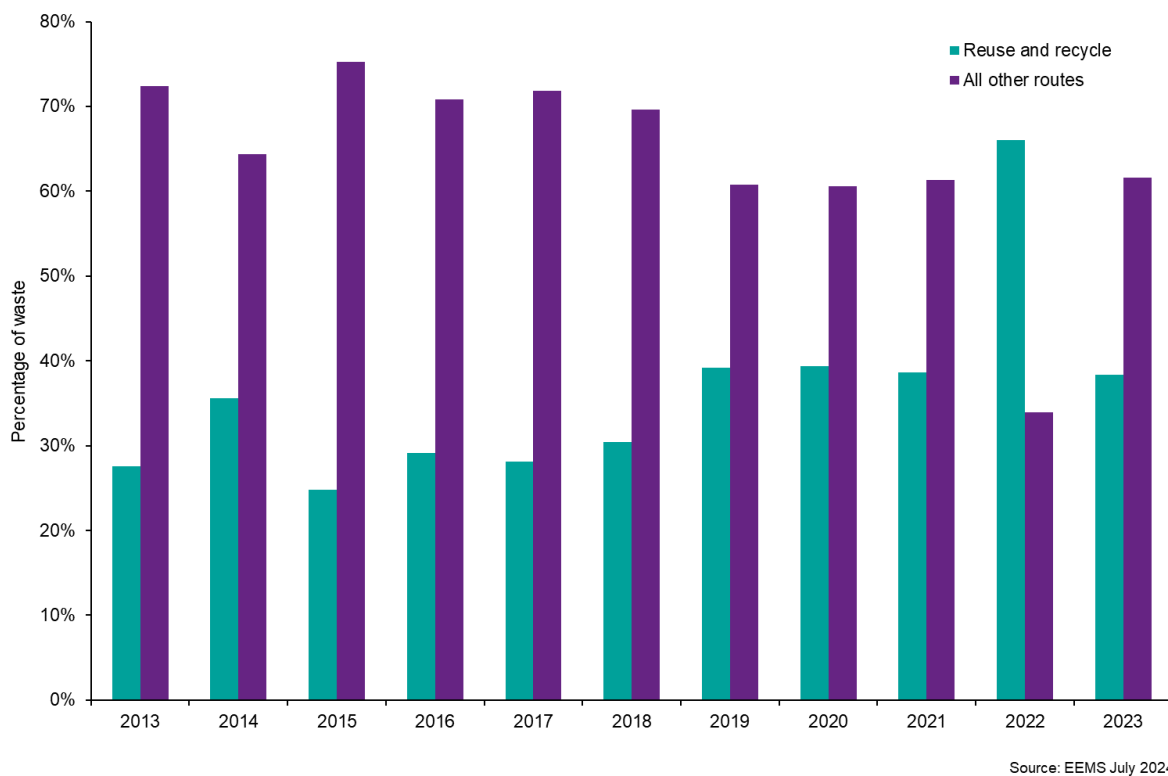
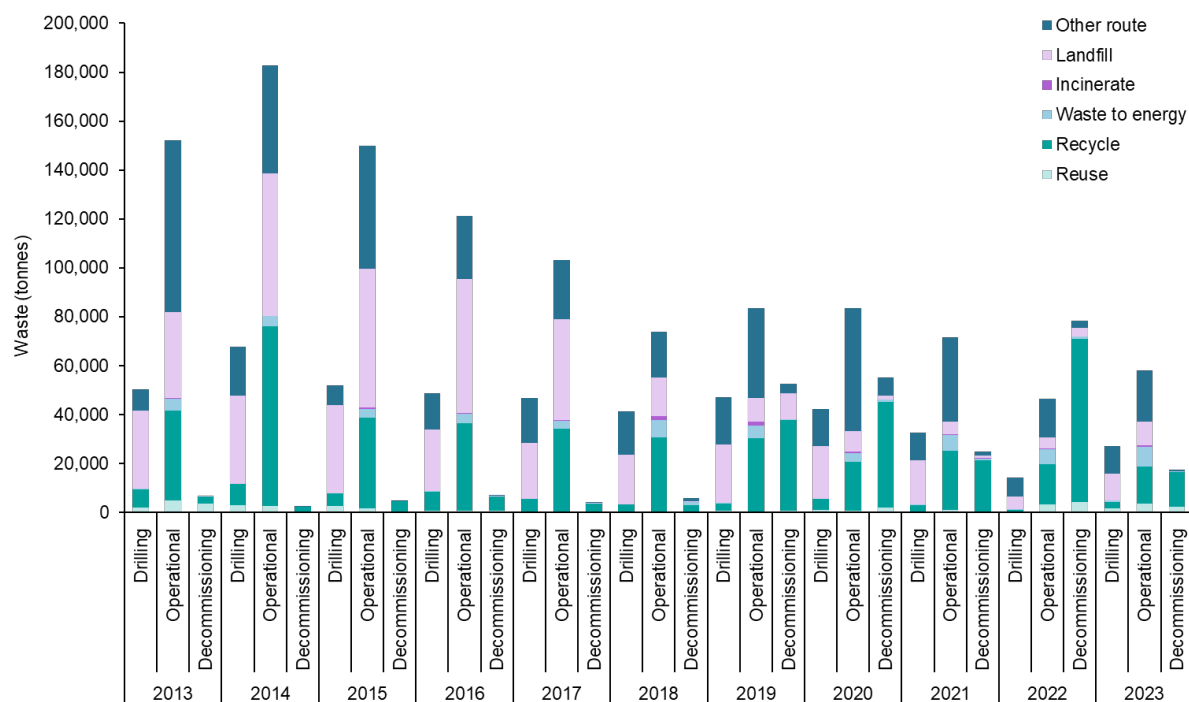


Figure 11 shows the amount of waste generated by operation type and Figure 12 breaks down the types of waste generated by all offshore activity in 2023.

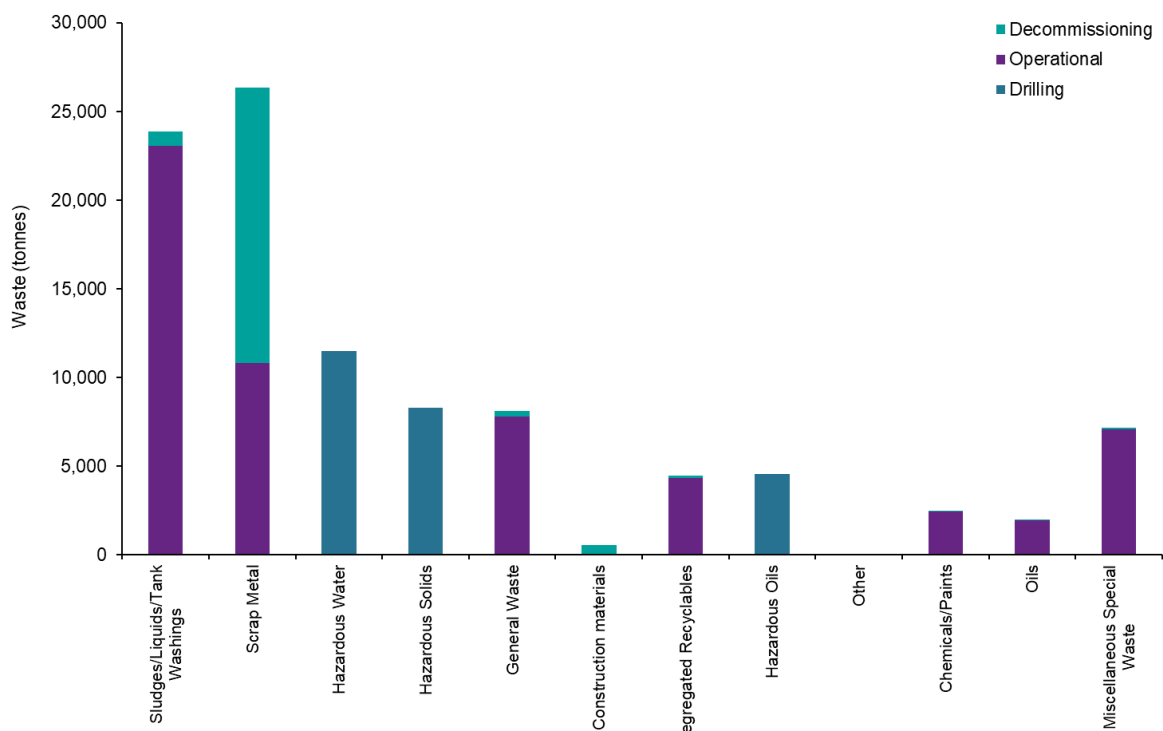
While waste from operational and drilling activities has generally declined, decommissioning waste has increased, however, decommissioning waste dropped by 78% in 2023 due to decreased activity levels.

Figure 11: Waste generated by offshore activity type



Source: EEMS July 2024

Figure 12: Types of waste generated by offshore activity 2023



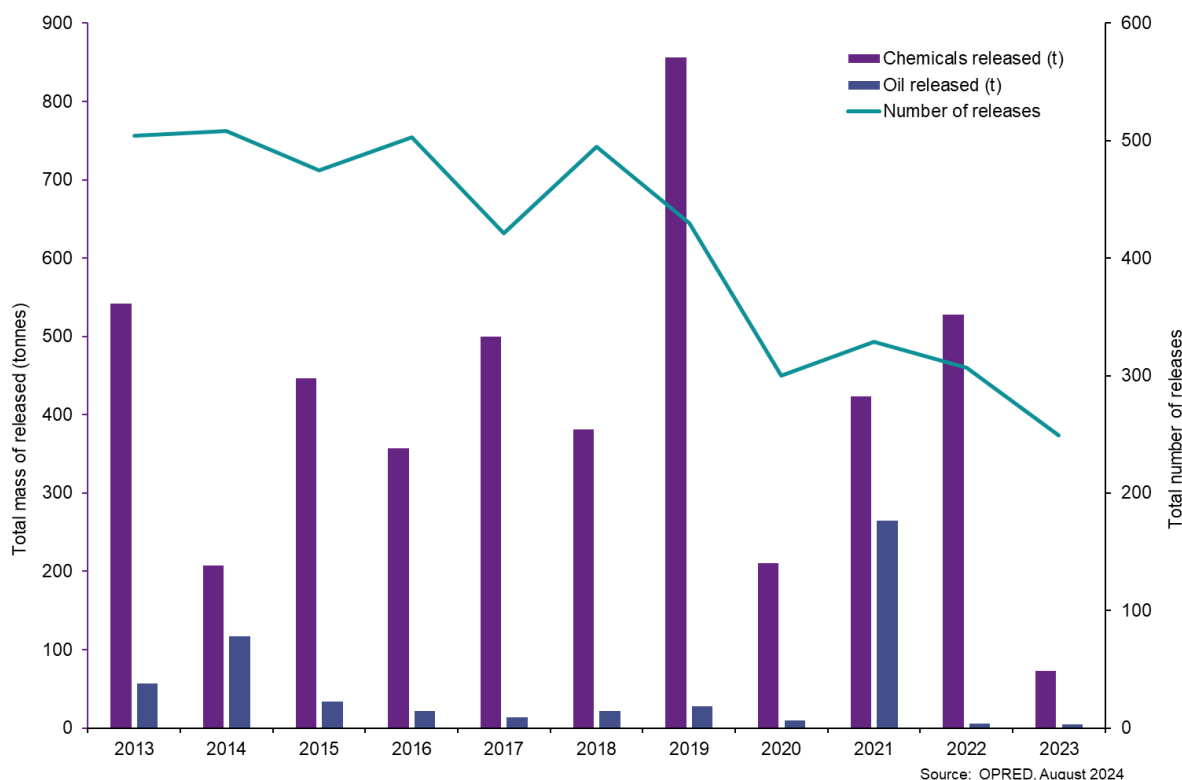
Source: EEMS July 2024

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 13, although the number of PON1s submitted has generally fallen since 2013, the total mass of chemicals and oil unintentionally released to the marine environment has continued to vary over the last ten years¹. 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.

Figure 13: Unintentional oil and chemical releases by mass and number



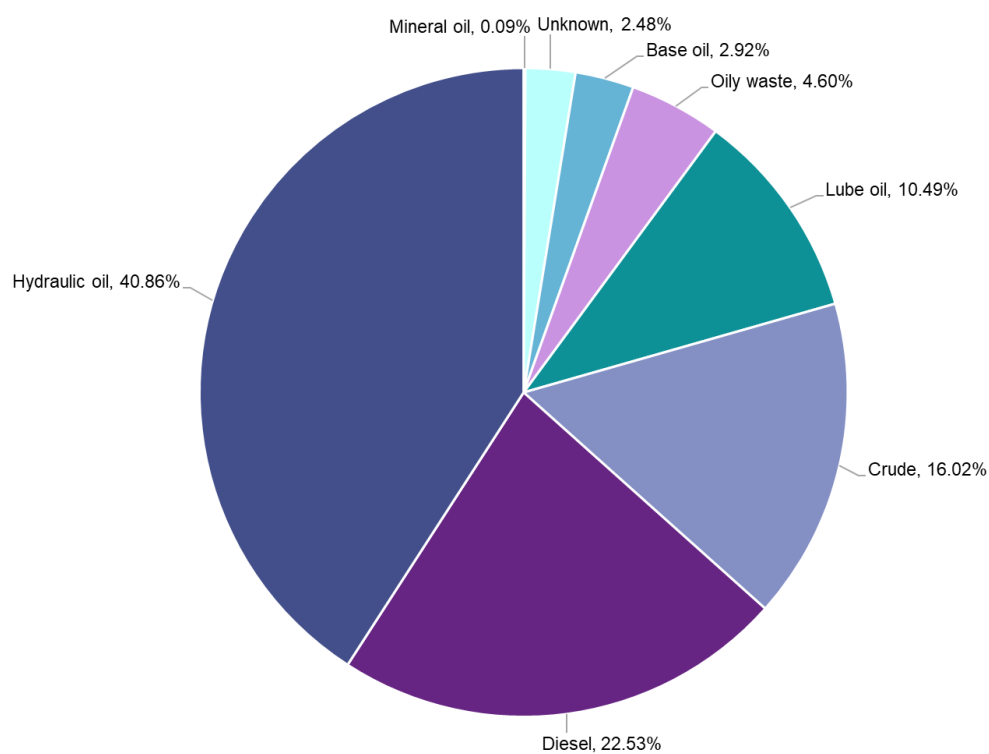
¹ Analysis is based on PON1 data provided by OPRED. Further analysis has been carried out to categorise PON1 data by product type released and by hazard category. Please note the data includes a number of releases that are currently under review by the regulator, in which case the volumes are not available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

4.1.1 Unintentional oil releases

In 2023, the mass of unintentional oil releases to the marine environment was 4.75 tonnes. To put this into context, in the same year, about 1,600 tonnes of oil were discharged to sea in produced water, under permit. This means that unintentional oil releases represented 0.3% of the total oil that entered the sea. Figure 14 shows that hydraulic oil accounted for the largest percentage of oil unintentionally released in 2023 at 41%, followed by diesel (22%) and crude (16%).

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 14: Percentage of unintentional oil releases by product type 2023



Source: OPRED, August 2024

4.1.2 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 2023, 73 tonnes of chemicals were unintentionally released in the UKCS.

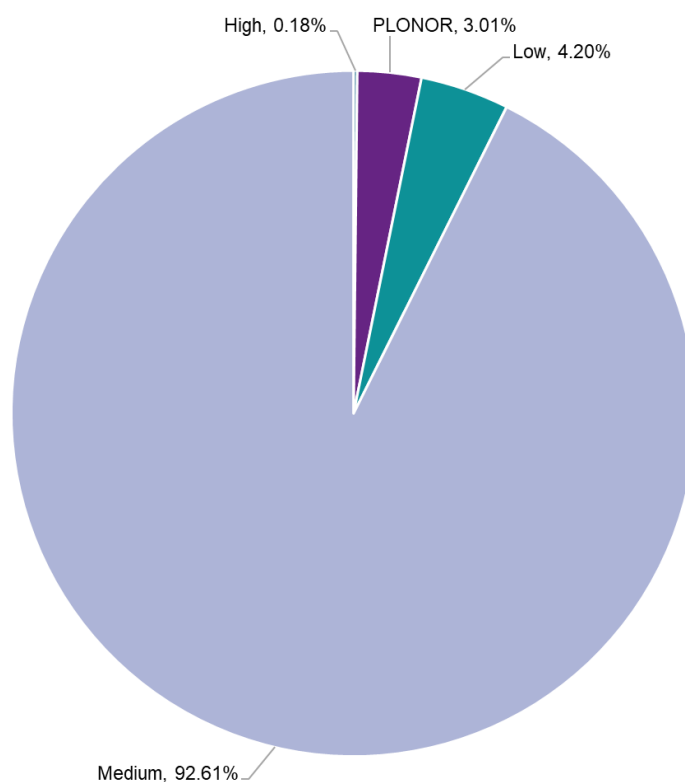
The CEFAS OCNS data 5 was used to produce the classifications detailed below in Table 1.

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 as medium ecotoxicity groupings.
High	OCNS group A, 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 2023, 92% of all unintentional chemicals released to sea were ranked as medium hazard, with 7% low or PLONOR, while just 0.2% of the mass released were ranked as high hazard (see Figure 15).

Figure 15: Percentage of total mass of chemical releases by hazard ranking 2023



Source: OPRED, CEFAS, August 2024

List of abbreviations

Abbreviations	Definitions
Bq	Becquerel
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
DESNZ	Department for Energy Security and Net Zero (formally BEIS)
Discharge	A permitted disposal of substances offshore
EEMS	Environmental Emissions Monitoring System
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
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.
Release	An unintentional discharge of oil or chemicals
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

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