

Preface

Trends in the risk level in the petroleum activities concern all parties involved in the industry, as well as the general public. RNNP is an important tool for helping to establish a common picture of the trends in selected conditions that affect risk. RNNP is consequently of particular significance for interaction between the social partners within the petroleum activities, and their ownership of the process and the results are important both in terms of the implementation of the activity and the follow-up of results.

The petroleum industry has considerable HSE expertise, and this expertise is a critical success factor for an activity such as RNNP. We are therefore pleased to acknowledge the active contribution to this work of the industry participants, as well as key personnel from operating companies, vessel owners, helicopter operators, consultancies, research and teaching.

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1. Objective and limitations

1.1 Purpose

The "Trends in risk level on the Norwegian Continental Shelf" project started in the year 1999. The background to the project was the participants' need to clarify uncertainties concerning the safety consequences of the major structural changes that the petroleum industry underwent in the late 1990s.

The industry has traditionally used a selection of indicators to illustrate safety trends in the petroleum activities. Indicators based on the frequency of lost-time incidents have been particularly widespread. It is generally accepted that this only covers a small part of the overall safety picture. Recent developments have moved towards using several indicators to measure trends. For the parties in the industry, it is important to establish methods for measuring the impact of the industry's overall safety work.

In this report, the Norwegian Ocean Industry Authority (Havtil) wishes to set out a description of core factors that affect risk based on sets of information and data from the activities, in order to allow key aspects of the impact of the overall safety work in the activities to be measured.

1.2 Objective

The objective of the work is to:

- Measure the impact of the industry's HSE work.
- Contribute to identifying areas that are critical for HSE and where the effort to identify causes must be prioritised in order to prevent undesirable incidents and accidents.
- Increase insight into potential causes of accidents and their relative significance for the risk profile, to provide better decision support for the industry and authorities concerning preventive safety and emergency preparedness planning.

The work may also contribute to identifying focus areas for amending regulations, as well as research and development.

1.3 Key limitations

In this report, the spotlight is on personal risk, which here includes major accidents and work accidents. Reactive and proactive indicators, both qualitative and quantitative in nature, are used.

The work is restricted to matters that are included in Havtil's area of authority as regards safety and the working environment. All passenger transport by helicopter is also included, in cooperation with the Civil Aviation Authority Norway and the helicopter operators on the Norwegian Continental Shelf (NCS). The following areas are covered:

- All production and mobile facilities on the NCS, including subsea facilities.
- Passenger transport by helicopter between the helicopter terminals and the facilities.
- Use of vessels within the safety zone around the facilities.

Onshore installations in Havtil's administrative area are included as of 1 January 2006. Data collection started from this date, since when separate reports have been published. Outcomes and analyses for onshore installations and the results from these installations are not included in this summary report. Since 2010, an annual report has been published, with the spotlight on acute spills to sea from offshore petroleum activities. The next report on acute spills will be published in autumn 2024.

2. Conclusions

Through RNNP, we seek to measure trends in safety, the working environment and the external environment using a series of indicators. The basis for the evaluations is the triangulation principle, i.e. assessing developments by using several instruments to measure changes in factors that affect risk.

In an indicator-based model, it is to be expected that some indicators, particularly within areas with relatively few near-misses, will sometimes display large annual variations. The main focus of this report is therefore trends. A positive trend in the number of near-misses may indicate that the industry's risk-management efforts are having an effect, but it provides no guarantee that future incidents will be avoided. Consequently, the petroleum industry, especially in the light of the Norwegian Parliament's ambition for the Norwegian petroleum activities to be world-leading in HSE, should maintain a constant focus on the effective management of conditions that affect risk.

Data for the indicators for noise, chemical working environment and ergonomic risk factors are not reported for 2023. Unfortunately, the development of new indicators, which is taking place in collaboration with the industry, is taking longer than expected.

Ideally, it should be possible to reach a summary conclusion on the basis of information from all the measurement instruments used. In practice, this is difficult, partly because the information used reflects HSE conditions at different levels.

Major accidents

In 2023, there were no accidents that resulted in fatalities, hence no major accidents according to the definition of major accident used in this report. As in 2022, nor were there any exceptionally serious major-accident near-misses assessed as having the potential for a large number of fatalities.

The number of near-misses with major-accident potential has been at a stable level since 2005. The level in recent years is lower than in the period preceding 2005. In 2023, there were 26 such incidents (helicopters not included). This is at the same level as the last nine years. When the number of incidents is normalised against working hours, the frequency in 2023 is within the expected range.

Four non-ignited hydrocarbon leaks at a rate above 0.1 kg/s were recorded in 2023 (eight in 2022), with two of the leaks in the category 0.1-1kg/s and two in the category 1-10 kg/s. In 2023, there were 11 well control incidents, all of which were in the lowest risk category. In 2023, three incidents of damage to structures and maritime systems that satisfy the damage criteria used in RNNP were registered. This is a decline from 2022 (six incidents).

If the near-misses with major accident potential are weighted by factors identifying their inherent potential for causing fatalities were they to develop into an accident, it can be seen that, in 2023, the indicator (the total indicator) is lower than in 2022. The total indicator shows an underlying positive trend since 2005. Since particularly serious incidents are assigned a relatively high risk weighting, the annual variation in the total indicator is large, but the positive trend is nevertheless clear. As described in chapter 6.3, the total indicator is a composite indicator that reflects the industry's ability to influence and manage a variety of risk-related factors. The underlying positive trend in the indicator indicates that over time the industry has improved at managing factors that affect risk. Recent years' stable levels indicate that achieving systematic improvements can be more challenging. Although an indicator based on historical figures provides relevant information on factors that affect future risk, it in no way provides sufficient information about future risk itself.

Helicopter risk constitutes a large share of the overall risk exposure to which employees on the NCS are subjected. The purpose of the risk indicators used in this work is to capture risks associated with incidents and to identify opportunities for improvement.

In the expert group's assessment of incidents for 2023, there were no incidents included in incident indicator 1.

Barriers

Leading indicators are used to describe robustness in withstanding incidents. Barrier indicators are an example of these. Notably, this type of indicator describes the barriers' ability to function when called on. The barrier indicators show that there are large differences in levels between the facilities. Across the industry, over time, for many barriers, there is a positive trend that exceeds the industry's self-defined requirements. In recent years, the level has been fairly stable with some exceptions. This may be because the participants have become more aware of quality in respect of the testing of barriers, and that the current level is a better reflection of the true value than was the case a few years ago.

The maintenance data for 2023 for the fixed facilities show that there are few hours of backlog in preventive maintenance, but a number of facilities have not performed the HSE-critical preventive maintenance in accordance with their own deadlines. The total backlog in preventive maintenance in 2023 is higher than that reported in 2022 and 2021. Some facilities have a high total number of hours of corrective maintenance not performed at 31.12.2023. Overall, there is a significant number of hours of unperformed corrective maintenance at 31.12.2023 and the scope in 2023 is approximately 20 percent higher than in 2022; the trend is negative and increasing. The number of hours of maintenance performed is at the same level in 2023 as in 2022.

The data for mobile facilities show large variations in the backlog in preventive maintenance and in outstanding corrective maintenance. This corresponds to what we have seen in recent years. A number of facilities have not carried out HSE-critical preventive maintenance and corrective maintenance in accordance with their own deadlines.

Personal injuries and accidents

In 2023, 185 reportable personal injuries were recorded on the NCS. In 2022, 234 such injuries were reported. 25 of the injuries were classified as serious in 2023 against 21 in 2022. In 2023, the rate of serious injuries per million hours worked increased to 0.6, returning to the level in 2021. In 2023, the injury rate is within the expected level based on the ten preceding years.

The questionnaire-based survey

In 2023, for the twelfth time, a comprehensive questionnaire-based survey was conducted among workers on the NCS. The survey has been conducted every other year since 2001. Even though the questionnaire is in continuous development, the core of the survey remains the same. This makes the data unique and offers great opportunities for in-depth studies.

The questionnaire results presented in this report give an overall picture of the employees' own assessments of the HSE climate and the working environment in their workplace.

The response rate is calculated on the basis of working hours on facilities reported to Havtil in the last half of 2023. 5,461 persons completed the form, which corresponds to 23% of the estimated workforce. This is lower than in 2021 (25.9%), but equivalent to the 2019 rate (23.1%).

The results as a whole show a positive development from 2021 to 2023 in terms of HSE climate and working environment factors. 3 out of 15 health complaints have had a negative development.

The HSE climate is generally rated more positively in 2023 than in 2021. Of the 40 HSE statements in the questionnaire, 31 were rated more positively and 3 more negatively. The change is statistically significant (sig*). In terms of the physical, chemical and ergonomic working environment, 2 out of 13 questions are responded to more negatively in 2023 than in 2021 (sig**). For the organisational and psychosocial working environment, 7 out of 20 questions show a positive change, and one a negative change (sig*). The results also show that those who experience bullying and/or harassment respond more negatively to all questions about the HSE climate and the working environment (sig*).

When it comes to health complaints, there is a negative change (sig**) in 3 out of 15 of them. The six most commonly experienced health complaints are the same as in previous years (impaired hearing, ringing in the ears/tinnitus, headache, knee/hip pain, back pain, neck/shoulder/arm pain). None of these are significantly different from 2021. Sleep while offshore and before and after travelling offshore is rated the same as in 2021.

3. Implementation

The results from RNNP are presented in annual reports. This report covers the year 2023. Work on the report was carried out mainly in the period December 2023 – March 2024.

The detailed objective for 2024 was to:

- Continue the work carried out in previous years
- Maintain and develop the total indicator method
- Evaluate correlations in the datasets.

3.1 Performance of the work

The following participants contributed to the work on this year's report:

- The Norwegian Ocean Industry Authority (Havtil): Responsible for execution and further development of the work
- Operating companies and vessel owners: Contribute data and information about activities on the facilities
- The helicopter operators: Contribute data and information about helicopter transport activities
- HSE specialist group: (selected specialists) Evaluate the procedure, input data, viewpoints on developments, evaluate trends, propose conclusions
- Safety Forum: (multipartite) Comment on the procedure and results, and recommend further work
- Advisory group: (multipartite) Multipartite RNNP advisory group that advises Havtil regarding further development of the work

Havtil's working group consists of: Arild Langseth, Tore Endresen, Marita Halsne, Morten Langøy, Trond Sundby, Inger Danielsen, Roar Høydal, Astrid Schuchert, Jan Ketil Moberg, Semsudin Leto, Eivind Jåsund, Kenneth Skogen, Bente Hallan, Torbjørn Gjerde, Øyvind Loennechen, Roar Sognnes and Torleif Husebø.

The following external parties have assisted Havtil with specific assignments:

- Irene Buan, Jorunn Seljelid, Torleif Veen, Marius Gårdsman Fosse, Espen Stemland, Askild Underbakke, Martin Dugstad, Kaia Stødle, Ragnar Aarø, Torbjørn Mjåtveit, Gabriela Bjørnsen, Lars Mogstad, Anette Andresen, Trond Stillaug Johansen and Marita Pytte all from Safetec
- The questionnaire-based survey: Leif Inge Sørskår, Marita Pytte, Malin Almedal, Jens Christen Rolfsen and Rolf Johan Bye from Safetec

The following people have contributed to the work on indicators for helicopter risk:

- Øyvind Solberg, Maj Brit Fjermestad, John Arild Gundersen, Offshore Norge represented by LFE
- Nils-Rune Kolnes, Morten Haugseng, Inge Løland, CHC Helikopter Service
- Geir Arne Karlsen, Atle Brokjøb, Bristow Norway AS

Numerous other people have also contributed to the work.

3.2 Use of risk indicators

Data have been collected for hazard and accident situations associated with major accidents, work accidents and working environment factors, specifically:

- Defined situations of hazard and accident, with the following main categories:

- Uncontrolled discharges of hydrocarbons, fires (i.e. process leaks, well incidents/shallow gas, riser leaks and other fires)
- Structure-related incidents (i.e. structural damage, collisions and risk of collision)
- Test data associated with the performance of barriers against major accidents on the facilities, including data concerning well status and maintenance management
- Accidents and incidents in helicopter transport
- Work accidents
- Other hazard and accident situations with consequences of a lesser extent or significance for emergency preparedness.

The term 'major accident' is used in many places in the reports. There are no unambiguous definitions of the term, but the following are often used, and coincide with the base definition employed in this report:

- A major accident is an accident (i.e. entails a loss) where at least three to five people may be exposed.
- A major accident is an accident caused by failure of one or more of the system's built-in safety and emergency preparedness barriers.

In light of the definition of major accident in the Seveso II Directive and in Havtil's regulations, the definition used here is closer to a 'large accident'.

Data collection for the DSHAs (Defined situations of hazard and accident) related to major accidents is founded in part on Havtil's existing databases (CODAM, DDRS, etc.), but also to a significant degree on data collection carried out in cooperation with the operating companies and vessel owners. All incident data have been quality-assured by, for example, checking them against the incident register and other Havtil databases.

Table 3.1 lists the 21 DSHAs and the data sources used. The industry has used the same categories for registering data through databases such as Synergi.

Table 3.1 List showing the primary source of data on incidents

<i>DSH A</i>	<i>Description</i>	<i>Database</i>
1	Unignited hydrocarbon leak	Industry
2	Ignited hydrocarbon leak	Industry
3	Well incidents/loss of well control	Havtil
4	Fire/explosion in other areas, not hydrocarbon	Havtil/Industry
5	Ship on collision course	Industry
6	Drifting object	Industry
7	Collision with field-related vessel/facility/shuttle tanker	Havtil
8	Damage to a facility's structure, stability/anchoring/positioning failure	Havtil/Industry
9	Leak from riser, pipeline and subsea production facility*	Havtil
10	Damage to riser, pipeline and subsea production facility*	Havtil
11	Evacuation	Industry
12	Helicopter incidents	Industry
13	Man over board	Industry
14	Work accidents	Havtil
15	Work-related illness	Industry
16	Full loss of power	Industry
18	Diving accident	Havtil
19	H ₂ S emission	Industry
20	Crane and lifting operations	Havtil/Industry
21	Dropped objects	Havtil/Industry

* Also includes wellstream pipeline, loading buoy and loading hose where relevant.

3.3 Developments in the activity level

Figure 3-1 and Figure 3-2 show the trends over the period 2005-2023 for production and exploration activities of the parameters used for normalisation against the activity level (all figures are relative to the year 2005, which has been defined as 1.0). Appendix A to the main report (Havtil, 2024a) presents the underlying data in detail.

From 2022 to 2023, we see that the total number of working hours has decreased by around 6%. The number of working hours for mobile facilities fell by around 13% and for production facilities by around 3%.

Production volume increased marginally in 2023 compared to 2022.

A presentation of DSHAs or contributors to risk can sometimes vary according to whether absolute or normalised values are stated, depending on the normalisation parameter. In the main, normalised values are presented.

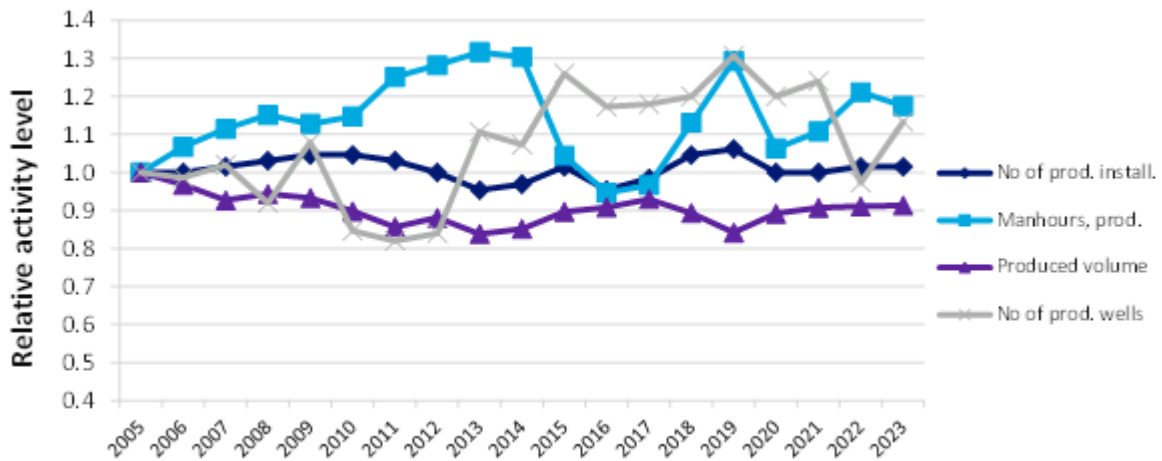


Figure 3-1 Relative trend in activity level for production facilities. Normalised against the year 2005

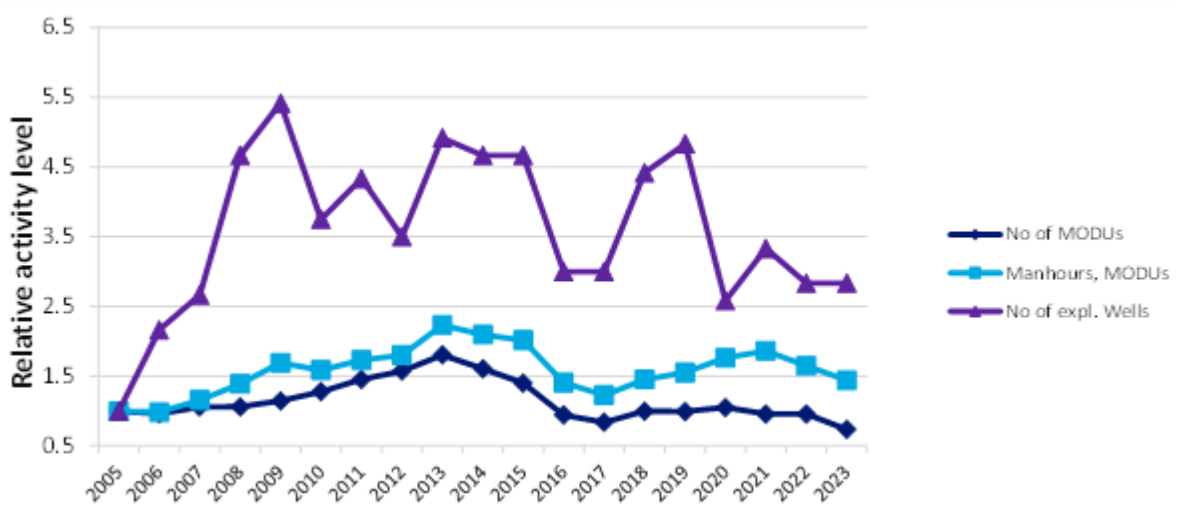


Figure 3-2 Relative trend in activity level for mobile facilities. Normalised against the year 2005

A corresponding activity overview for helicopter transport is shown in sub-chapter 5.1.

3.4 Documentation

Analyses, assessments and results are documented as follows:

- Summary report – the Norwegian Continental Shelf for the year 2023 (Norwegian and English versions)
- Main report – the Norwegian Continental Shelf for the year 2023
- Report for onshore facilities for the year 2023
- Report for acute spills to sea for the Norwegian Continental Shelf 2023, to be published in the autumn of 2024
- Methodological report, 2023

The reports can be downloaded from the Norwegian Ocean Industry Authority’s website (www.havtil.no/rnnp).

4. The survey

A questionnaire-based survey was conducted of employees who were offshore in the period 9 October to 19 November 2023. The survey is carried out every other year. The year's results are reported together with data from previous years. This is the twelfth time that data have been collected using this questionnaire. The general aim of the survey is to measure the employees' perception of HSE conditions in Norwegian petroleum activities. Specifically, the survey has three objectives:

- To provide a description of employees' perception of HSE conditions in the offshore industry, and map factors that are significant in respect of variations in this perception.
- To help illuminate underlying factors that may go towards explaining results from other sections of RNNP.
- To follow trends over time in respect of employees' perception of HSE conditions at their own workplace.

The questionnaire consists of five main parts:

- **Demographic data.** This section includes questions about gender, age, nationality, education, job category, seniority, the company the person is employed by, the facility, affiliation to the facility and the company, working time arrangements, emergency preparedness functions and whether the respondent has managerial responsibilities. This section also includes questions about experiences with downsizing and reorganisation.
- **HSE climate at own workplace.** This section consists of 40 statements relating to different factors of significance for the state of HSE: 1) personal assumptions for performing work safely, 2) characteristics of one's own and others' behaviour of significance for HSE, 3) conditions in the work situation that affect one's own behaviour.
- **Assessment of accident risk.** This section consists of a question where the participants are asked to answer how often they are afraid of 11 different accident scenarios. The scenarios cover most of the defined situations of hazard and accident (DSHAs) included in RNNP. These were not included in the measurement in 2021; the last time was in 2019.
- **Working environment.** This section consists of 34 questions covering physical working environment factors (exposure and strain), psychosocial working environment factors (requirements for concentration and attentiveness, control over one's own work performance and social support) and job security. Four questions deal with bullying and harassment. There are also 11 questions about working hours, rest and recovery. One question about accommodation and living conditions offshore is also included in this section.
- **Health complaints, sickness absence and injuries.** This section consists of five questions concerning sickness absence and involvement in any work accidents causing injuries, as well as 15 questions about health complaints. A new health complaint was added in 2023.

A similar survey is also carried out of onshore facilities. Most of the questions are the same, but there are also certain differences. Finally, this chapter presents a comparison of the results for the offshore and onshore facility samples respectively in 2023.

The questionnaire survey for 2023 made the following changes to the questionnaire, as well as some adjustments to the wording:

- Added three follow-up questions about perceived changes in collaboration conditions, and whether these changes have led to a better or worse working day

- Added question about how many offshore periods the respondent has had in the past 12 months
- Added question on whether the respondent has an onshore position with occasional or regular offshore periods
- Added question about air quality as a problem when sleeping.
- In the case of hired personnel, added a response option so that the respondent can state whether they are hired from a recruitment company or from a business that normally performs such services themselves (production company).
- Non-binary added as possible response to gender
- Fatigue/exhaustion included as a health complaint

4.1 Introduction

For a questionnaire-based survey where everyone in a domain is given the opportunity to respond, the composition of the respondents is important for the representativity of the responses. With the information we have available, we can say that the respondents to this survey do essentially reflect the demographic composition of the employees in this industry. In cases where some groups are over- or under-represented, it is possible to assess the impact of this on the results. Although a high response rate is desirable, it is of less significance for the assessment of the survey's validity. At the same time, the composition of the respondents has remained very stable from year to year, and this provides a good basis for comparison over time.

Between the performance of the questionnaire-based surveys in RNNP 2019 and RNNP 2021, society was impacted by Covid-19. Most industries, including parts of the petroleum industry, were hit by uncertainty and layoffs. This impact was greatest in 2020, whereas in 2021 we witnessed a return of optimism and an upturn in petroleum activity. Sickness absence across society was generally high in 2020 and 2021. It is difficult to evaluate how much and in what ways this situation has affected the results of the questionnaire-based survey in 2021. The results from 2023 point to their "normalisation" in several areas, attaining once again similar levels as in 2019.

The overall response rate (mobile and production facilities) was 23% in 2023, which was somewhat lower than in 2021 (25.9%), but slightly higher than in 2019 (22.2%). We see that the age in the sample has increased compared to previous years, and the 51-60 year age group is still the largest. The proportion of respondents over the age of 51 has increased, and respondents in the 31-50 year age group have decreased. Respondents aged 30 and younger, on the other hand, are comparable to 2021. 60% of those who answered are employees of contractors, and 71% work on a production facility. Maintenance, drilling and processing are the areas of work within which most of the respondents are employed. 96.5% have permanent employment, which is stable over time, and 36.6% have managerial responsibility.

The following provides a summary of the most important results within the various topics in the questionnaire. For further details, please see the main report. The indication (sig.) with optional asterisk(s) means that the changes between 2021 and 2023 or differences between groups are statistically significant (* for $p \leq .01$ and ** for $p \leq .001$). This is shown as "(sig**)" and "(sig*)" in the text. Where several statements are concerned, "(sig.)" is used since there are different levels for the different questions.

4.2 HSE climate

The HSE climate is generally rated more positively in 2023 than in 2021. Of the 40 HSE statements in the questionnaire, 31 have more positive assessments (sig.), and 3 have more negative assessments (sig.). The following HSE statements have the largest changes from 2021 to 2023 (all these changes are positive, except for the statement "Dangerous situations arise..." (no. 4) which was assessed more negatively):

- I have been given necessary instruction in cybersecurity for my role
- The management takes input from the safety delegates seriously
- There is enough manning to properly safeguard HSE

- Dangerous situations arise because everyone does not speak the same language
- Being too preoccupied with HSE can be a disadvantage to your career
- I am not adequately trained to perform my emergency preparedness tasks in case of an emergency
- I feel peer pressure which affects HSE assessments

However, we see that, overall, results were more negative in 2021 compared to previous years, while returning in 2023 to similar levels as in 2019. This may indicate that 2021 was an exceptional year in which the results were affected by Covid-19. However, we would like to highlight two questions that have nevertheless shown a negative change (sig.) for two measurements in a row:

- Deficient maintenance has led to poorer safety
- There are often simultaneous work operations which lead to dangerous situations

One question has gone in a positive direction for the last two measurements:

- I experience a pressure not to report personal injuries or other incidents which may "mess up the statistics"

Of the six indices, there were more positive scores compared to 2021 on the following five: management's commitment, colleagues' commitment, the organisation's commitment, conflicting goals, and freedom to speak up. The biggest change was in management's commitment. There was no change to the cooperation and communication index, as was also the case from 2019 to 2021. Cooperation and communication is also the topic with the most negative answers, and we see no improvement over time.

4.3 Perceived risk

14 questions in the survey are directed at how often the respondent is "afraid of" different incidents, where the scale goes from "several times every week" to "rarely or never". These questions are only asked in every alternate survey, and in 2023 were asked for the first time since 2019.

Compared to 2019, there is only one significant change in three of the incidents. Fewer people in 2023 are afraid of helicopter accidents than in 2019, while more are afraid of physical sabotage/terrorist action and cyberattacks/hacking. This probably reflects cyberattacks and sabotage/terrorist action having been more frequently on the agenda in 2022 and 2023 than in previous years, especially after the Ukraine crisis.

As in previous years, most people report that they are more often afraid of dropped objects and serious work accidents.

4.4 Working environment

In terms of the physical, chemical and ergonomic working environment, there is very little change from 2021 to 2023. Of 13 questions, two have more negative answers in 2023 than in 2021, and none were answered more positively. The two questions with significant negative changes are:

- Do you work under poor indoor conditions?
- Can you smell chemicals or clearly see smoke or dust in the air?

The question of poor indoor conditions also had more negative assessments in 2021 compared to 2019, and this was also the question with the greatest negative change in 2021. The question of chemicals or dust/smoke in the air has the most negative rating in 2023 across all measurements taken. Both questions may also relate to air quality.

13 out of 20 questions about the psychosocial working environment were assessed more positively (sig.) in 2023 than in 2021. One question was assessed more negatively and one question had a significant change but is not unambiguously positive or negative ("Is it

necessary to work at a high pace?"). The questions with the biggest changes are the following:

- Do you work so much overtime that it is a strain?
- Can you set your own work speed?
- Do you find the shift arrangement a strain?
- Do you get sufficient rest/recreation between work periods?
- Do you know exactly what is expected of you at work?
- Do you feel that the cooperation climate in your work unit is encouraging and supportive?

The last question has moved in the negative direction, while the others have developed positively. The responses indicate that the workload is perceived as more positive in 2023 than in 2021.

Overall, 4.5% experience bullying and 2.5% experience unwanted sexual attention either occasionally or more frequently. There is relatively little overlap between these groups (0.5%). A lower proportion state that they have been bullied by managers and colleagues in 2023 than in 2021 (sig**). The proportion experiencing unwanted sexual attention is largely unchanged from 2023 to 2021. Among employees, fewer than 1% of all men experience unwanted sexual attention and 15% of all women.

4.5 Sleep, health, sickness absence and injury

Sleep is assessed the same as in 2021 and worse than in 2019. As in 2021, there is a difference between how employees with different shift schemes rate the quality of their sleep. In general, those who work day shifts assess sleep the most positively, and those who work swing shifts assess it the most negatively. A new question for 2023 is whether air quality is a problem when sleeping offshore, to which 14% replied it is quite often or very often a problem.

Of the 15 health complaints that employees were asked if they had, there were 3 that were significantly more prevalent than in 2021: skin complaints, stomach/bowel problems and respiratory problems. There is a higher proportion of all three than in all previous measurements. The complaints that most respondents experience are pain in the neck/shoulder/arm, back pain, and knee/hip pain, and these have been the three commonest complaints in all measurements. In 2023, one new health complaint has been included: "Fatigue/exhaustion". 7.7% experience having this health complaint, and 40.2% say that the complaint is work-related.

A similar proportion in 2023 (32.7%) to 2021 (33%) responded that they had had sick leave during the last year caused by their own illness. 23.2% of those who have been on sick leave believed that the last sick leave period was wholly or partly caused by the work situation (compared to 25.8% in 2021). The same proportion as in 2021 had been in an accident involving personal injury in 2023 (3.2%). This is lower than all prior measurements.

4.6 Comparison between results offshore and onshore

For both samples, there is a tendency towards increasing age and seniority. The largest proportion of offshore respondents is aged 51-60 years, the same as since 2019. Onshore, the 51-60 year age group also represents the largest proportion, but it is the first year in which this is the case. Previously, the 41-50 year age group dominated. There is still a higher proportion of younger people working onshore than offshore. There are more men than women in both samples, but the disparity is greater offshore (89% men) than onshore (77% men). The proportion of men has fallen somewhat onshore since 2021, but has remained stable offshore. There is also a higher proportion of managers offshore (37%) than onshore (30%). Both proportions have remained relatively similar to 2021. Concerning terms of employment, permanent employment is more prevalent among respondents offshore (96.5%) than onshore (92%). Onshore, approx. 61% are employed by the operator/TSP, which is similar to 2021, while 39.5% of the offshore respondents

are employed by the operator, an increase from 2021. Based on working hours, the contractors are underrepresented offshore. Offshore, 90.9% are of Norwegian nationality, and onshore, 93.9%.

Figure 4-1 shows an overview of the questions about HSE, the physical and psychosocial working environments, and health complaints, and how many of the questions have changed (sig.) compared to 2021, at offshore and onshore facilities.

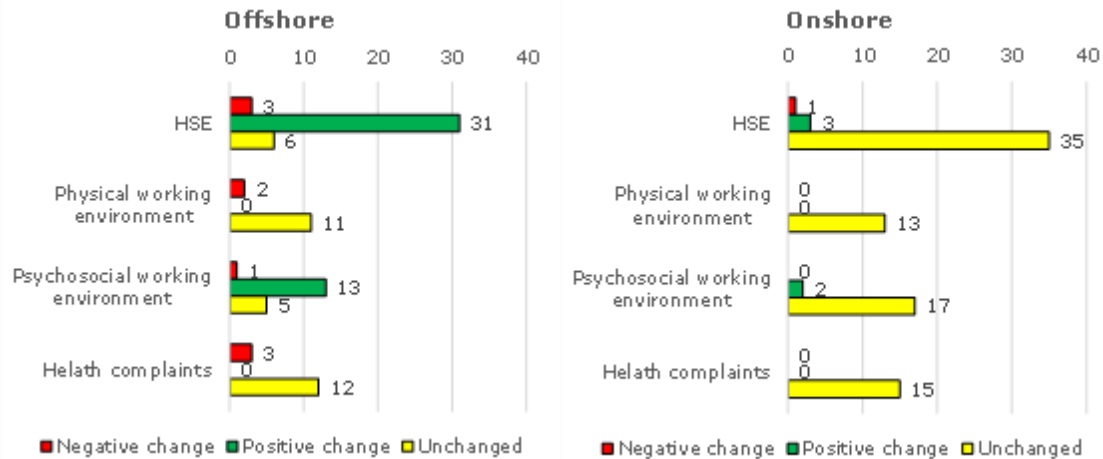


Figure 4-1 Overview of the number of positive (green), negative (red) or unchanged (yellow) questions in 2023 compared to 2021, offshore and onshore.

Overall, we see a predominantly positive trend offshore, while onshore there has been little change. It should also be noted that there are fewer survey respondents from onshore facilities, which makes it statistically harder to register significant differences.

HSE climate

For the offshore sample, there is a steady positive trend in the HSE climate indices, with all of them except cooperation and communication moving in a positive direction. Onshore, however, there is no trend in the same indices, either positive or negative. Looking at individual statements, we find that for offshore there is a significant positive trend in 31 out of 40 statements. The corresponding development onshore concerns three statements. Three statements offshore show significant negative developments, and one statement does the same onshore. Common to both samples is that those who have experienced reorganisation rate the indices more poorly.

Working environment

For the physical, chemical and ergonomic working environments, there is a small negative trend among employees offshore (2 out of 13 questions show negative developments), continuing the negative trend in the 2021 results. For employees at onshore facilities, the results are more or less the same as previously. For the psychosocial working environment, the results are better than in 2021 for the offshore sample, and all indices other than management support are moving in a positive direction. For offshore, 13 out of 20 statements are rated significantly more positively than in 2021, and are on a par with the results for 2019. Onshore, the results are similar to 2021, with two questions moving in a positive direction. Both samples have significant positive changes in the "colleague support" index.

The proportion who state that they have been the victim of bullying is approximately the same both offshore (4.5%) and onshore (4.1%), and it is bullying from colleagues that is most prevalent. A somewhat lower proportion offshore (2.5%) answer that they have been exposed to unwanted sexual attention than is the case onshore (4.2%). For women, the proportions are 15% (offshore) and 13.3% (onshore). Both onshore and offshore alike, those who have experienced bullying occasionally or more often, and/or harassment more than once, consistently respond more negatively on all HSE and working environment

indices, a larger proportion have health complaints, and a larger proportion have suffered a work accident involving personal injury.

Accommodation and sleep

There are differences in how accommodation and sleep are rated in the two samples, but the conditions are also different. Everyone working offshore must be accommodated on the facility, while only a minority of onshore employees are accommodated by the employer. The offshore employees are more satisfied with accommodation and living conditions than those accommodated onshore. Of those who say they are accommodated by their employer onshore, 65.7% say they always, very often or fairly often sleep well when they are so accommodated, which is a decline from 2021 (75.4%). For offshore, responses concerning sleep quality remain unchanged since 2021.

Health

Offshore, significantly more people reported being troubled by 3 out of 15 health complaints, compared to 2021. Onshore, there were no significant changes. For both samples, hearing problems (impaired hearing and ringing in the ears/tinnitus) and musculoskeletal disorders (pain in the neck/shoulders/arm, back pain and knee/hip pain) are most prevalent. On the new question concerning fatigue and exhaustion, 7.7% offshore and 11.9% onshore are quite or very bothered by this, with just over a third of them attributing it to work.

Of all the health complaints, a larger proportion of respondents offshore than onshore state that they are wholly or partly work-related. Offshore, tinnitus is the most common complaint stated to be work-related, while onshore the most prevalent complaint attributed to work is pain in the neck/shoulders/arms.

Self-reported sickness absence is significantly higher onshore than in 2021, while offshore it is more or less unchanged. However, fewer respondents report having had sickness absence offshore (32.7%) than onshore (56.6%), which may be due to differences in the working-hours and rotation schemes. There is also a lower proportion who report having been injured offshore (3.2%) than onshore (5.9%).

Differences between groups

Managers consistently rate HSE conditions as better than other employees do. The exception is that managers report having more stressful job requirements, higher workloads and more role conflicts than those without managerial responsibility. These results apply to both offshore and onshore.

There is a difference between employees of operators and of contractors, both in their assessments of HSE conditions and health complaints, and in how these differences are manifested offshore and onshore. For both samples, the operators' employees rate the organisation's commitment and workload most negatively and the contractors' employees are more negative in their assessment of musculoskeletal disorders. Also common to both samples is that permanent employees consistently rate HSE conditions more negatively and have more health complaints than temporary employees.

In the offshore sample, men rate five indices more negatively than women and they report having more hearing complaints. The women assess job control as poorer than men, and they report having more musculoskeletal complaints and more sickness absence. Onshore, there is only a difference between genders in role conflicts, where men respond more negatively.

In general, younger age groups are more positive than older age groups on indices and health complaints. The 31-40 and 41-50 year age groups tend to respond more negatively on the indices (some significant differences offshore), and the 51-60 and 61 plus year age groups more negatively to questions about health complaints (some significant differences both onshore and offshore).

When it comes to the work area the respondents belong to and the correlation with results on HSE conditions and the working environment, there are major differences between offshore and onshore. There are also large variations between which groups rate the different indices positively and negatively. Offshore, employees within well service have more negative results on several indices within HSE climate and the working environment (sig.), and employees in processing and drilling also tend to respond more negatively than other work groups (not sig.). Employees in catering have more negative results in health than other groups. Onshore, there are no significant differences between groups, but there is a tendency for employees within processing/operations and security services to be more negative than other employees. For the type of shift arrangement offshore and rest, the results are disparate, but those on fixed day shifts report being most rested and more satisfied with the working hours schemes. It is similar onshore, where employees on continuous shifts rate relaxation and rest worse than employees on day shifts.

5. Status and trends – helicopter incidents

Cooperation with the Civil Aviation Authority Norway and the helicopter operators on the work on risk indicators was continued in 2023. Aviation data obtained from the helicopter operators involved includes incident type, risk class, severity, type of flight, phase, helicopter type and information about departure and arrival.

5.1 Activity indicators

Figure 5-1 shows activity indicator 1 which includes volumes in the number of flight hours and the number of passenger flight hours per year in the period 2005-2023. The sharp reduction in the number of flight hours and passenger flight hours from 2014-2016 is due to the reduction in the number of hours worked on the NCS.

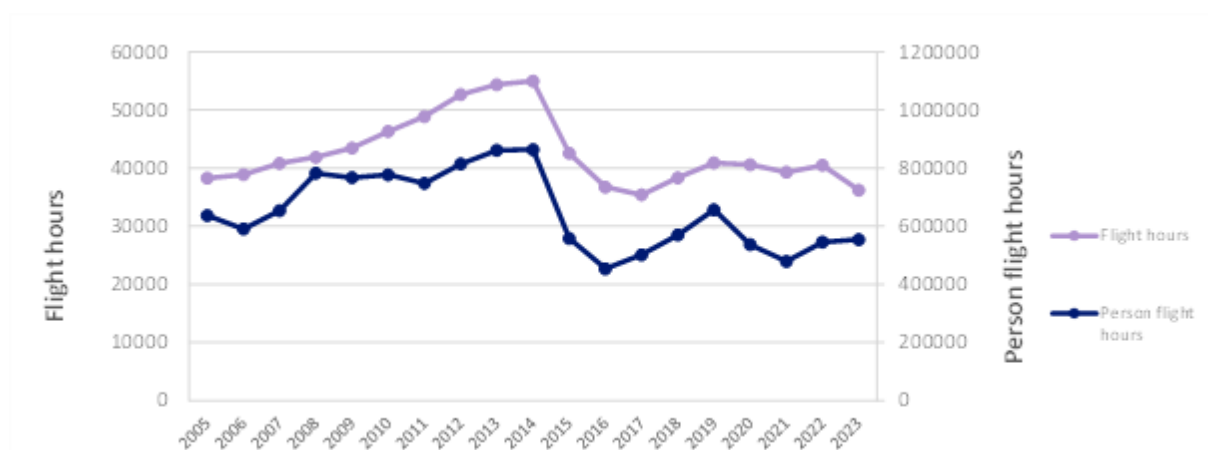


Figure 5-1 Flight hours and passenger flight hours per year, 2005-2023

The volume of helicopter flights per year must be viewed in the context of the activity level on the NCS; see main report. From 2014 to 2016, the number of passengers fell by 40%, the number of passenger flight hours fell by 47%, while the number of working hours fell by 28%. This means that fewer people were on short stays on the facilities, and that a greater proportion than before were on the facilities for a full 14 days.

5.2 Incident indicators

5.2.1 Incident indicator 1 – serious incidents and near-misses

Figure 5-2 shows the number of incidents included in incident indicator 1. From 2009 (and subsequently for 2006, 2007 and 2008), the most serious near-misses which the companies reported were reviewed by an expert group consisting of operational and technical personnel from the helicopter operators, from the oil companies and from Havtil's project group in order to classify the incidents based on the following categories:

- Little remaining safety margin against fatal accident: *No remaining barriers*
- Medium remaining safety margin against fatal accident: *One remaining barrier*
- Large remaining safety margin against fatal accident: *Two (or more) remaining barriers.*

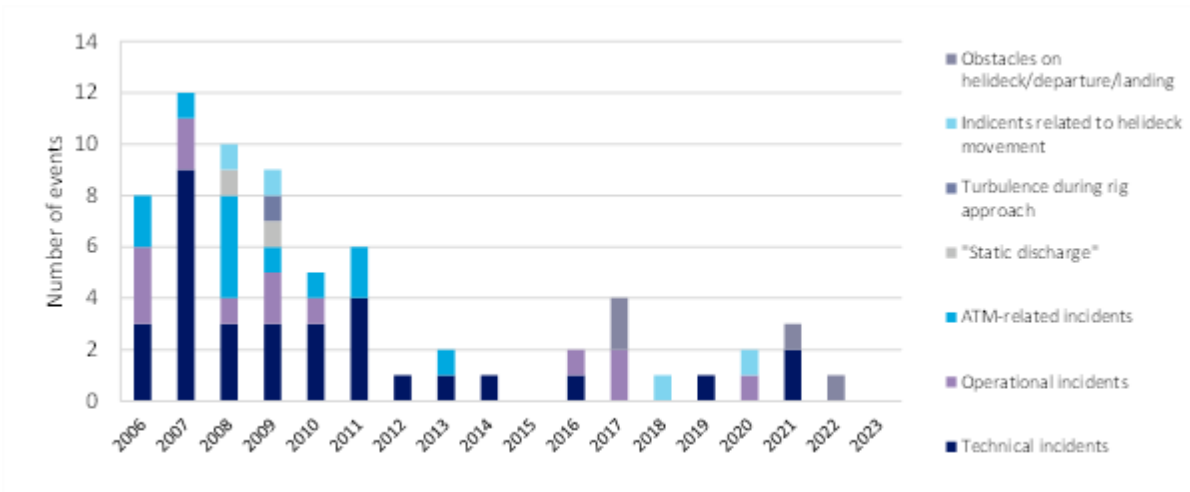


Figure 5-2 Incident indicator 1 per year by causal categories, not normalised, 2006–2023

In the expert group's assessment of incidents for 2023, there were no incidents included in incident indicator 1.

6. Status and trends – indicators for major accidents on facilities

The indicators for major accident risk from previous years have been continued, with a primary emphasis on indicators for incidents and near-misses with the potential for causing a major accident (DSHA 1-10). The indicators for DSHA 12, helicopter incidents, are presented separately in chapter 5. Barriers against major accidents are presented in chapter 7.

There have been no major accidents, per the definition used in the report, on facilities on the NCS since 1990. The serious incident on COSL Innovator in 2015 where a wave stove in windows in an accommodation section, injuring four and killing one person, is categorised as a structural incident and is the first major accident DSHA to have caused a fatality in the period 2005-2023. The last time there were any fatalities in connection with one of these major accident DSHAs was in 1985, with a shallow gas blowout on the “West Vanguard” mobile facility. Added to this are the Norne and Turøy helicopter accidents in 1997 and 2016.

6.1 DSHAs associated with major accident risk

Figure 6-1 shows the trend in the number of reported DSHAs in the period 2005-2023. It is important to emphasise that this figure does not take account of the potential of near-misses in respect of loss of life. There was a rising trend in the number of incidents during the period 1996-2000, which has been discussed in previous years’ reports. From the level in 2005, there has been a gradual reduction in the number of incidents with major accident potential. The number of reported incidents in 2023 is the lowest recorded in the period.

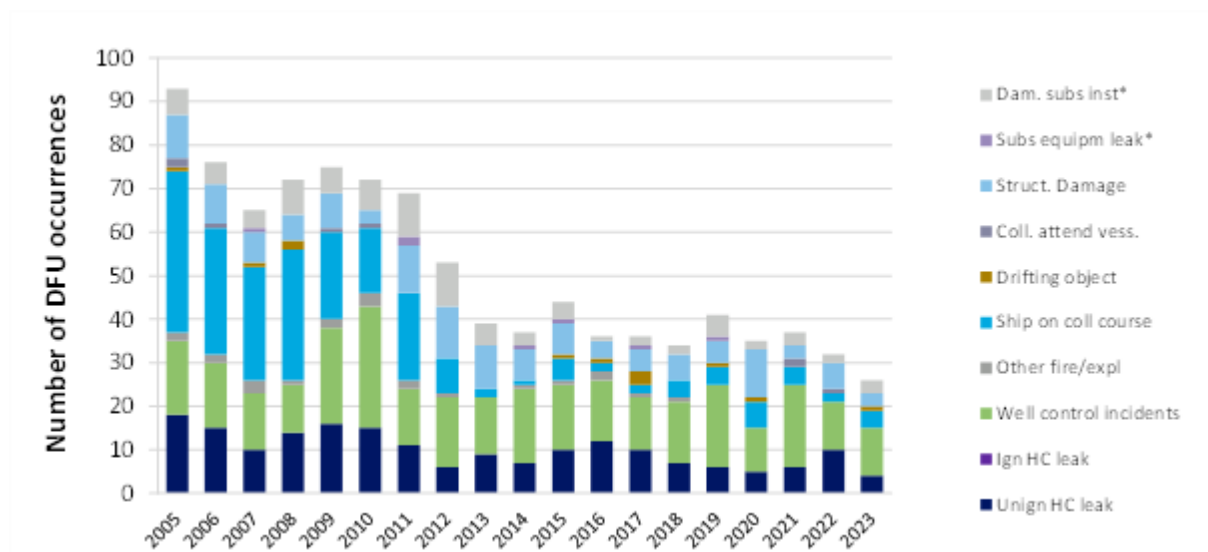


Figure 6-1 Reported DSHAs (1-10) by categories.

**Within the safety zone*

Figure 6-1 shows the numbers, while Figure 6-2 is same overview normalised against the number of working hours. The level for 2023 is in the hatched area, indicating a stable level compared to the average in the previous ten-year period.

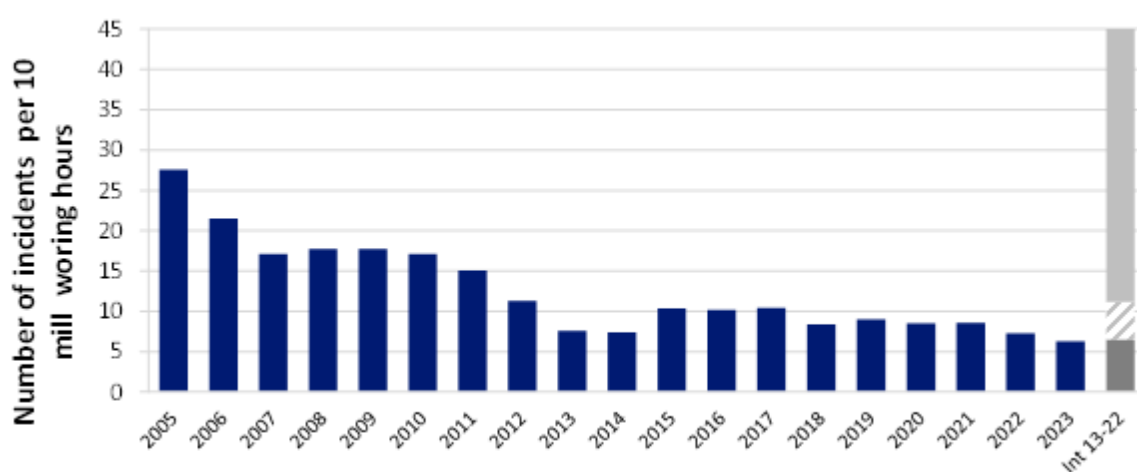


Figure 6-2 Total number of incidents DSHA 1-10 normalised against working hours

6.2 Risk indicators for major accidents

6.2.1 Hydrocarbon leaks in the process area

Figure 6-3 shows an overview of hydrocarbon leaks above 0.1 kg/s for the period 2005-2023, broken down by category of leak rate. 4 hydrocarbons leaks above 0.1 kg/s were recorded in 2023, 2 in the category 0.1-1 kg/s and 2 in the category 1-10 kg/s.

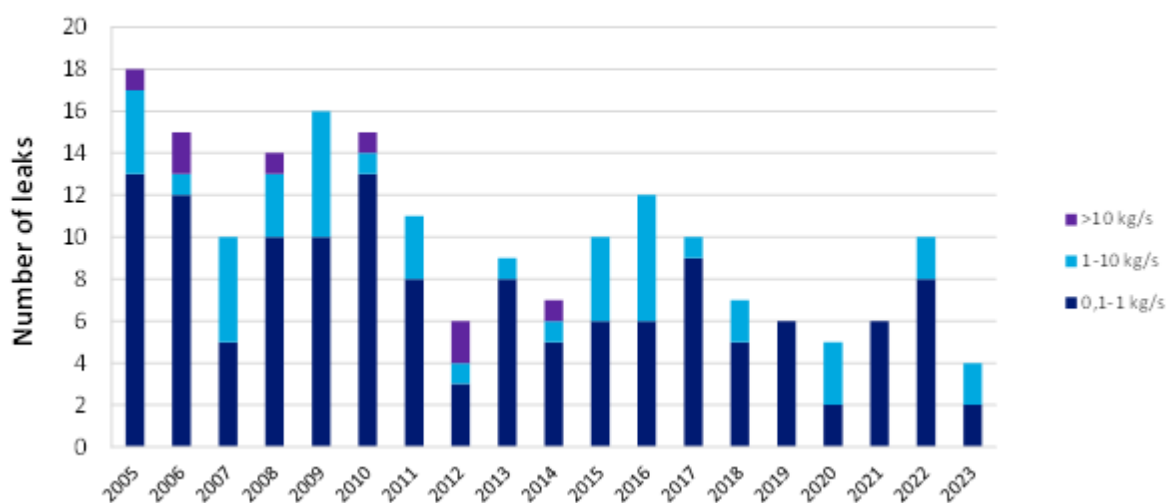


Figure 6-3 Number of hydrocarbon leaks exceeding 0.1 kg/s, 2005-2023

Figure 6-4 shows the number of leaks when these are weighted according to the risk potential they are assessed as having. In simple terms, one can say that the risk contribution of each leak is roughly proportional to the leak rate expressed in kg/s. The risk contribution in 2023 is about the same as in 2022, despite there being fewer than half the number of incidents.

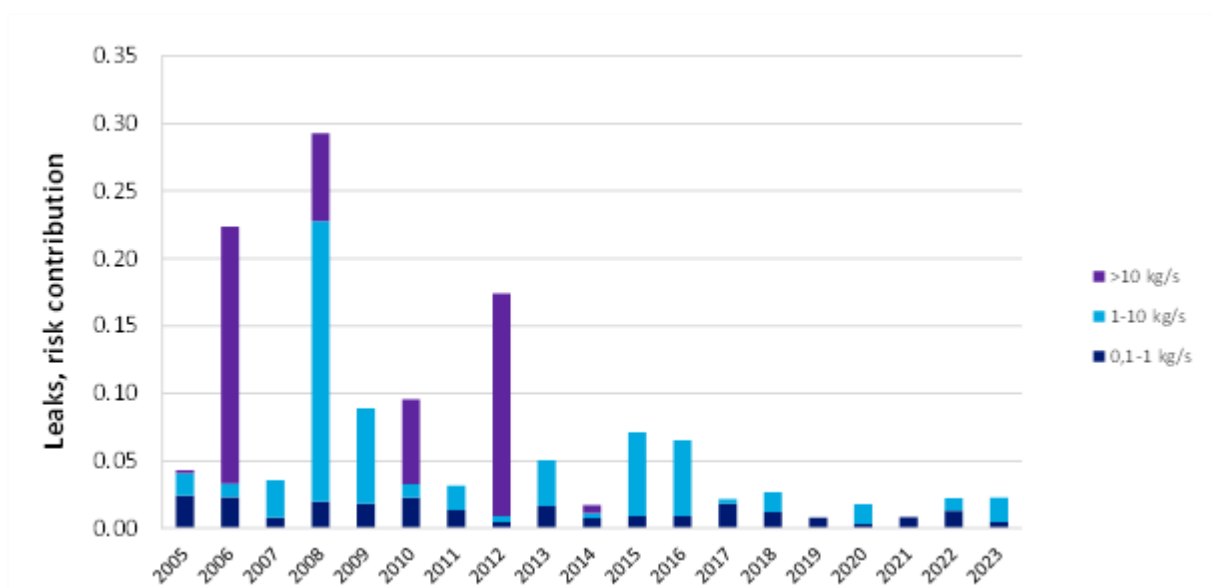


Figure 6-4 Number of hydrocarbon leaks exceeding 0.1 kg/s, 2005-2023, weighted according to risk potential

Figure 6-5 shows the trend in leaks exceeding 0.1 kg/s, normalised against working hours for production facilities. The figure shows that the number of leaks per million working hours in 2023 is within the prediction range. The change is therefore not statistically significant relative to the average for the period 2012-2021. The number of leaks has been normalised both against working hours and the number of facility years in the main report.

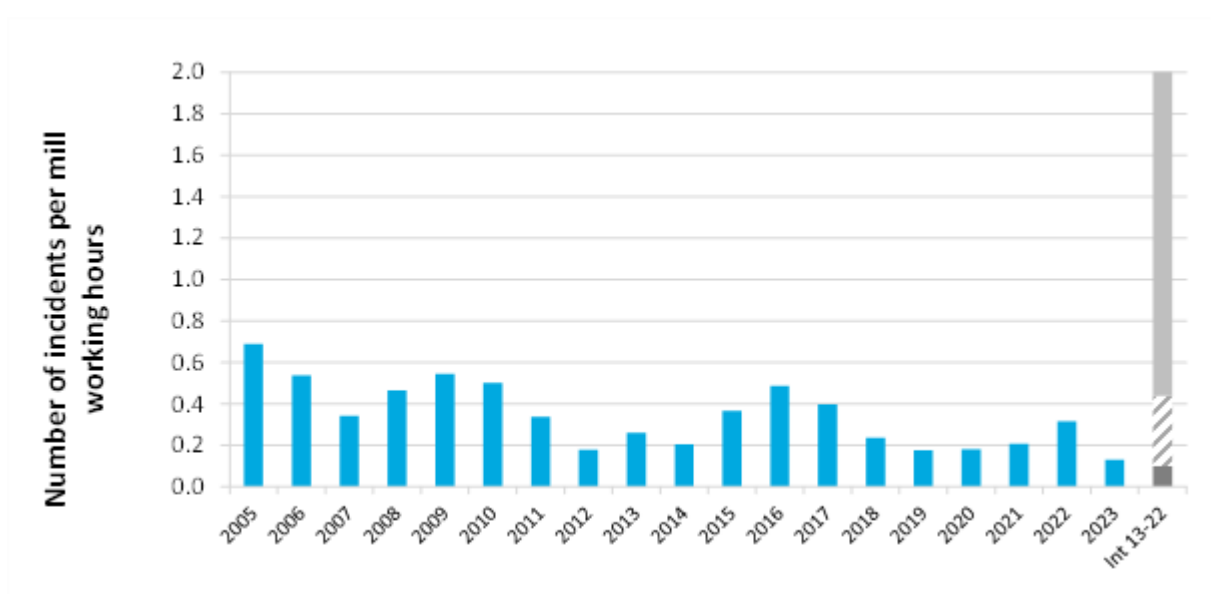


Figure 6-5 Trend, leaks, normalised against working hours

6.2.2 Loss of well control, blowout potential, well integrity

Figure 6-6 shows well control incidents broken down by exploration drilling and production drilling, normalised per 100 drilled wells.

There were 11 well control incidents in 2023, seven in production drilling and four in exploration drilling. They were all in the lowest risk category. Figure 6-6 shows the proportion of well control incidents per 100 wells drilled. In general, the number of well control incidents per drilled well has been higher for exploration drilling, and with greater annual variation, than for production drilling. This is also the case in 2023. Well control incidents in production drilling have continued the trend of recent years and are at a low level. In 2023, the gap between exploration drilling and production drilling is particularly evident with a higher proportion of incidents in exploration drilling per drilled well.

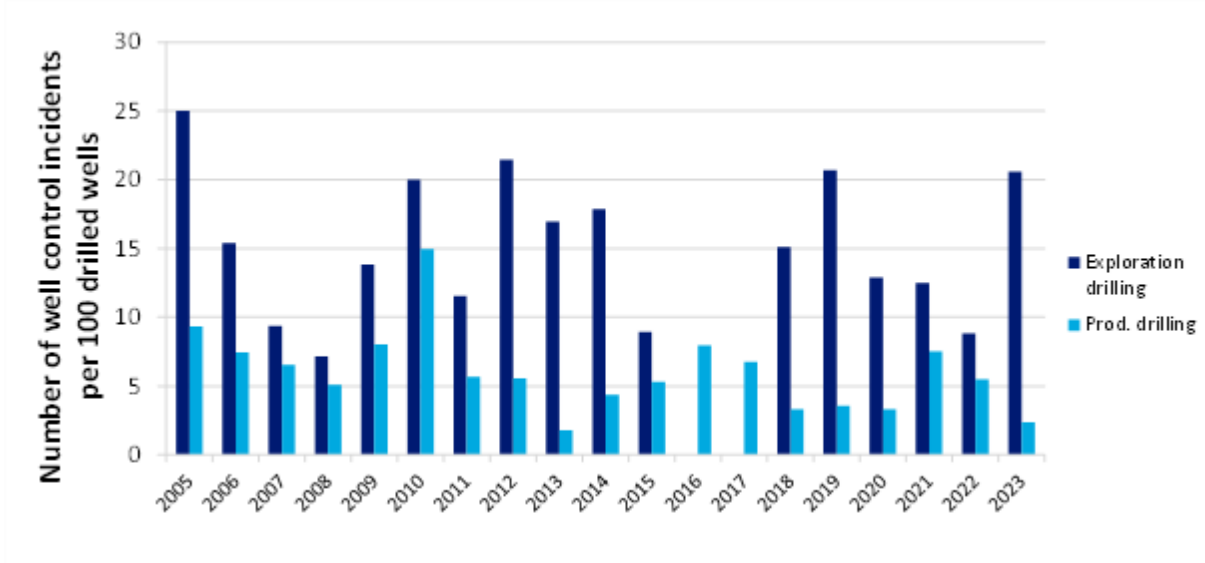


Figure 6-6 Well incidents per 100 wells drilled, for exploration and production drilling

Figure 6-7 shows the trend in weighted risk of loss of life normalised against working hours for exploration and production drilling combined. The figure shows that in 2017-2023 there was a relatively low risk associated with well control incidents on the NCS. The peaks we see in the figure are often associated with serious individual incidents that are weighted very highly compared to other incidents.

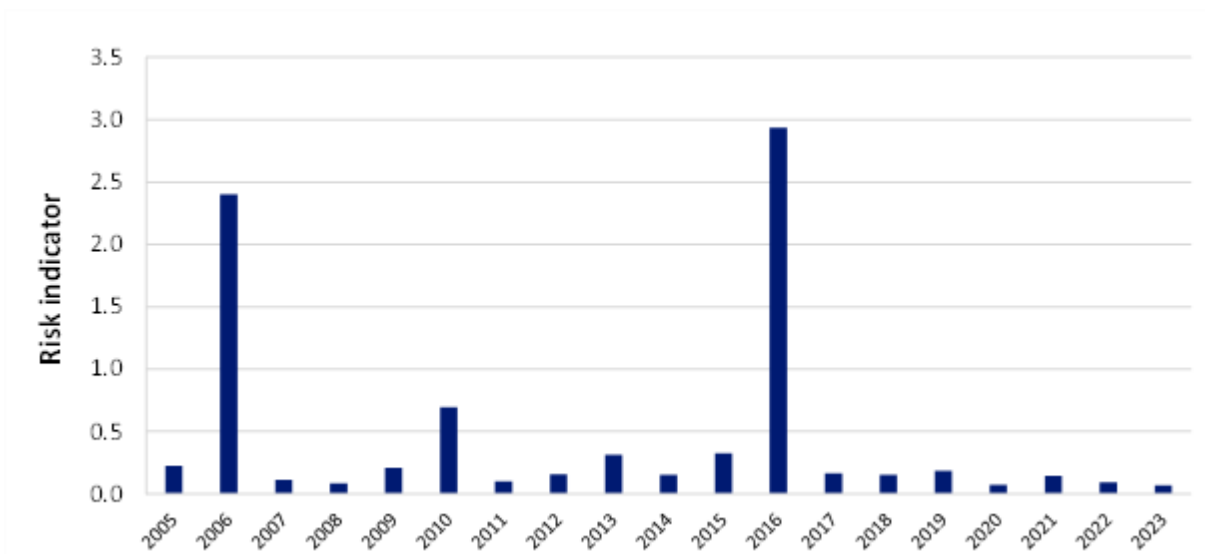


Figure 6-7 Risk indicators for well control incidents in exploration and production drilling, 2005-2023

Offshore Norge (the Norwegian Oil and Gas Association) has continued the work on well integrity issues through the Well Integrity Forum (WIF), a working group of the Drilling Managers Forum. This is a joint project for the operators on the NCS with operational production wells.

Offshore Norge Recommended Guidelines 117 for well integrity also discuss recommendations covering training, documents for transferring wells between different departments in the companies, including well barrier drawings and criteria for categorising wells.

Table 6.1 shows the criteria for categorising wells with respect to well integrity in accordance with Guidelines 117.

Table 6.1 Criteria for categorisation of wells with respect to well integrity

Category	Principle
Red	Failure of one barrier and the secondary is degraded/uncontrolled, or leak to the surface.
Orange	Failure of one barrier and the secondary is intact, or single failure that may cause leak at the surface.
Yellow	One barrier degraded, the secondary intact.
Green	Well undamaged – no or minimal non-conformity.

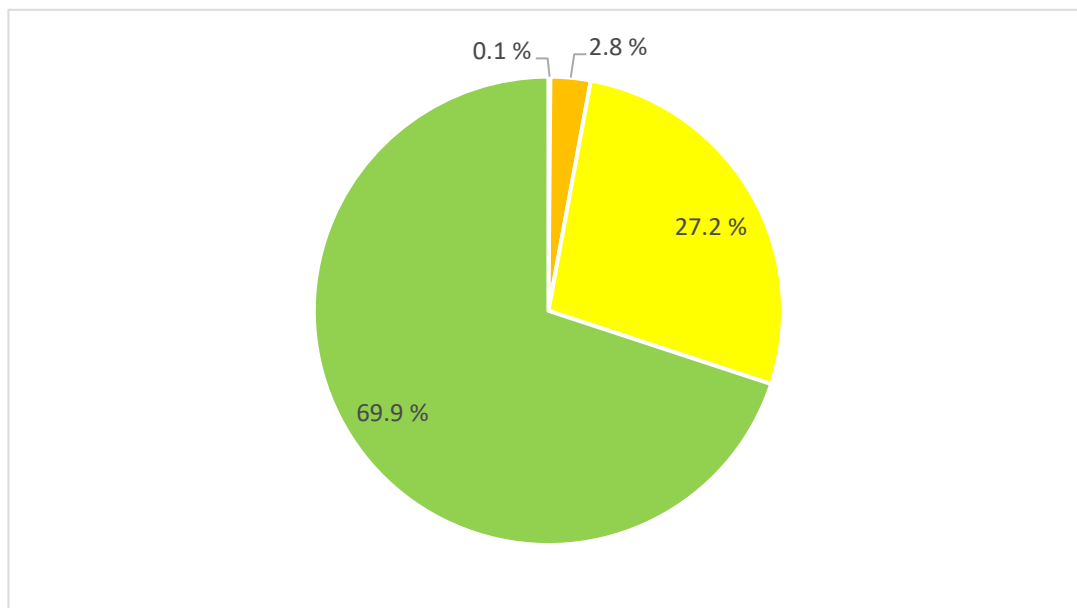


Figure 6-8 Well categorisation

The mapping in Figure 6-8 shows an overview of well categorisation by percentage share of a total of 2,245 wells.

The categorisation shows that around 30% of the wells included in the mapping have degrees of weakness of integrity. Wells in the red and orange categories have reduced quality in respect of the two-barrier requirement. Three wells (0.1%) were recorded in the red category and 62 wells (2.8%) in the orange category. There are two temporarily plugged wells and one shutdown production well included in the red category. Wells in the yellow category have reduced quality in respect of the requirement for two barriers, but the companies have compensated for this through various measures such that they are deemed to comply with the two-barrier requirement. There are 610 wells (27.2%) in the yellow category.

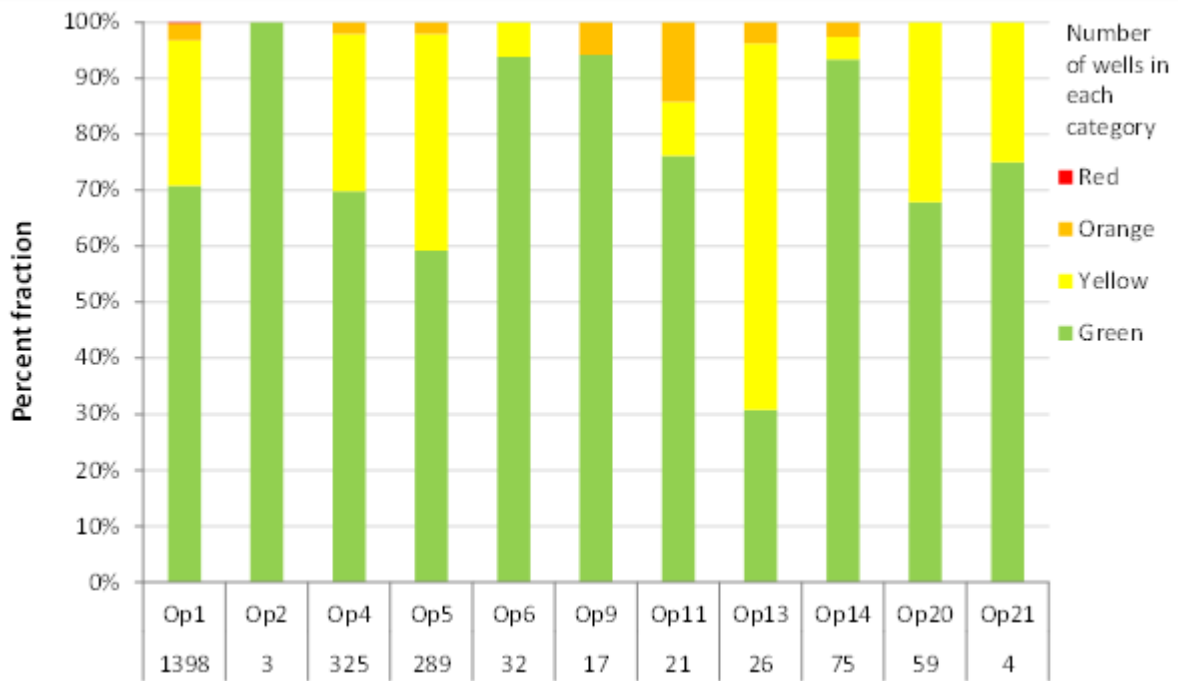


Figure 6-9 Well categorisation, by operator, 2023¹

Figure 6-9 shows the 10 operators and the wells in the integrity categories red, orange, yellow and green. There is one operator that has wells in the red category (operator 1). Six out of ten operators have over 70% of their wells in the green category, with one of them reporting all of their wells in the green category.

6.2.3 Leak/damage to risers, pipelines and subsea facilities

In 2023, no serious leaks from risers were reported. Nor were any serious leaks from pipelines within the safety zones of surface facilities reported in 2023. Two incidents of hydrocarbon leaks from pipelines and subsea facilities outside the safety zones of manned facilities were reported.

As in previous years, there are still some leaks of chemicals such as hydraulic/barrier/control fluid and the like. Five such leaks have been reported.

¹ The number of wells included for each operator is stated under Op1, Op2, etc.

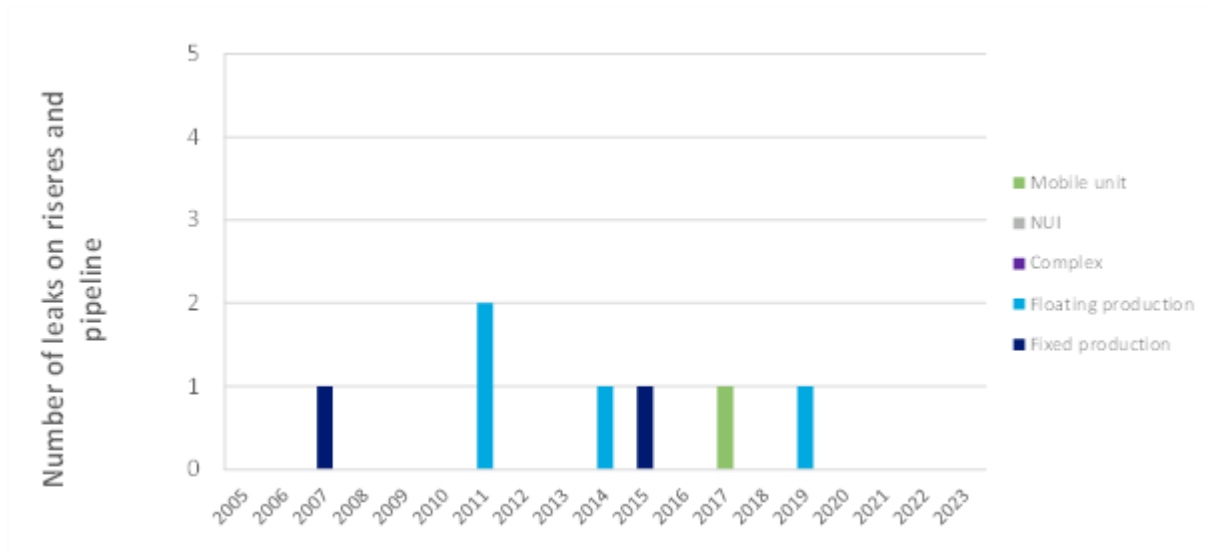


Figure 6-10 Number of leaks from risers & pipelines within the safety zone, 2005-2023

In 2023, three serious incidents involving flexible risers were reported. Flexible risers have been and remain an important contributor to risk. We have followed up on this topic for several years, and in 2023 continued our previous work on auditing and general monitoring of flexible risers. Figure 6-11 shows the number of incidents of major damage to risers and pipelines during the period 2005-2023. Updated information has emerged from a number of previous years, which means that the figure is not comparable with figures in previous reports.

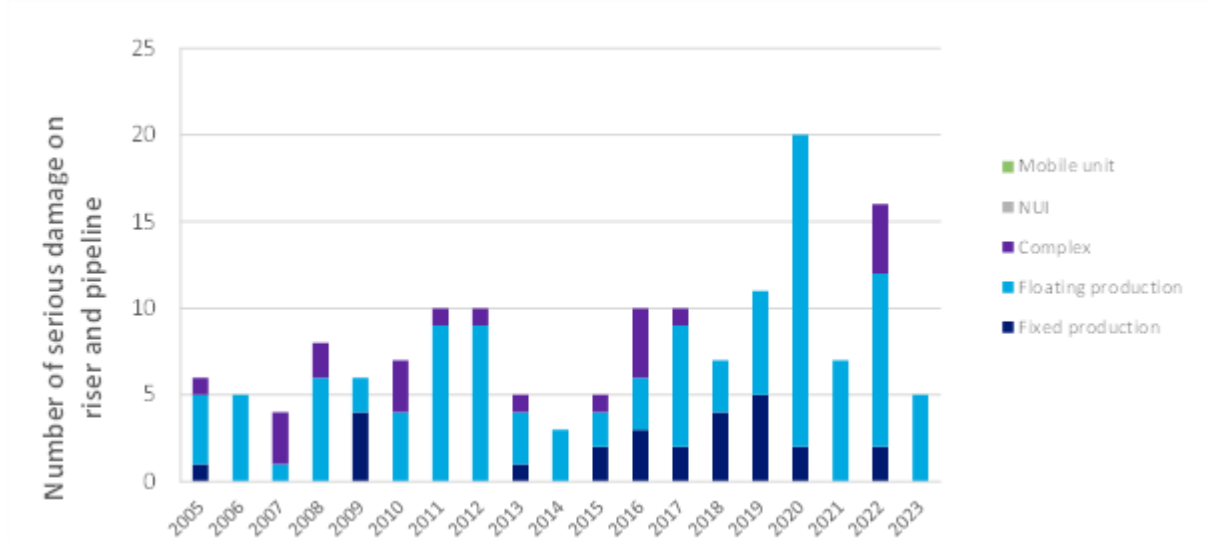


Figure 6-11 Number of major damage incidents to risers & pipelines within the safety zone, 2005-2023

6.2.4 Ships on collision course, structural damage

The number of instances of ships on collision courses has declined substantially in recent years. The number of incidents in 2023 shows no statistically significant change against the average in the period 2013-2022.

Major accidents associated with structures and maritime systems are rare. Even though there have been several very serious incidents in Norway, there are too few to gauge trends. Accordingly, incidents and damage of lesser severity have been selected as

measures of changes in risk. It is assumed that there is a connection between the number of minor incidents and the most serious; see the methodology report.

The current regulations set requirements for flotel and production facilities in terms of withstanding the loss of two anchor lines without serious consequences. Loss of more than one anchor line happens from time to time. Mobile drilling facilities are required to withstand the loss of one anchor line without undesirable consequences.

Structural damage and incidents that have been included in RNNP are primarily classified as fatigue damage, while some are storm damage. As regards cracks, only continuous structural cracks are included. No clear connection has been demonstrated between the age of the facility and the number of cracks. Figure 6-12 shows the number of reported incidents and damage events to structures and maritime systems which conform to the criteria for DSHA 8 in the period 2005-2023. In total, three incidents are included for 2023. That is three fewer than in 2022.

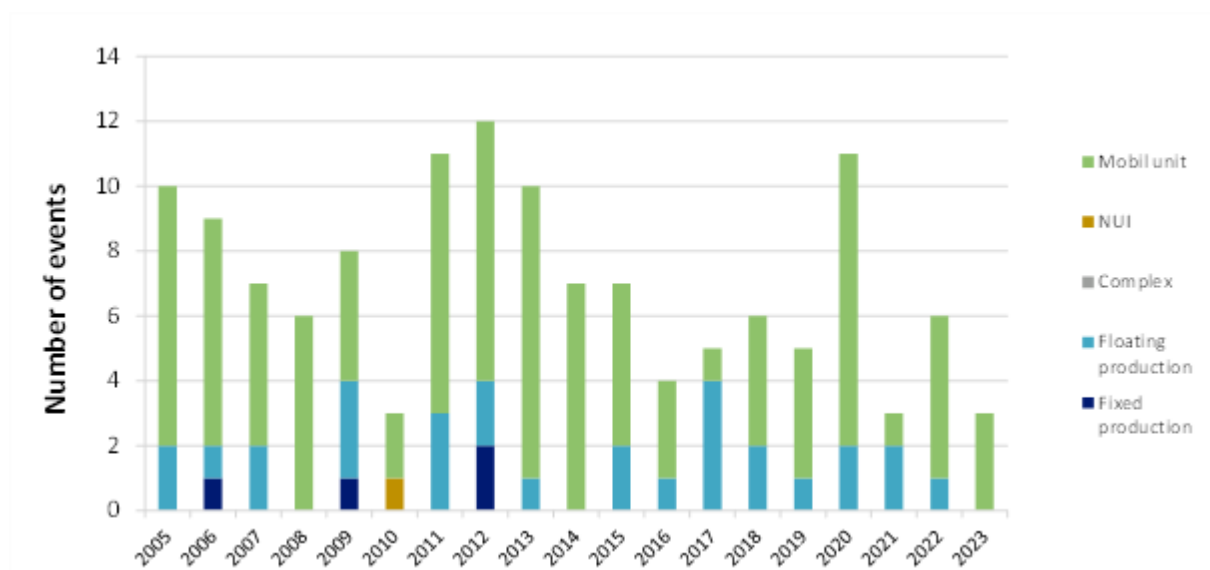


Figure 6-12 Number of reported incidents and damage events to structures and maritime systems which conform to the criteria for DSHA 8

6.3 Total indicator for major accidents

The total indicator is a calculated indicator based on incident frequency and the potential of the incidents/near-misses to cause loss of life if they develop into an actual accident. It is emphasised that this indicator is only a supplement to the individual indicators, and expresses the development in risk factors related to major accidents. In other words, the indicator expresses the effects of risk management.

The total indicator weights the contributions from the observations of the individual near-misses according to the potential for loss of life, and will therefore vary considerably, based on the potential of the individual incidents. The weightings were last amended in 2020 to better reflect current knowledge. More details about these can be found in the methodology report (Havtil, 2024c). The weightings are still fixed for different types of incidents and facility types. Especially serious incidents are assessed individually, in order to determine a realistic weighting based on the relevant conditions at the facility and the incident. In 2023, there were no especially serious incidents.

There are large annual variations in this indicator, mainly caused by especially serious incidents. The large variations are reduced when viewing the three-year rolling average. This clarifies the underlying trend. Normalisation is performed against working hours. The level of the normalised value is set at 100 for the year 2005, which also applies to the value for the three-year rolling average.

Figure 6-13 shows the total indicator for production and mobile facilities. The 2023 value is the lowest observed throughout the period. The underlying trend, illustrated using a 3-year rolling average, shows a positive trend over time, with a levelling off in recent years.

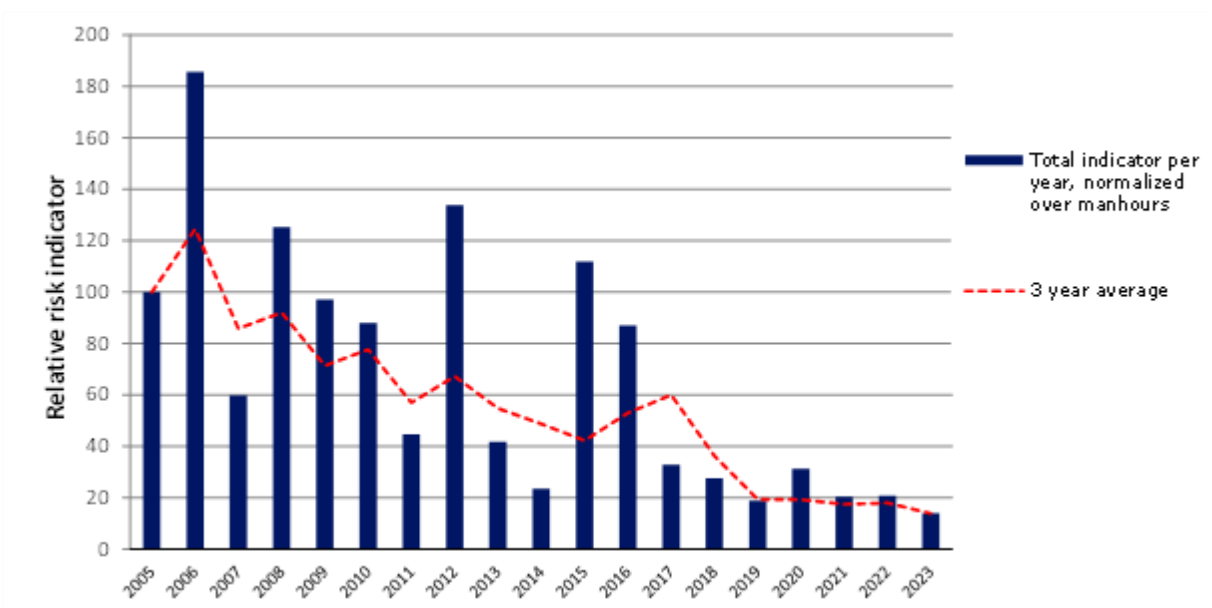


Figure 6-13 Total indicator for major accidents per year, normalised against working hours (Reference value is 100 in the year 2005, both for total indicator and three-year rolling)

The trend can be interpreted to mean that, in the period, the participants have achieved better management of factors that affect major accident risk. This can also be taken as an indication that factors that affect future risk must be kept in sharp focus and under active and continuous management.

Figure 6-14 and Figure 6-15 show the total indicator for production facilities and mobile facilities.

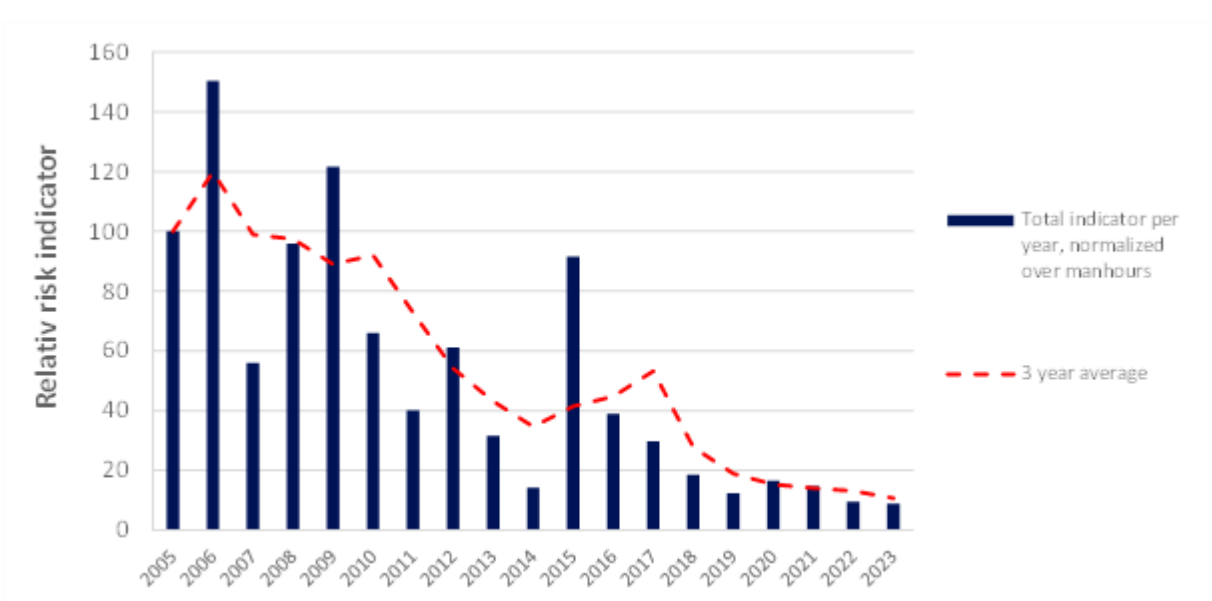


Figure 6-14 Total indicator, major accidents, production facilities, normalised against working hours, compared to three-year rolling average (Reference value is 100 in the year 2005, both for total indicator and three-year rolling)

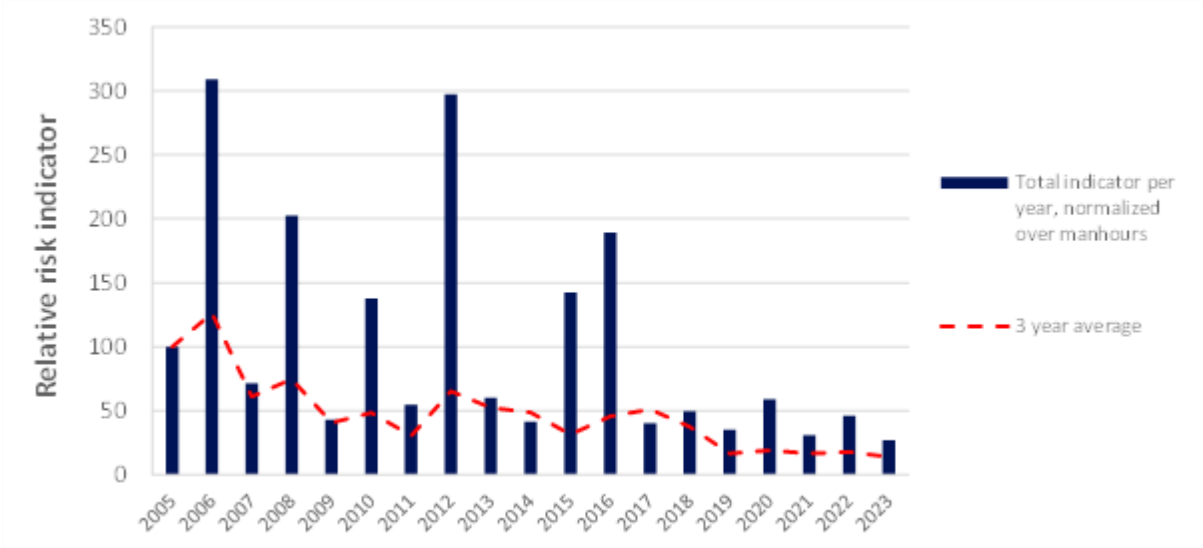


Figure 6-15 Total indicator, major accidents, mobile facilities, normalised against working hours, compared to three-year rolling average (Reference value is 100 in the year 2005, both for total indicator and three-year rolling)

7. Status and trends – barriers against major accidents

Reporting and analysis of data concerning barriers has been continued from preceding years without significant adjustments. As previously, the companies report test data from routine periodic testing of selected barrier elements.

7.1 Barriers in the production and process facilities

Primary emphasis is placed on barriers relating to leaks from the production and process facilities, including the following barrier functions:

- Integrity of hydrocarbon production and process facilities (covered to a considerable degree by the DSHAs)
- Prevent ignition
- Reduce clouds/emissions
- Prevent escalation
- Prevent any fatalities

The different barriers consist of several interacting barrier elements. For example, a leak must be detected before isolation of ignition sources and emergency shutdown (ESD) is implemented.

Figure 7-1 shows the proportions of failures for selected barrier elements associated with production and processing. The test data are based on reports from all production operators on the NCS. In addition, the associated industry norm for each barrier element is shown. Mean proportions of failures for 2023 are above the industry norms for riser ESDV closure test and leak test, DHSV and BDV.

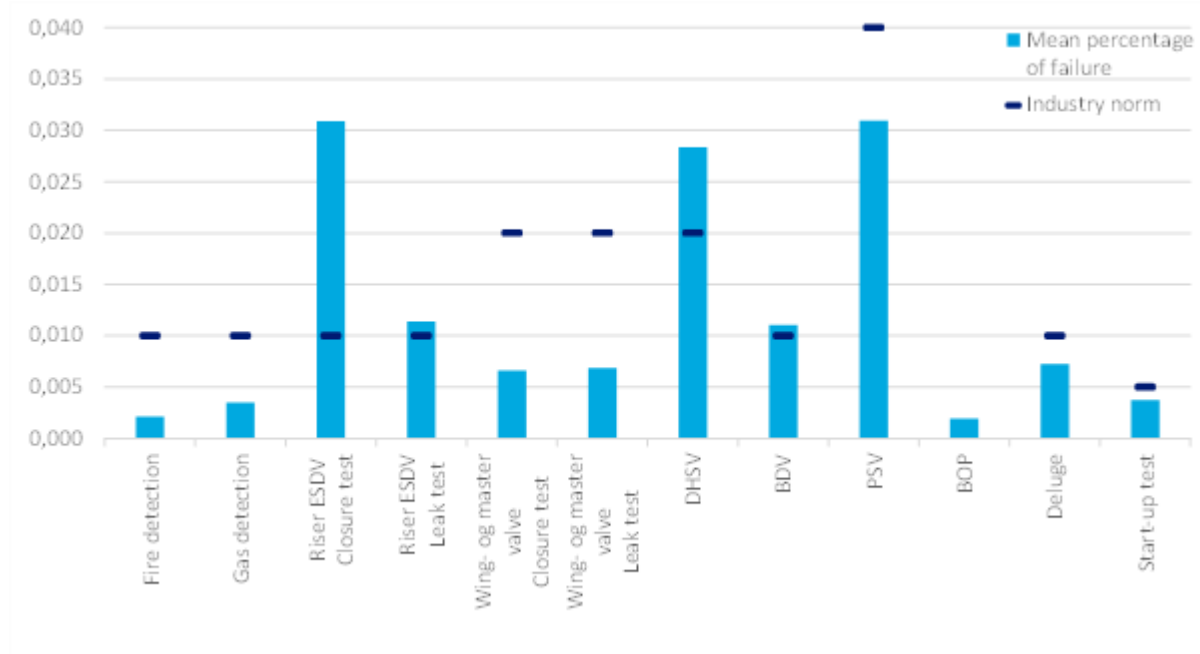


Figure 7-1 Mean proportions of failures for selected barrier elements in 2023

The main report shows both the “mean proportion of failures”, i.e. the proportion of failures for each facility individually, averaged for all facilities, and the “overall proportion of failures”, i.e. the sum of all failures on all reporting facilities, divided by the sum of all tests for all reporting facilities. All facilities make the same contribution to the mean proportion of failures, regardless of how many tests they have.

The data show considerable variations in average levels for each of the operating companies, and for several of the barrier elements. The variations are even greater when one looks at each individual facility, as has been done for all barrier elements in the main report. Figure 7-2 shows an example of such a comparison for gas detection (all types of gas detectors). Each individual facility is assigned a letter code, and the figure shows the

proportion of failures in 2023, the mean proportion of failures during the period 2005-2023, as well as the total number of tests carried out in 2023 (as text on the X axis, along with the facility code).

The industry norm for gas detection is 0.01. Figure 7-2 shows that 5 facilities are above the norm for the proportion of failures in 2023, while 11 are above the norm when taking the average in the period 2005-2023.

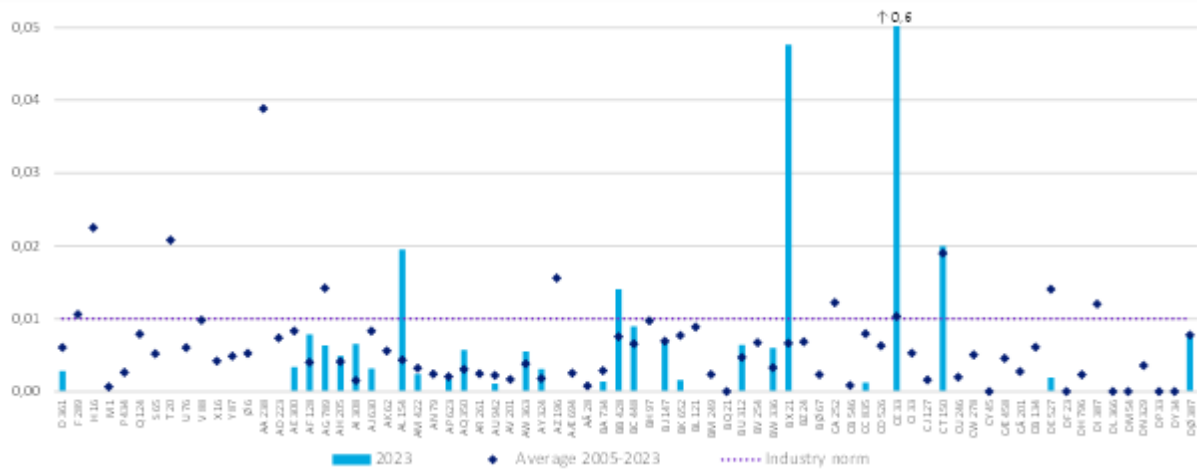


Figure 7-2 Proportion of gas detection failures

For production facilities, barrier data have now been collected for 20 years for most of the barriers, and the results show that there are large differences in level between the facilities. In Figure 7-3 and Figure 7-4 the mean proportion of failures as three-year rolling averages are compared from 2011 to 2023.

Figure 7-3 shows that fire detection, gas detection and start tests of fire pumps are consistently low and below the respective industry norms for mean proportions of failures as three-year rolling averages. Riser ESDV closure tests show a fall from the start of the period up to 2015, but a rising trend from 2015 to 2021. In 2022, there is a large reduction, with a slight increase again in 2023. Riser ESDV leak tests have the same trend, with declines up to 2018 and then a sharp increase every year until 2021 before falling off again in 2022-2023. All years are well above the industry norm of 0.01 for both riser ESDV closure and leak tests. BDV shows a downward trend from 2012 to 2015, with a subsequent slight upward trend in the period 2015-2022. In 2023, we see a decline from 2022. For the past ten years, BDV has been between 0.015 and 0.025, which is well above the industry norm of 0.01. Deluge valve fluctuates around the industry norm at 0.01, with some years above and other years below the industry norm. In 2023, the deluge valve is just below the industry norm.

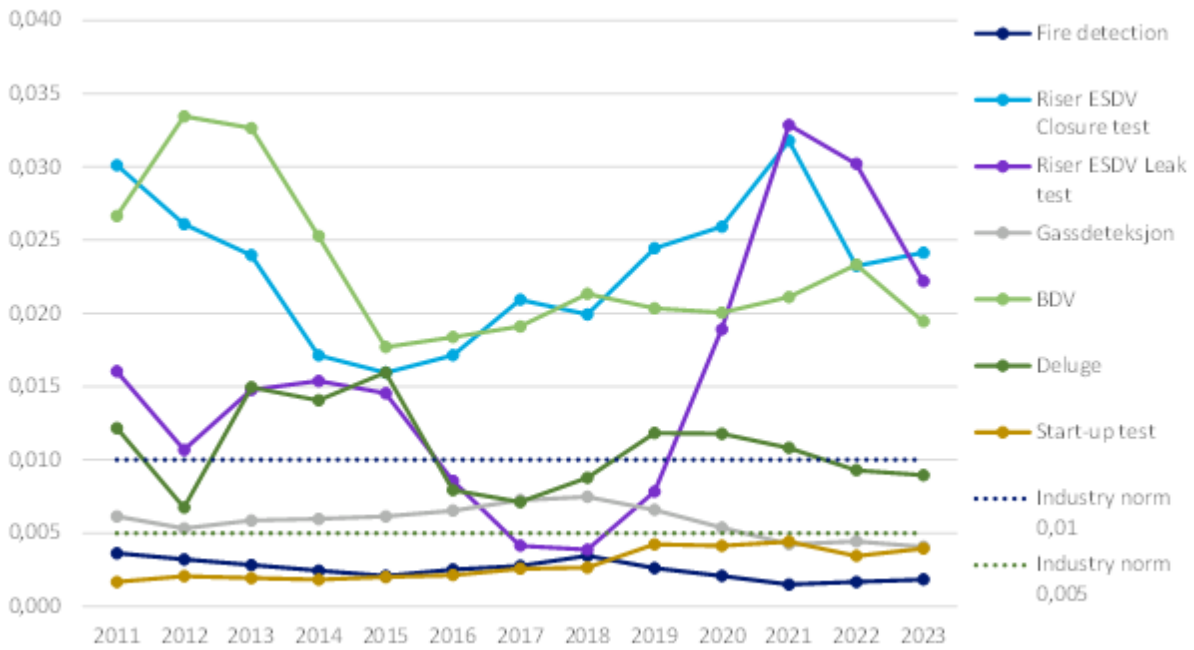


Figure 7-3 Mean proportions of failures as three-year rolling averages

Figure 7-4 shows that for DHSV, the mean proportion of failures as three-year rolling averages has a rising trend from 2012 to 2017, before it flattens out and shows a steady slight decline in the period 2021-2023. DHSV has been above the industry norm of 0.02 since 2013. Other barriers remain stably below applicable industry norms. The wing and master valve closure and leakage tests have shown a weak downward trend in recent years. PSV is relatively stable in the period 2011-2019, with a rising trend in subsequent years. PSV is still well below the industry norm of 0.04 throughout the period 2011-2023.

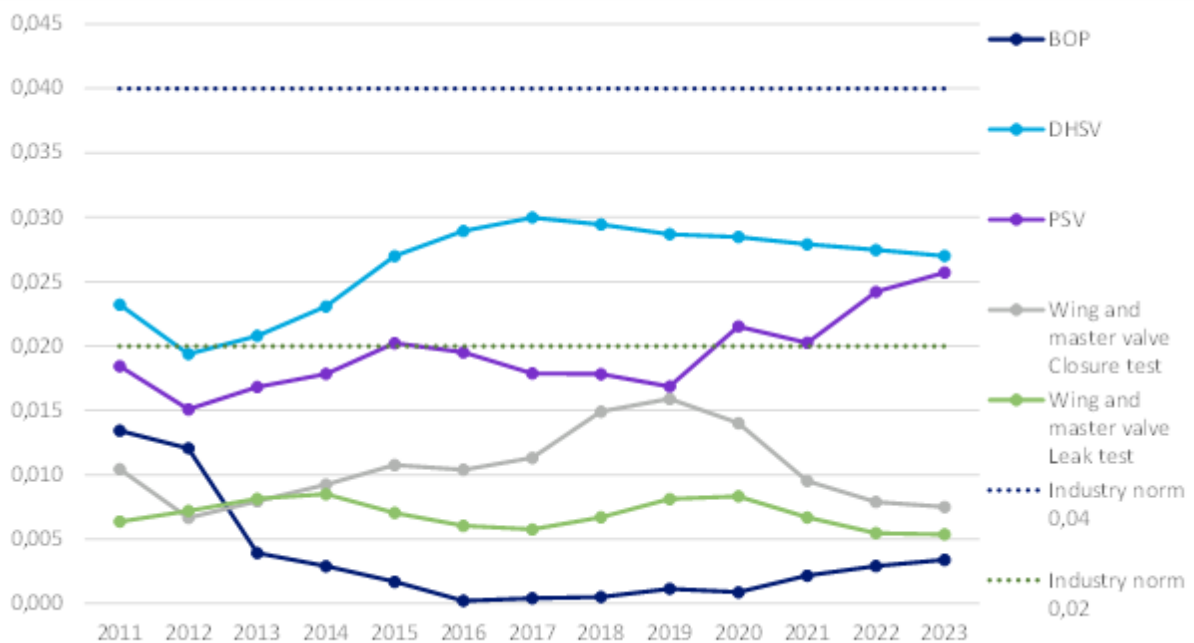


Figure 7-4 Mean proportion of failures as three-year rolling averages

Table 7-1 shows how many facilities have carried out tests for each barrier element, the average number of tests for those facilities that have carried out tests, the number of facilities that have a proportion of failures above the industry norm in 2023, and the average for the period 2005-2023 above the industry norm. The mean proportion of failures for 2023 and for the period 2005-2023 have also been included. These can then

be compared with the industry's availability requirements for safety-critical systems. Figures in bold indicate that the proportion of failures exceeds the industry norm.

Table 7-1 General calculations and comparison with industry norms for barrier elements

Barrier elements	Number of facilities where tests were performed in 2023	Average number of tests, for facilities where tests were performed in 2023	Number of facilities with proportion of failures in 2023 higher than the industry norm (and avg. 2005-2023 in parentheses) ^{2,3}	Mean proportion of failures in 2023	Mean proportion of failures 2005-2023	Industry norm for availability
Fire detection	75	461	5 (5)	0.002	0.003	0.010
Gas detection	74	268	5 (12)	0.003	0.007	0.010
Shutdown:						
· Riser ESDV	67	20	12 (12)	0.029	0.020	0.010
Closure test	66	12	11 (9)	0.031	0.022	0.010
Leak test	66	7	4 (5)	0.011	0.016	0.010
· Wing and master (Christmas tree)	83	218	8 (8)	0.006	0.010	0.020
Closure test	80	102	6 (6)	0.007	0.007	0.020
Leak test	83	119	9 (10)	0.007	0.011	0.020
· DHSV	82	86	30 (25)	0.028	0.026	0.020
Blowdown valve (BDV)	64	48	19 (20)	0.011	0.021	0.010
Pressure safety valve (PSV)	73	74	18 (14)	0.031	0.023	0.040
Isolation using BOP	18	145	2 (6)	0.002	0.010	-
Active fire safety:						
· Deluge valve	75	26	10 (10)	0.007	0.011	0.010
· Start test	61	85	15 (9)	0.004	0.003	0.005

7.2 Barriers associated with maritime systems

In 2023, data were collected for the following maritime barriers on mobile facilities:

- Watertight doors
- Valves in the ballast system
- Deck height (air gap) for jack-up facilities
- GM and KG margin values for floaters. The KG margin values have been collected as of 2015.

Data collection is carried out for both production and mobile facilities. There are considerable variations in the number of tests per facility, from daily tests to twice per year.

7.3 Maintenance management

Defective or deficient maintenance has often proved to be a contributory cause of major accidents. The major accident potential means that safety work in general and the

² For *closure tests* and *leak tests* for riser ESDVs and wing and master valves, the average is from 2007, for PSVs and BDVs, the average is from 2005.

³ For BOP, which does not have a defined industry norm, the table shows the number of facilities with number of failures above 0.

maintenance of safety-critical equipment in particular have been given a strong emphasis in the petroleum industry.

One aim of such maintenance management is to identify critical functions, and ensure that safety-critical barriers work when required.

The individual participant is responsible for regulatory compliance and ensuring systematic HSE efforts, so as to reduce the risk of unwanted incidents and major accidents.

7.3.1 The management of maintenance of fixed facilities

The main report shows more graphs of participants' maintenance management figures than are reproduced here.

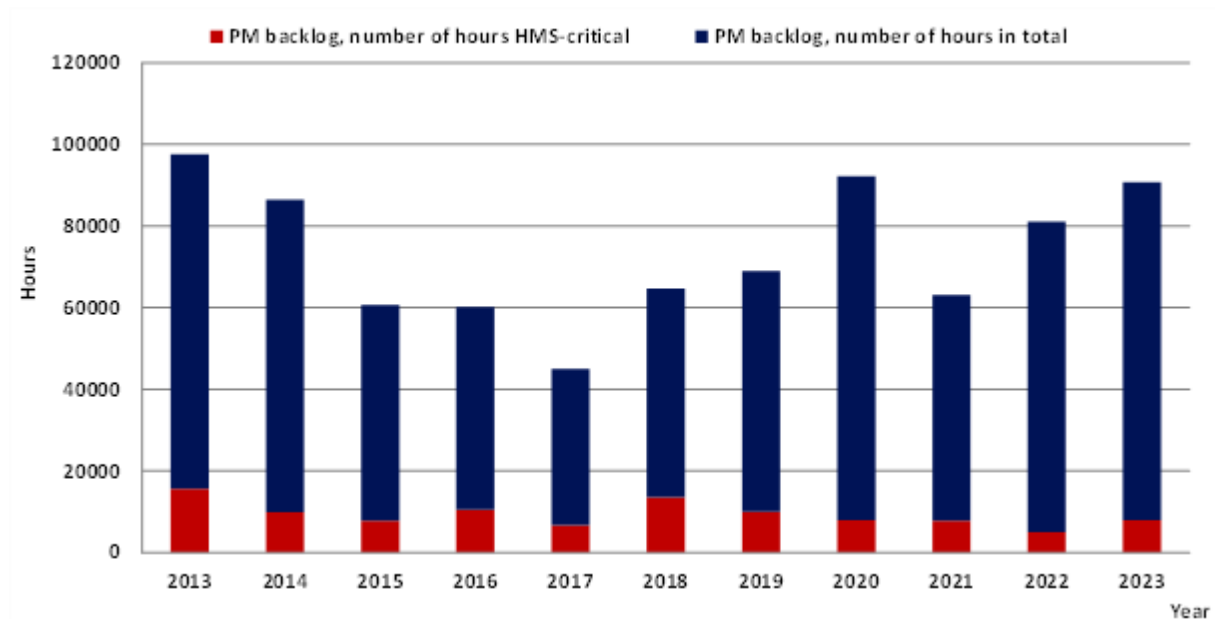


Figure 7-5 Total backlog in PM per year in the period 2012-2023 for the fixed facilities

Figure 7-5 shows the *total backlog in preventive maintenance* in the period 2012-2023 (sum of monthly averages). The total backlog in preventive maintenance in 2023 is higher than that reported in 2021 and 2022. The backlog in HSE-critical preventive maintenance is stable.

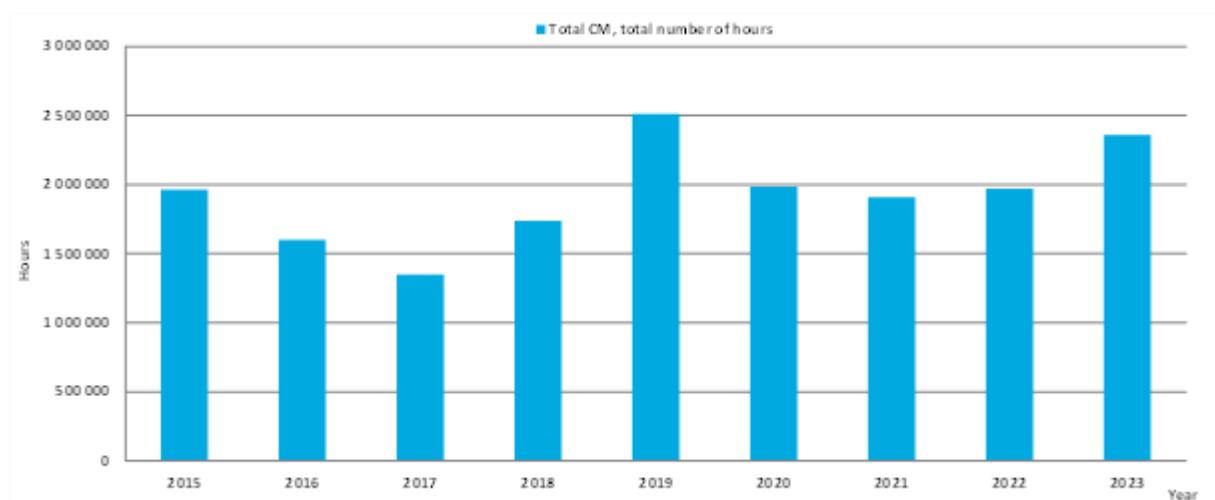


Figure 7-6 Total CM at 31.12.2023 for the fixed facilities. Two facilities have not provided data.

Figure 7-6 shows that the amount of identified corrective maintenance increases significantly in 2023 compared to 2022. At facility level, we see that some facilities have a high total number of hours of corrective maintenance not performed as at 31.12.2023.

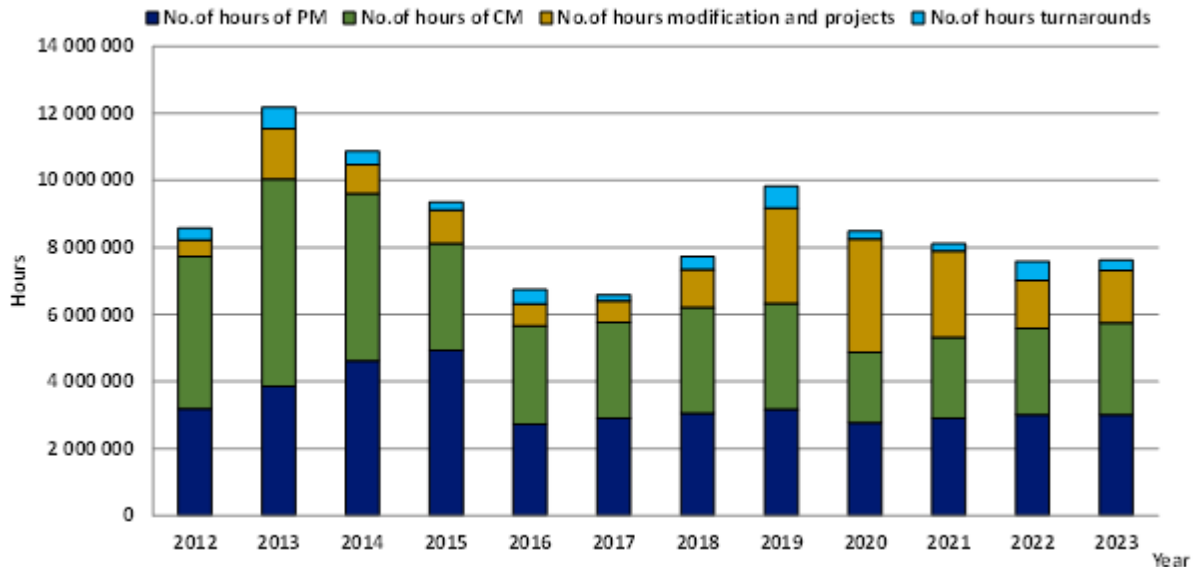


Figure 7-7 Total number of hours for performed maintenance, modifications and planned shutdowns for the fixed facilities in the period 2012-2023

Figure 7-7 is the total number of hours for *performed maintenance, modifications and planned shutdowns* for the fixed facilities in the period 2012-2023. Figure 7-7 is especially intended to show the *distribution* of the activities. We see that the hours performed for the activities overall are stable over the last three years.

We note that:

- some of the facilities have not classified some of the tagged equipment
- there are large variations in the proportion of HSE-critical equipment, with some facilities having a low proportion of such equipment. The participants use virtually the same classification method
- there are few hours of backlog in preventive maintenance, but a number of facilities have not performed HSE-critical preventive maintenance in accordance with their own deadlines
- the total backlog in preventive maintenance in 2023 is higher than that reported in 2021 and 2022. The backlog in HSE-critical preventive maintenance is stable
- some facilities have a high total number of hours of corrective maintenance not performed at 31.12.2023. Some facilities have increased the number of hours, but most facilities have stable figures
- one participant has seen a significant increase in the number of hours of corrective maintenance that have been identified, but not performed, in recent years
- there is overall a considerable number of hours of corrective maintenance not performed as at 31.12.2023. The level in 2023 is approximately the same as in 2019, and there has been an increase over the past three years
- in 2023, fewer hours on the total outstanding corrective maintenance were recorded than in recent years and they constitute the lowest amount reported since 2016. The total outstanding HSE-critical corrective maintenance also shows a decline in 2023 and is the lowest reported since 2016
- the hours performed for the activities overall are stable over the last three years.
- there is a large variation in the percentage distribution by participant of performed preventive and corrective maintenance

some operators have a significant number of hours of corrective maintenance not performed on 31.12 of the last three years compared to the corrective maintenance performed in the same period. We see that some operators have more identified corrective maintenance than they are able to perform, even across the years. Compared against the figure for tagged equipment, there are no significant changes to identified equipment during the same period.

These observations must be seen in the context of the regulatory requirements, This means that

- plant, systems and equipment must be tagged and classified so as to facilitate safe operation and prudent maintenance, including maintaining the performance of the barriers
- the activity level on the facility must take account of the status of maintenance performance. Status in this context includes the backlog of preventive maintenance and the outstanding corrective maintenance
- the significance of unperformed maintenance must be assessed both individually and in combination. The assessment is crucial for determining the extent to which unperformed maintenance entails increased risk
- backlogs in the HSE-critical preventive maintenance may contribute to increased uncertainty with regard to technical condition, and hence increased risk
- corrective maintenance of HSE-critical equipment should not exceed the defined deadlines, since the HSE-critical equipment is intended to inhibit or restrict the defined hazard and accident situations.

7.3.2 The management of maintenance of mobile facilities

Figure 7-8 provides an overview of tagged and classified equipment at 31.12.2023. The figure shows that there is large variation in the degree of tagging and classification of the facilities' systems and equipment

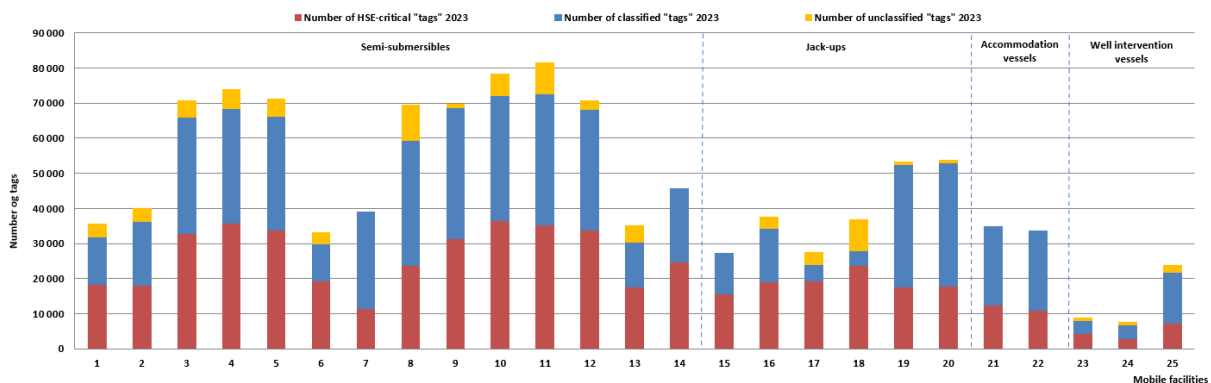


Figure 7-8 Tagged and classified equipment for mobile facilities at 31.12.2023.

Figure 7-9 shows the *backlog in preventive maintenance* in 2023.

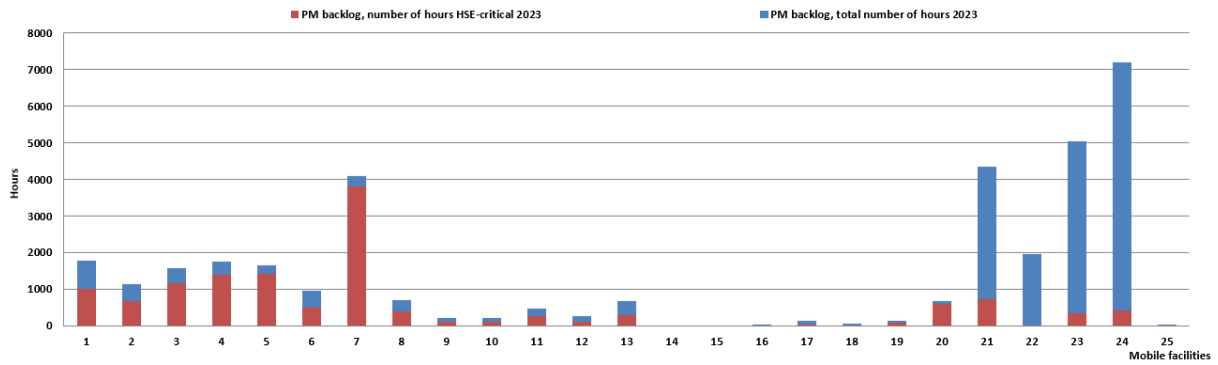


Figure 7-9 Backlog in PM for mobile facilities in 2023

Figure 7-9 shows variations in the backlog of preventive maintenance for mobile facilities. Several facilities have not performed HSE-critical preventive maintenance in accordance with defined deadlines. This may contribute to increased uncertainty with regard to technical condition, and hence increased risk.

Maintenance is of great importance for maintaining critical functions and ensuring that HSE-critical equipment functions when required.

Figure 7-10 shows the *outstanding corrective maintenance* in 2023.

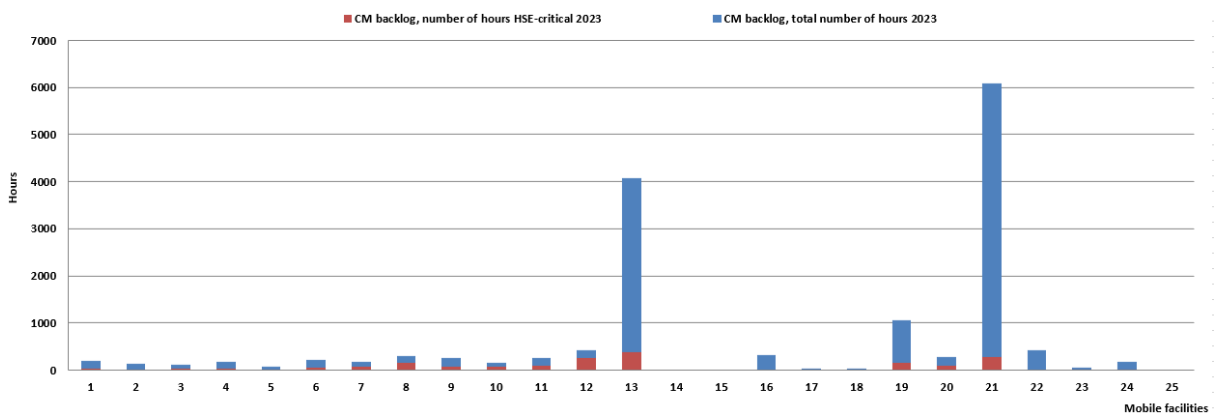


Figure 7-10 Outstanding CM for mobile facilities in 2023

Figure 7-10 shows variations in the outstanding corrective maintenance for mobile facilities. However, the hour count is relatively low for most facilities. Some facilities have not performed HSE-critical corrective maintenance in accordance with their defined deadlines.

Maintenance of this type of equipment should not exceed the defined deadlines since HSE-critical equipment is intended to inhibit or restrict the defined situations of hazard and accident.

On several occasions, we have emphasised the importance of participants assessing the significance of outstanding corrective maintenance, both as individual items and collectively. The assessment is crucial for determining the extent to which outstanding maintenance entails increased risk.

We note that:

- there is large variation in the degree of tagging and classification of the facilities' systems and equipment
- newer facilities generally have a higher quantity of tagged and classified equipment than older ones
- there is a lot of variation in the proportion of HSE-critical equipment for the mobile facilities and that not all of the equipment is classified

- there are variations in the backlog of preventive maintenance for mobile facilities.
- several facilities have not performed HSE-critical preventive maintenance in accordance with their defined deadlines
- there are variations in the outstanding corrective maintenance for mobile facilities. However, the hour count is relatively low for most facilities.
- some facilities have not performed HSE-critical corrective maintenance in accordance with their defined deadlines
- several facilities have large variations in the tagging of equipment from year to year. Some facilities have a significant reduction in the amount of tagged equipment reported in 2023 compared to previous years. Most have stable numbers
- there is a large variation in the percentage distribution by participant of performed preventive and corrective maintenance.

These observations must be seen in the context of the regulatory requirements, This means that

- plant, systems and equipment must be tagged and classified so as to facilitate safe operation and prudent maintenance, including maintaining the performance of the barriers
- the activity level on the facility must take account of the status of maintenance performance. Status in this context includes the backlog of preventive maintenance and the outstanding corrective maintenance
- the significance of unperformed maintenance must be assessed both individually and in combination. The assessment is crucial for determining the extent to which unperformed maintenance entails increased risk
- backlogs in the HSE-critical preventive maintenance may contribute to increased uncertainty with regard to technical condition, and hence increased risk
- corrective maintenance of HSE-critical equipment should not exceed the defined deadlines, since the HSE-critical equipment is intended to inhibit or restrict the defined hazard and accident situations.

8. Work accidents involving fatalities and serious personal injuries

There were no fatalities within Havtil's area of authority on the NCS in 2023. For 2023, Havtil registered 185 personal injuries on facilities in the petroleum activities on the NCS that fulfil the criteria of fatality, absence into the next shift or medical treatment. In 2021, 234 personal injuries were reported.

In addition, 28 injuries classified as off-work injuries and 13 first aid injuries were reported in 2023. For comparison, in 2022 there were 30 off-work injuries and 15 first aid injuries. First aid injuries and off-work injuries are not included in figures or tables.

In recent years, we have seen a reduction in the number of injuries reported on the NAV (Norwegian Labour and Welfare Administration) forms, and this trend continued in 2023. 49.7% of the injuries were not reported to us on NAV forms in 2023. These injuries are therefore recorded on the basis of information received in connection with the quality assurance of the data. The injuries not reported on NAV forms include six classified as serious. The injuries concern both contractors' and operators' employees.

There were 155 personal injuries on production facilities in 2023 against 180 in 2022. In the long term, there has been a positive trend in the injury rate since 2013 when the overall rate was 7.0 injuries per million working hours. In 2023, there were 5.0 injuries per million working hours. This is a fall in the injury rate from 2022 of 0.7 injuries per million working hours. The fall is not significant.

In 2023, there were 30 personal injuries on mobile facilities, compared with 54 in 2022. The total injury rate fell from 4.3 in 2022 to 2.7 injuries per million working hours in 2023. The fall is significant. In 2021, we recorded the lowest level of injury in the entire period. In the long term, mobile facilities, like production facilities, have seen a positive trend. The injury rate has fallen from 6.7 in 2013 to 2.7 in 2023.

8.1 Serious personal injuries

Serious personal injuries are defined in the guidelines to the Management Regulations Section 31, which definition is used as the basis for classifying serious personal injuries.

Figure 8-1 shows the frequency of serious personal injuries on production facilities and mobile facilities combined. In 2023, a total of 25 serious personal injuries were reported, against 22 in 2022.

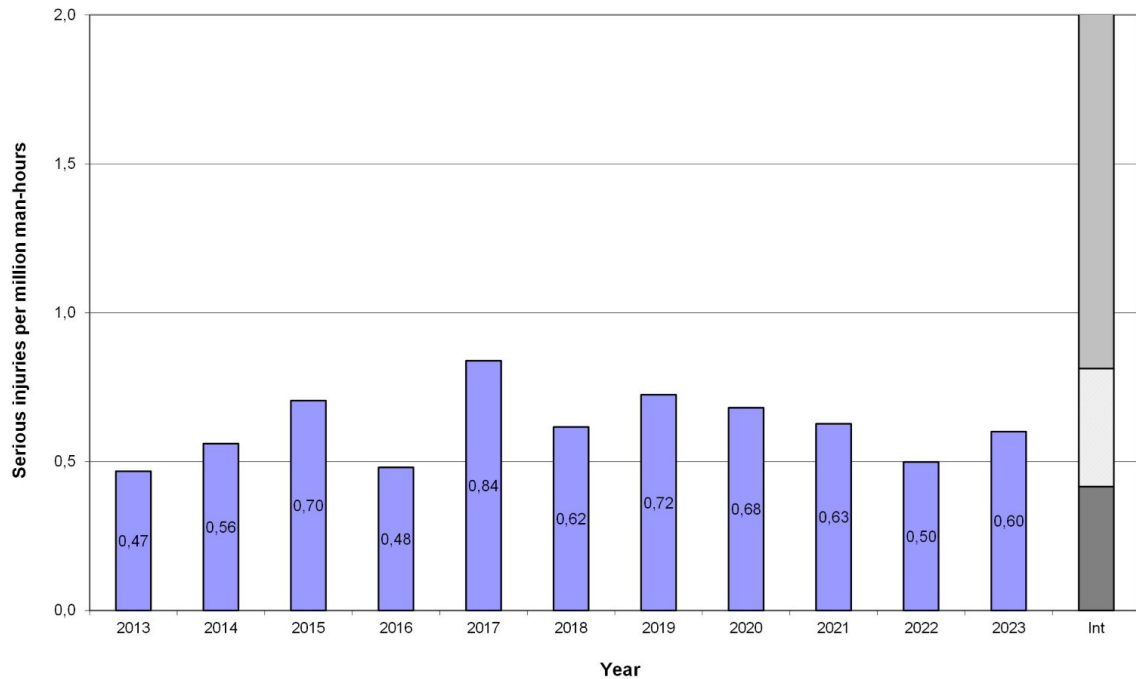


Figure 8-1 Serious personal injuries per million working hours – NCS

In the first part of the 11-year period, there was an upward trend in the personal injury rate on the NCS. After 2015, the trend was more varied, with the rate of serious injuries per million working hours varying from 0.5 in 2016 to 0.8 in 2017. In the latter part of the period, from 2019 to 2022, we see a downward trend. In 2023, the rate of serious injuries per million hours worked increased to 0.6, returning to the 2021 level. In 2023, the injury rate is within the expected level based on the ten preceding years.

The activity level on the NCS last year fell by 2.5 million working hours from 44.14 to 41.64 million working hours.

8.2 Serious personal injuries on production facilities

Figure 8-2 shows the frequency of serious personal injuries on production facilities per million working hours.

With the exception of 2015, the injury level in the first part of the 11-year period was lower than in the latter part of the period. From 2018 to 2020 we see a slight increase, but after 2021 the trend is at approximately the same level as in the first part of the period. The rate of serious personal injuries per million working hours rose marginally from 0.47 in 2022 to 0.52 in 2023. The rate in 2023 is within the expected level based on the ten preceding years.

On production facilities, there were 15 serious injuries in 2022 compared with 16 in 2023. The number of working hours fell by 0.9 million hours, from 31.6 million in 2022 to 30.7 million in 2023.

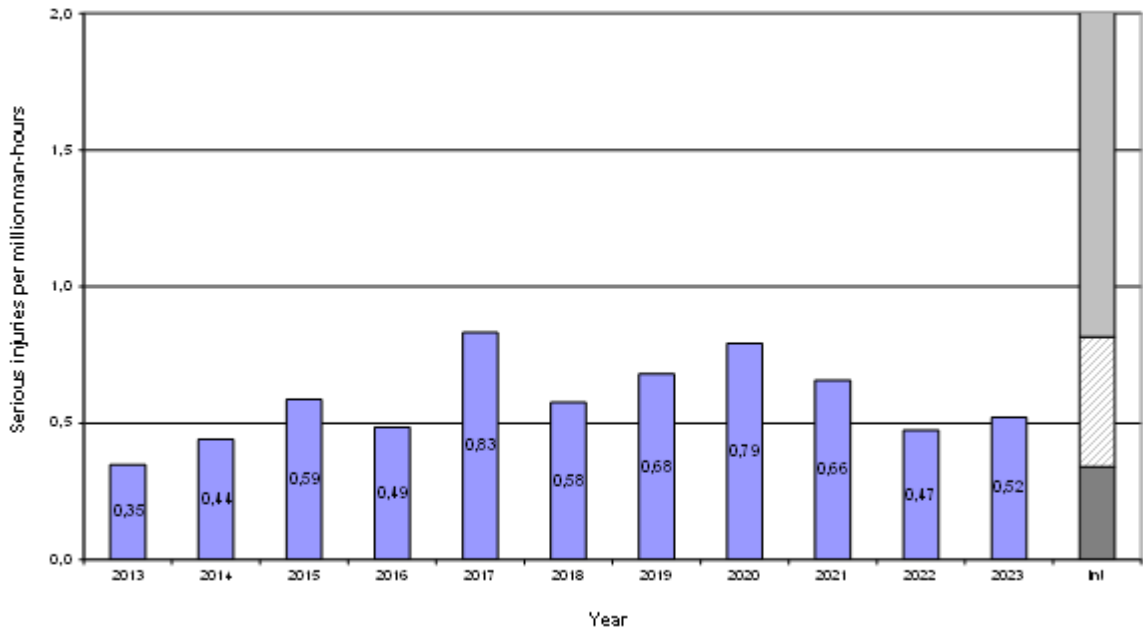


Figure 8-2 Serious personal injuries on production facilities per million working hours

8.3 Serious personal injuries on mobile facilities

Figure 8-3 shows the frequency of serious personal injuries per million working hours on mobile facilities.

We see a levelling off of the frequency level in 2021 and 2022, where, in both years, the injury level is 0.6 serious personal injuries per million working hours. In 2023, we saw a marked increase to 0.8 serious injuries per million working hours.

The hour count reported for the mobile facilities in 2023 is 10.9 million. We see a significant reduction of 1.6 million compared to 2022 when we noted 12.5 million hours (-12.5%). The number of serious injuries is nine in 2023 compared with seven in 2022.

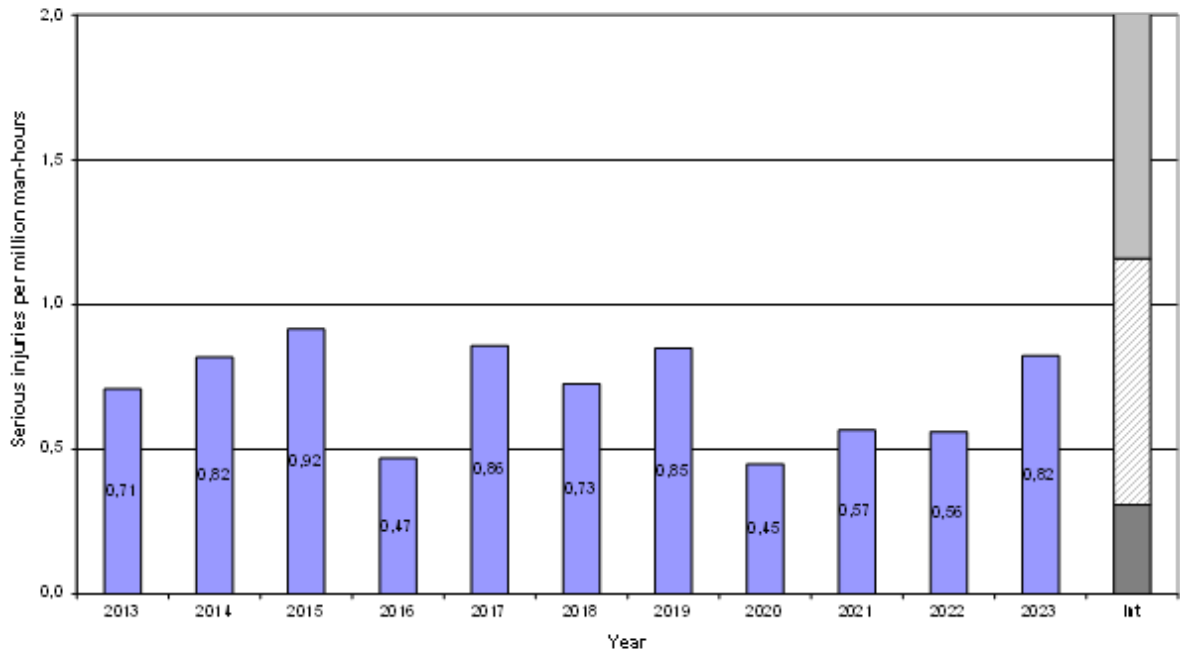


Figure 8-3 Serious personal injuries per million working hours, mobile facilities

9. Other indicators

9.1 DSHA 20 Crane and lifting operations

DSHA 20 crane and lifting operations includes incidents involving lifting equipment and its use which led to, or could have led to, personal injury or harm to equipment or the environment. It includes incidents both involving and not involving dropped objects. DSHA 20 was created and presented for the first time in the 2015 report. The time series now consists of data for the period 2014-2023. The analysis looks at both the ten years combined and a comparison between the years, as appropriate.

The most important findings, which are also shown in the figures below, are:

Fixed facilities

- There is a small decrease in the absolute number of reported incidents for fixed facilities in 2023 compared to 2022 (see Figure 9-1). There was also a decrease in the number of incidents normalised against working hours from 2022 to 2023. In the period 2018 to 2021, there was a rising trend in the normalised number of incidents, with a peak in 2021, and a fall in the last two years. The absolute number of incidents has been around the same level throughout the period 2017 to 2023, but with a slight fall in 2023 from 2022.
- For **personal injury incidents** (see Figure 9-2), there is also a decrease from 2022 to 2023, both in absolute number of incidents and normalised against working hours. Note here that in 2022 there was a peak, so 2023 is at about the same level as prior to 2022. Nevertheless, keep in mind that there is a relatively low number of incidents involving injuries, so there will be a relatively large variation from year to year.
- For incidents related to **lifting using offshore cranes** (see Figure 9-3), in 2022 there was an increase over the previous year. In 2023, there is a fall, and the number of incidents in 2023 is at the same level as in 2021. This applies to both absolute and normalised numbers.
- For **lifting in the drilling module**, the number of absolute incidents in 2023 increased to a maximum level for the entire analysis period (one incident more than the previous peak in 2017). The number of incidents normalised against working hours spent on drilling and well operations also increased from 2022 to 2023 – to the highest level since 2017 (see Figure 9-4). Figure 9-5 shows the same, but the number of incidents is normalised against the number of wells drilled. This shows the same type of development as the normalisation against working hours.
- Looking at incidents without personal injury, but with the **potential for injury** (see Figure 9-6), in 2023 there was a fall in the number of incidents with one or more persons exposed.

Mobile facilities

- For mobile facilities, there has been a downward trend since 2020 in both absolute number of incidents and normalised against the number of working hours (see Figure 9-1). This trend has continued in 2023.
- For **personal injury incidents** (see Figure 9-2), there is also a decrease from 2022 to 2023, both in absolute number of incidents and normalised against working hours. Nevertheless, keep in mind that there is a relatively low number of incidents involving injuries, so there will be a relatively large variation from year to year.
- For **lifting in the drilling module**, back in 2021 for the absolute number and in 2022 for the number normalised against working hours spent on drilling and well operations, there was a peak in the number of incidents (see Figure 9-4). However, in 2023 there is a slight fall in the number of incidents, both for absolute and normalised numbers, compared to 2022. Figure 9-5 shows the same, but the

number of incidents is normalised against the number of wells drilled. This shows the same type of development as the normalisation against working hours.

- Looking at incidents without personal injury, but with **the potential for injury** (see Figure 9-6), in 2023 there were a total of six incidents with one or more people exposed, which is approximately the average for recent years, and lower than 2020 and 2021, which had a high number of such incidents.

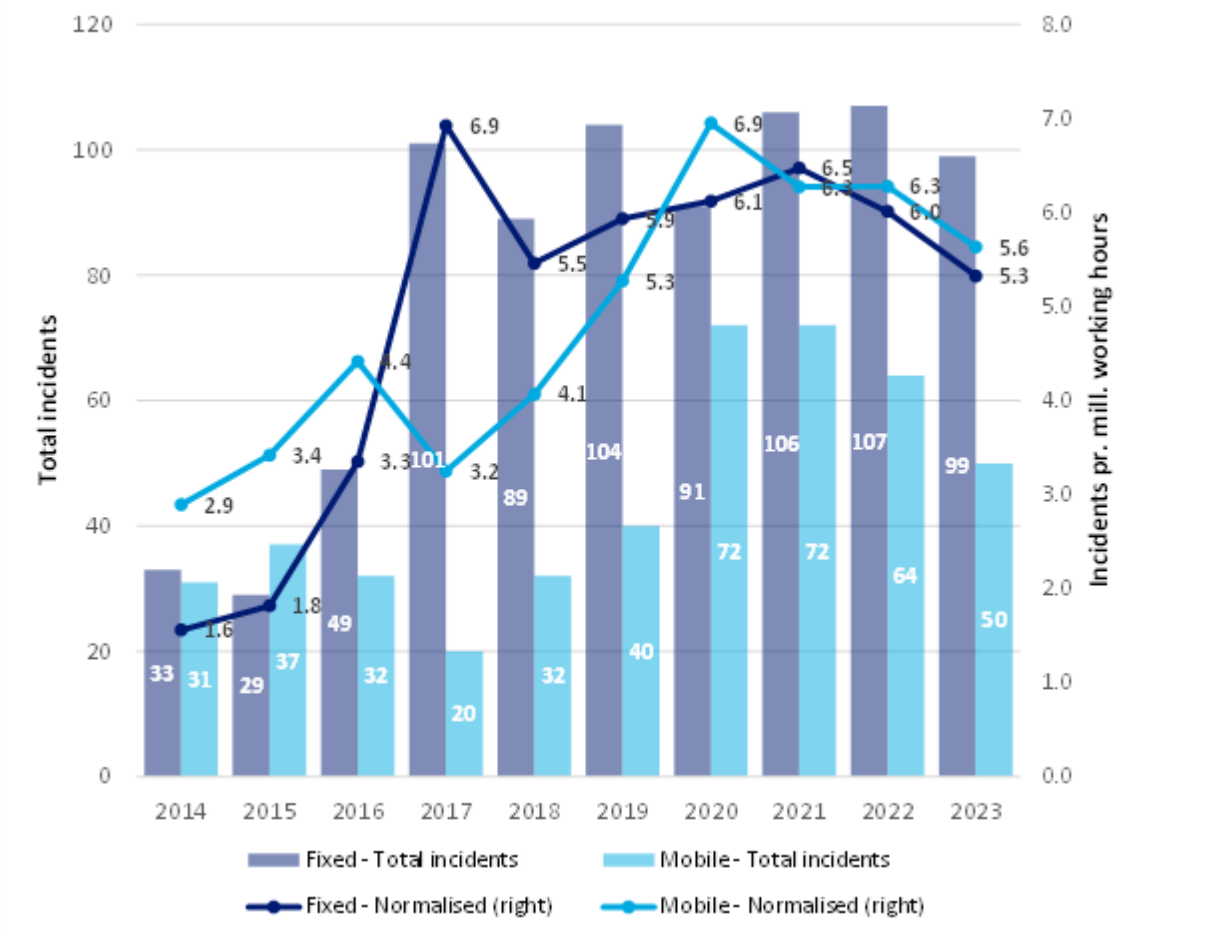


Figure 9-1 Number of reported incidents for crane and lifting operations in the period 2014-2023 for fixed and mobile facilities – absolute numbers and numbers normalised against millions of working hours spent on drilling and well operations and on construction and maintenance

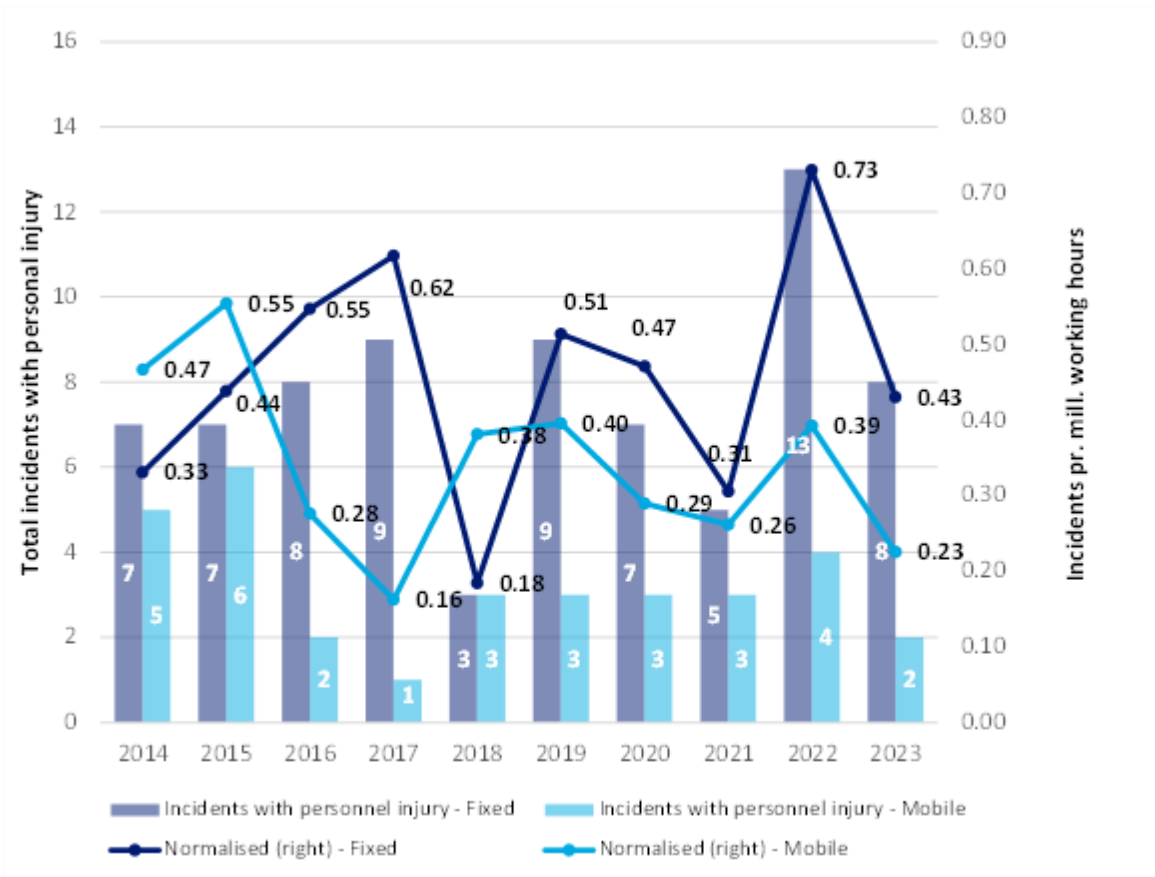


Figure 9-2 Number of incidents involving personal injuries for crane and lifting operations in the period 2014-2023 for fixed and mobile facilities – absolute numbers and numbers normalised against millions of working hours spent on drilling and well operations and on construction and maintenance

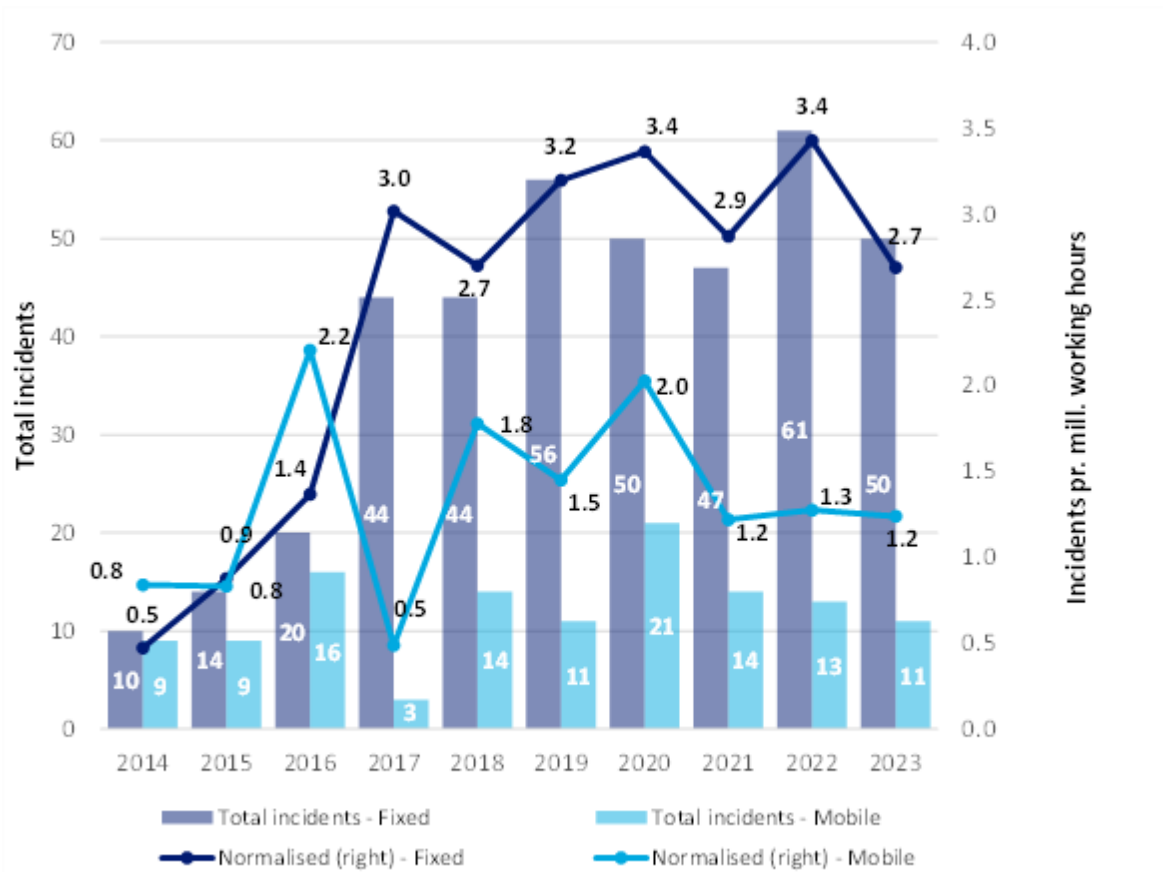


Figure 9-3 Number of incidents relating to lifting using offshore cranes for the period 2014-2023 shown for fixed and mobile facilities – absolute numbers and numbers normalised against millions of working hours spent on drilling and well operations and on construction and maintenance, per type of facility

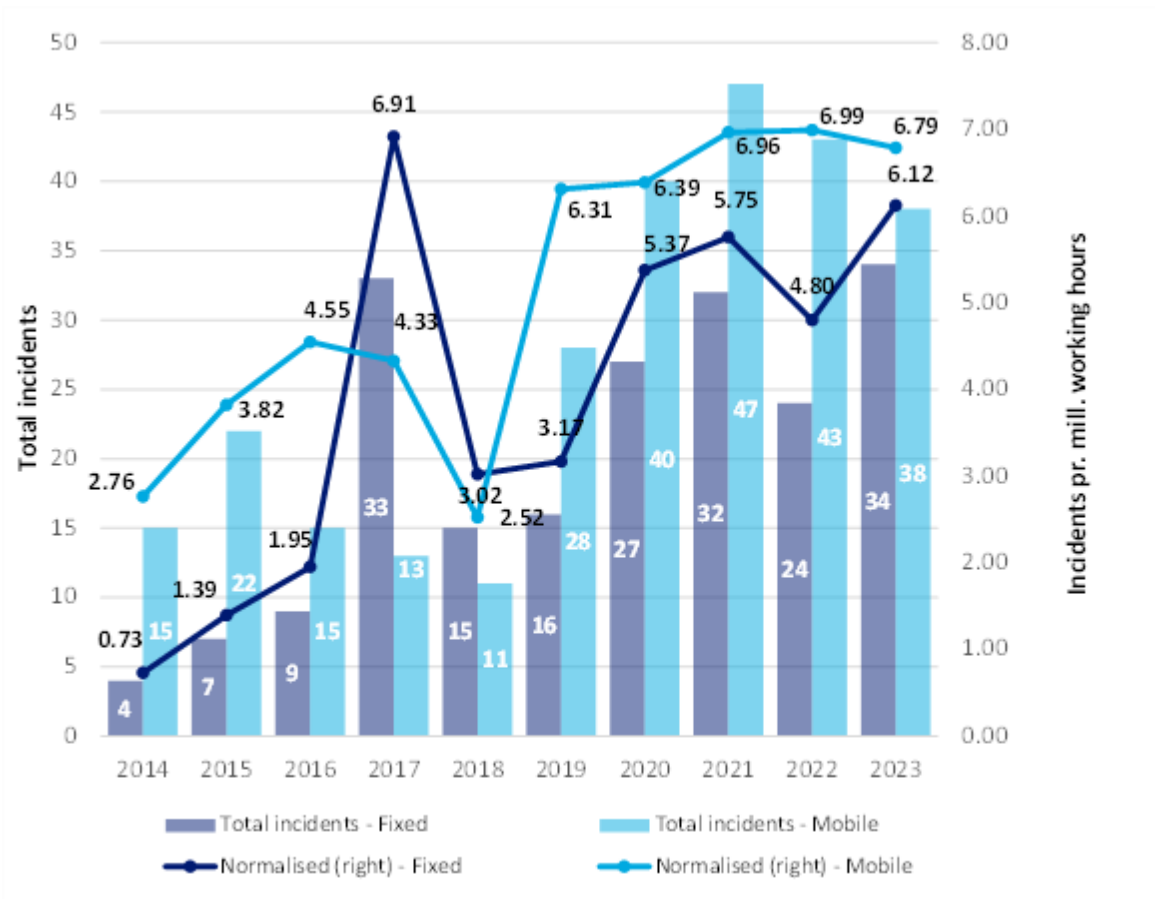


Figure 9-4 Number of incidents relating to lifting in the drilling module for the period 2014-2023 shown for fixed and mobile facilities – absolute numbers and numbers normalised against million working hours spent on (exclusively) drilling and well operations, per type of facility

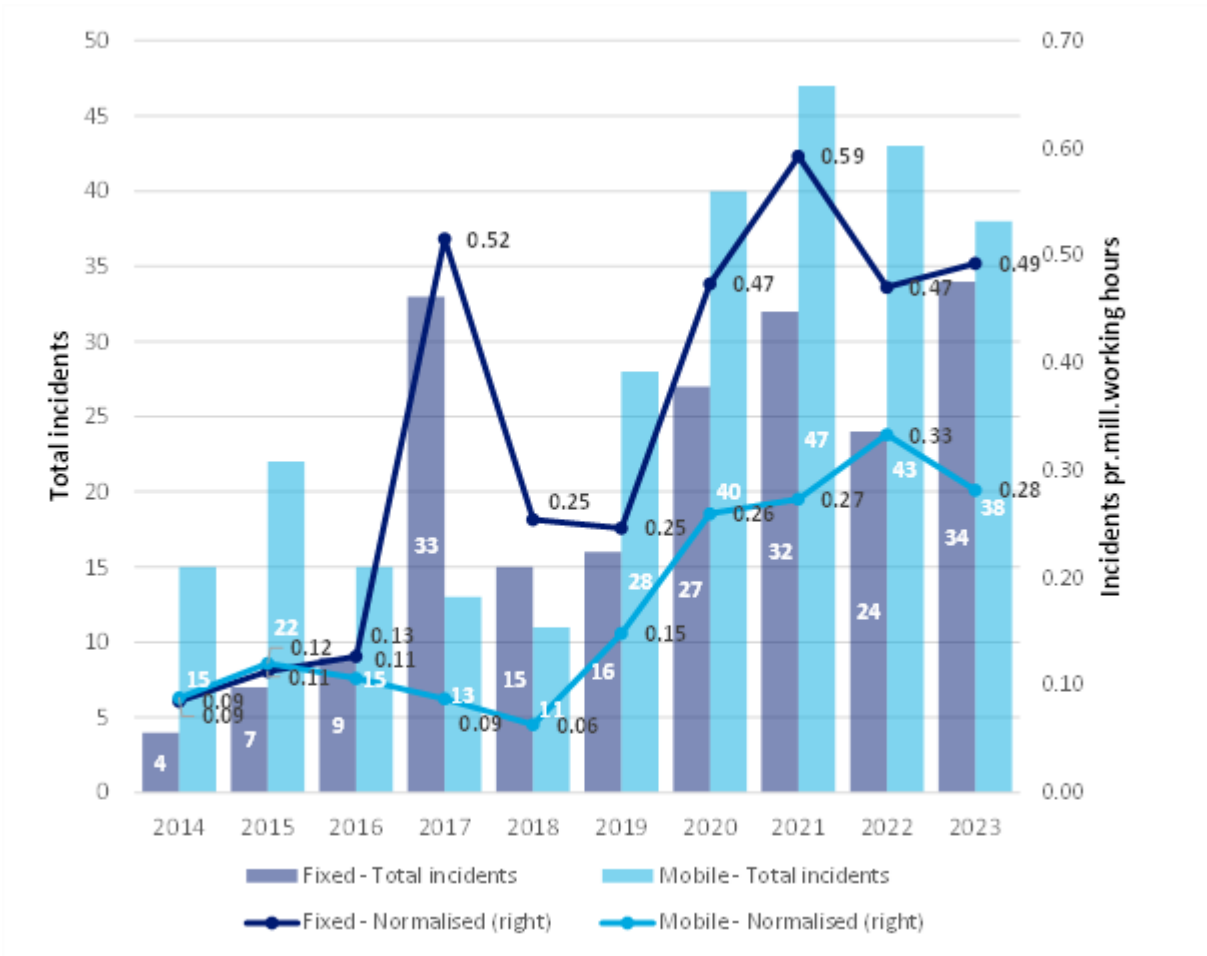


Figure 95 Number of incidents relating to lifting in the drilling module for the period 2014-2023 shown for fixed and mobile facilities – absolute numbers and numbers normalised against number of wells drilled (exploration and production wells)

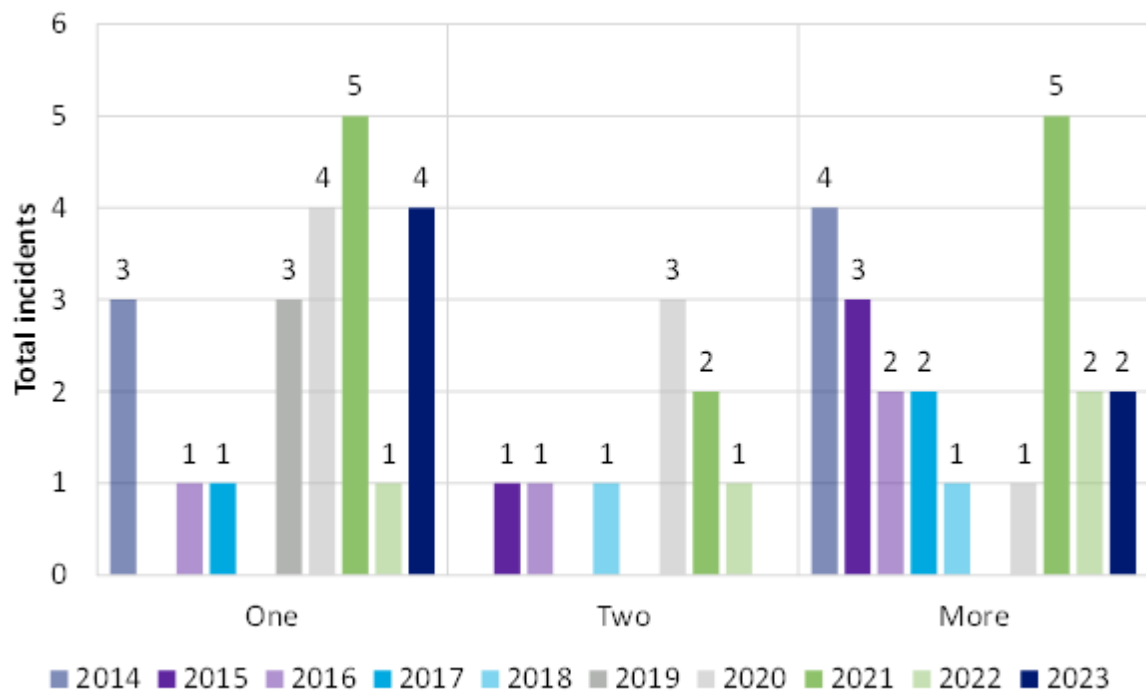
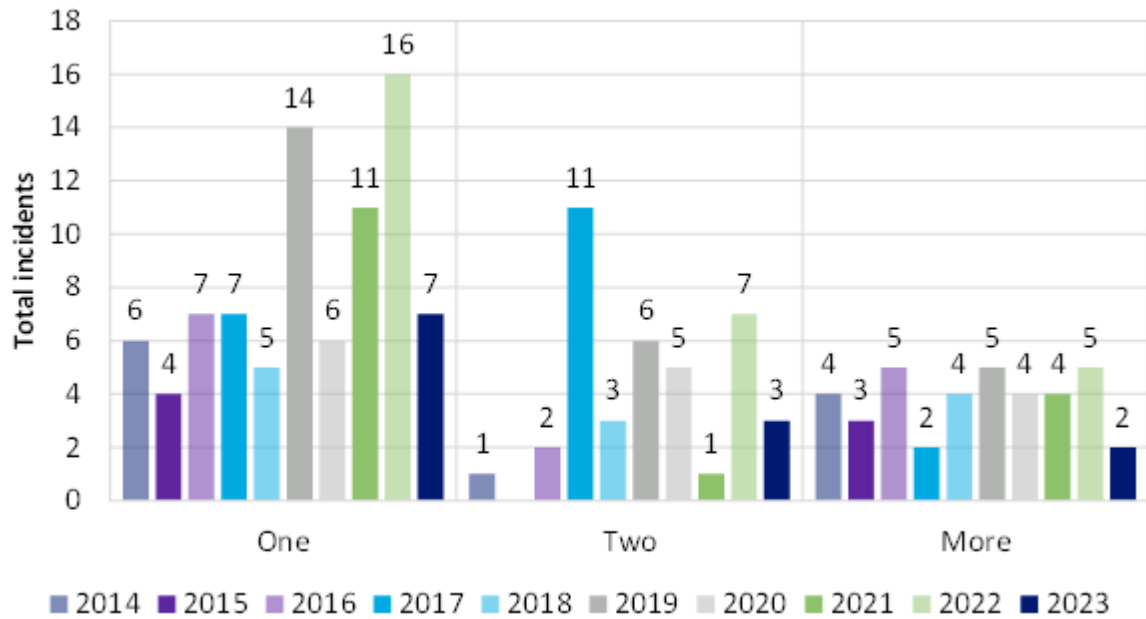


Figure 9-6 Number of incidents (without personal injury) with persons exposed to the incident, for fixed (top) and mobile (bottom) facilities, for the period 2014-2023

9.2 DSHA 21 Dropped objects

DSHA 21 Dropped objects comprises all incidents where an object falls within a facility’s safety zone, either on deck or into the sea, with the potential for becoming an accident, and which does not involve crane and lifting equipment and the use thereof. Incidents linked to crane and lifting equipment and the use thereof are presented in DSHA 20.

As of the 2015 report, for offshore facilities, a new DSHA 20, Crane and lifting operations, was introduced which has caused changes in DSHA 21 Dropped objects. Up to the previous report (2022 report), the entire period back to 2013 has been presented. New this year is a switch to presenting data for the last ten years. This year’s report presents data for the

period 2014-2023. The analysis looks at both the ten years combined and a comparison between the years, as appropriate.

The most important findings, which are also shown in the figures below, are:

Fixed facilities

- The number of reported incidents for *fixed facilities* shows a slight increase in 2023 compared with 2022. This applies both absolutely and to the number of incidents normalised against the number of working hours. In 2023, the absolute number of incidents is the second highest in the entire analysis period (349 incidents versus 359 in 2018). See Figure 9-7.
- In 2023, a sharp increase is seen in the number of personal injuries on *fixed facilities* compared to 2022 and this is also the highest (15 injured) of the entire analysis period (Figure 9-8). This applies to both absolute and normalised numbers. A closer analysis of the personal injury incidents shows that, in 2023, there were more incidents involving personal injury in process areas (three incidents, 20%) than in the entire 2014-2022 period combined (two incidents in total, 4%). See Figure 9-9. See also the next point concerning dropped objects in process areas overall.
- In process areas, until 2023, there were far fewer dropped objects in total than in the other areas, especially with energy >40 J. There has therefore not been such a good basis for observations in previous years. However, in 2023, there was a sharp increase in the number of dropped objects for both <40 J and >40 J. See Figure 9-10 and Figure 9-11.
- For drilling areas, in 2023 there was approximately the same number of dropped objects of <40 J in 2023 as in 2021, while this number was slightly higher in 2022. For the number of objects of >40 J, which also had a high number in 2022, the number is back down towards the level in 2020/2021. The same development is also seen in the number of incidents normalised both against the number of working hours spent on drilling and well operations (Figure 9-12 and Figure 9-13) and against the number of wells drilled (Figure 9-14 and Figure 9-15).
- For scaffolding, there was a considerable increase in the number of dropped objects from 2020 to 2021. For objects of <40 J, this number fell in 2022, and continued downwards in 2023. For objects with energy >40 J, the number was at the same level in 2023 as in 2021 and 2022. See Figure 9-16.
- For incidents without personal injury, but with exposed personnel (one, two and more people), the number of incidents with one person exposed is down again at the same level as in 2020 and 2021 (Figure 9-17). In 2023, the number of incidents with two people exposed is the same as in the previous three years and the number of incidents with more than two people exposed is the same as in 2022.
- In the entire period after 2020, there has been an annual increase in dropped objects with energy >40 J (Figure 9-18). This increase continued in 2023, which has the highest number of dropped objects with energy >40 J since 2019.

Mobile facilities

- For *mobile facilities*, in 2023 there was a decrease in both the absolute number of incidents and the number of incidents normalised against the number of working hours compared to the most recent years, and numbers are now down to the lower level that existed before 2018. See Figure 9-7.
- For drilling areas and dropped objects of <40 J, there was an increase in the number of incidents each year throughout the period up to a peak in 2018 (Figure 9-19). There has since been a reduction in the number of incidents each year after that, including in 2023. The year 2023 has the lowest number of dropped objects of <40

J since 2017. For dropped objects of >40 J in drilling areas, the number of incidents has shown a similar development, with a similar marked peak in 2018 (Figure 9-20). The year 2023 is (like 2021) down to the level prior to 2018.

- On mobile facilities, in the entire period since 2019, there has been an annual reduction in dropped objects with energy >40 J (Figure 9-18). This reduction continued in 2023, which had the lowest number of dropped objects with energy >40 J since 2017.

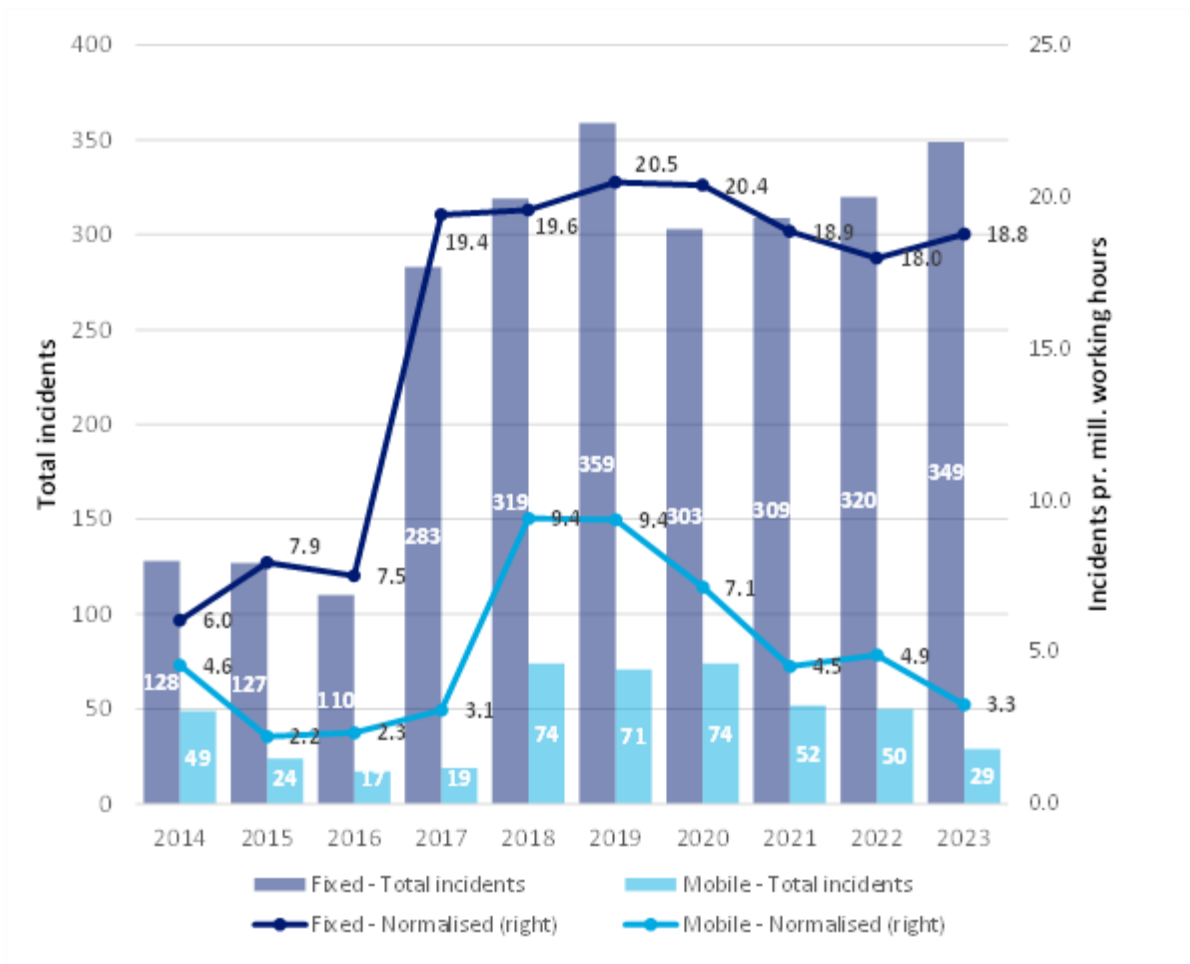


Figure 9-7 Number of incidents and incidents per million working hours classified as dropped objects, by fixed and mobile facilities, in the period 2014-2023.

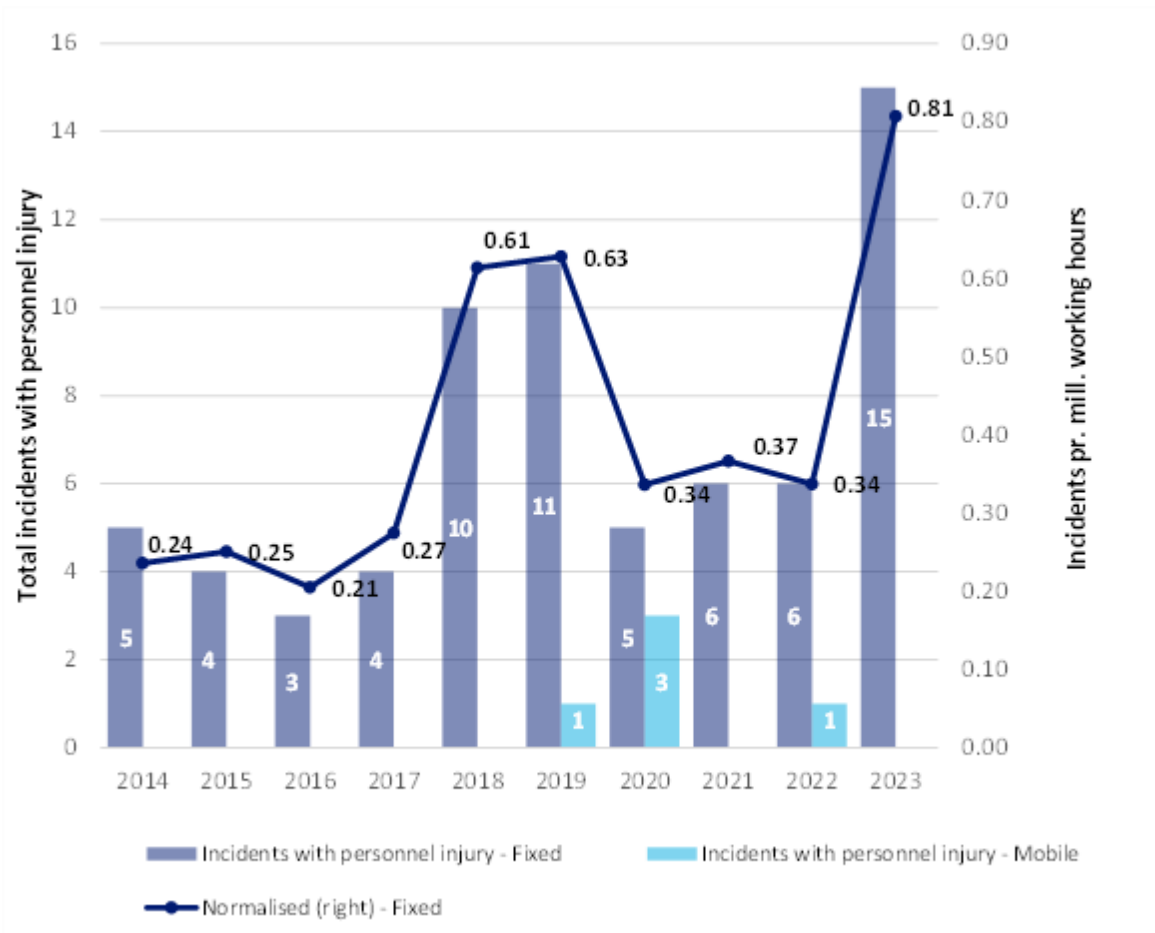


Figure 9-8 Total number of dropped object incidents causing personal injury, in the period 2014-2023.

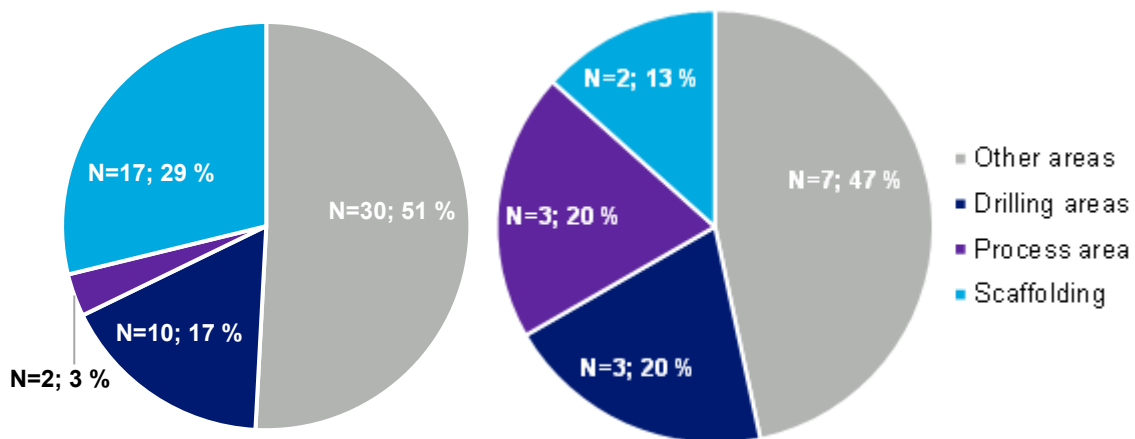


Figure 99 Distribution of personal injury incidents by work processes/areas. The chart on the left shows the distribution for the period 2014-2022 overall. The chart on the right shows the distribution for 2023.

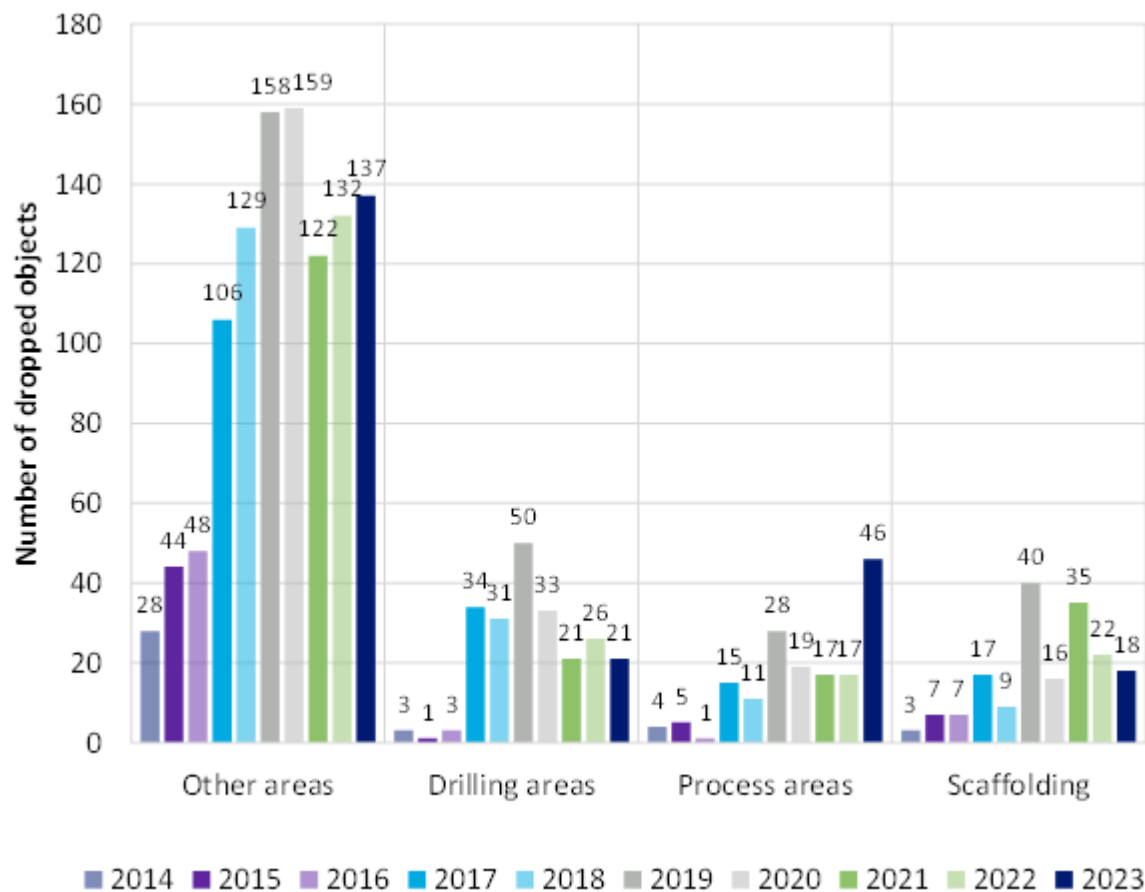


Figure 9-10 The total number of dropped object incidents for fixed facilities, involving energy <40 J – by main categories of work processes (numbers of dropped objects per year are shown above the columns), for the period 2014-2023.

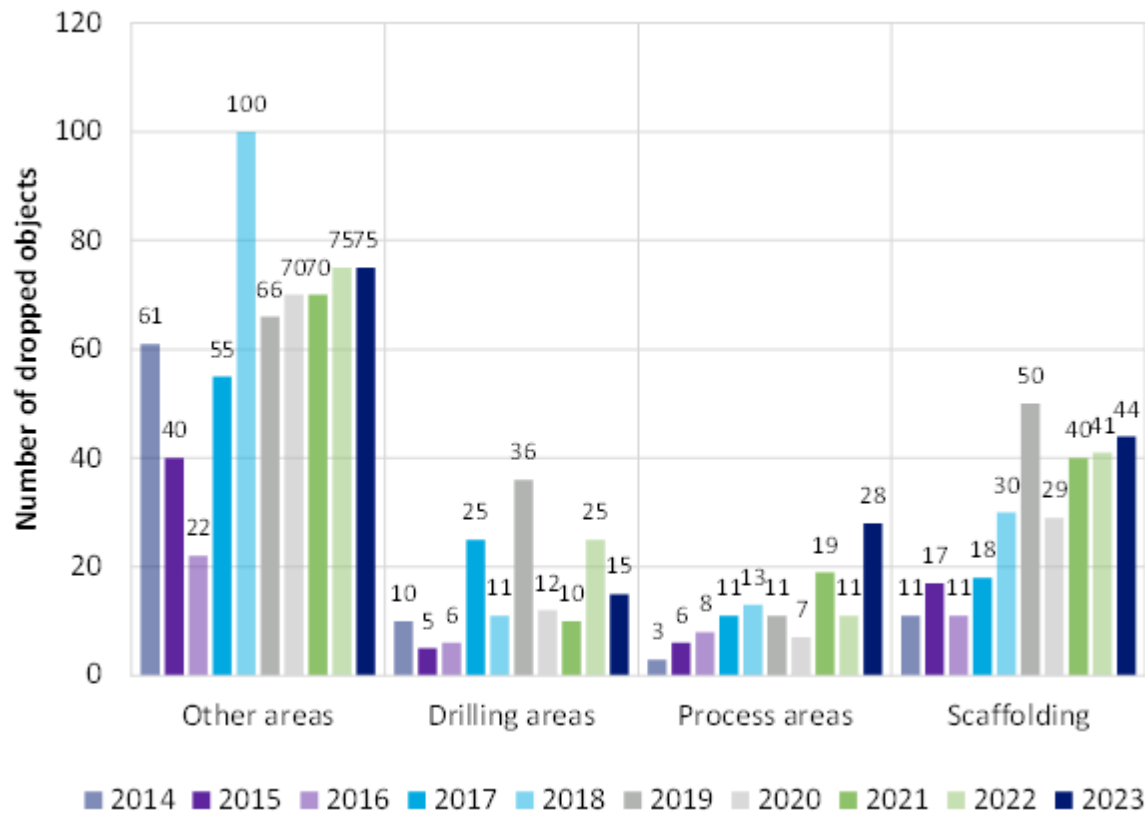


Figure 9-11 The total number of dropped object incidents for fixed facilities, involving energy >40 J – by main categories of work processes (numbers of dropped objects per year are shown above the columns), for the period 2014-2023.

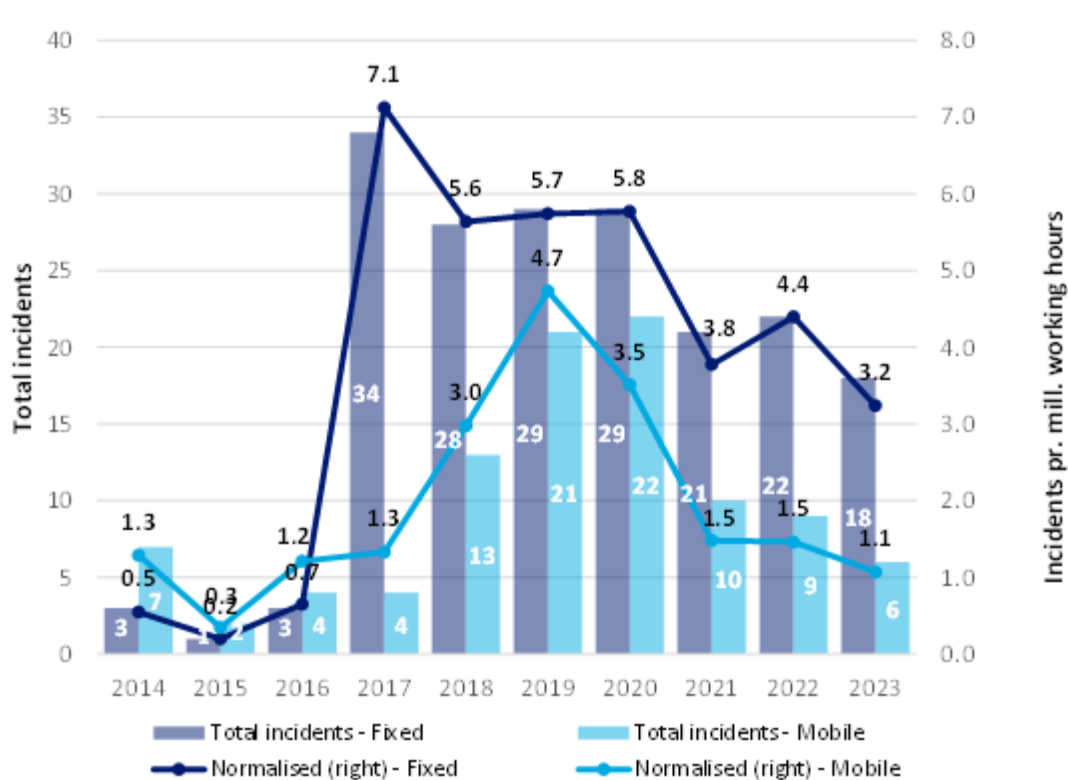


Figure 9-12 Number of incidents in drilling areas with energy <40 J, by fixed and mobile facilities, and normalised against number of working hours spent on drilling and well operations per year, for the period 2014-2023.

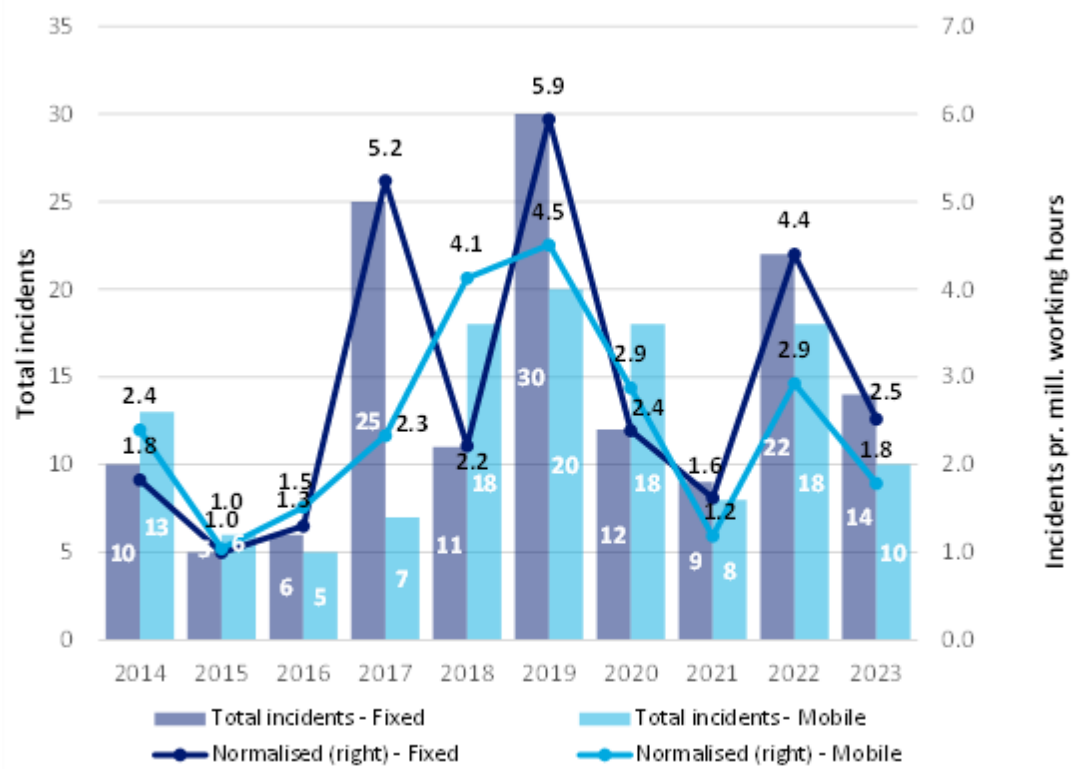


Figure 9-13 Number of incidents in drilling areas with energy >40 J, by fixed and mobile facilities, and normalised against drilling and well hours per year, for the period 2014-2023.

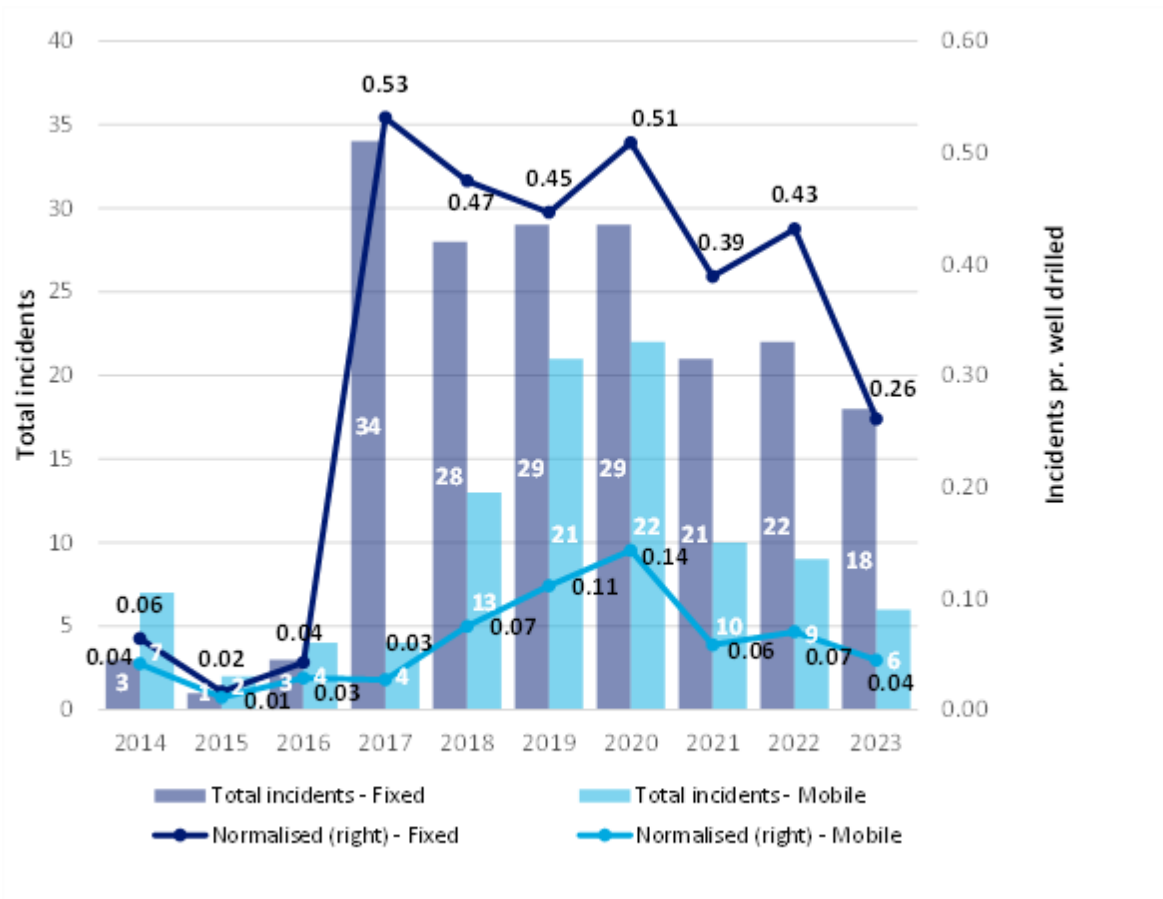


Figure 9-14 Number of incidents in drilling areas with energy <40 J, by fixed and mobile facilities, and normalised against number of wells drilled per year, for the period 2014-2023.

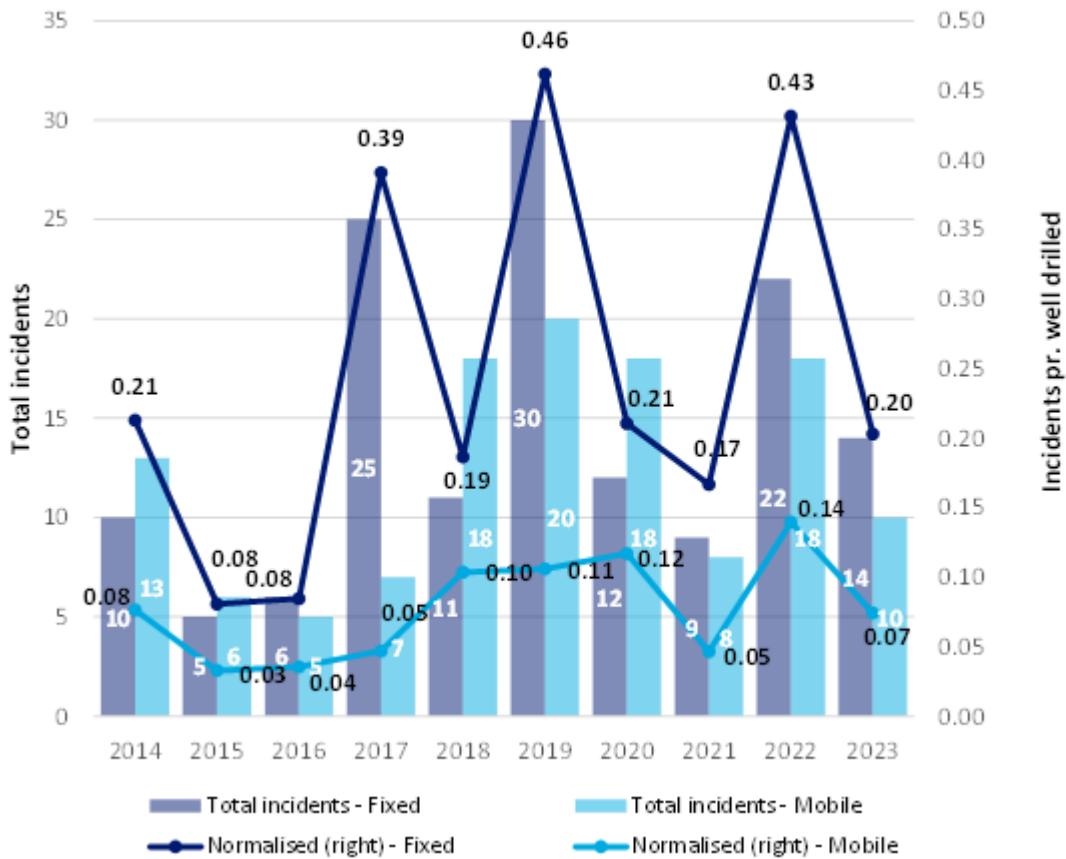


Figure 9-15 Number of incidents in drilling areas with energy >40 J, by fixed and mobile facilities, and normalised against number of wells drilled per year, for the period 2014-2023.

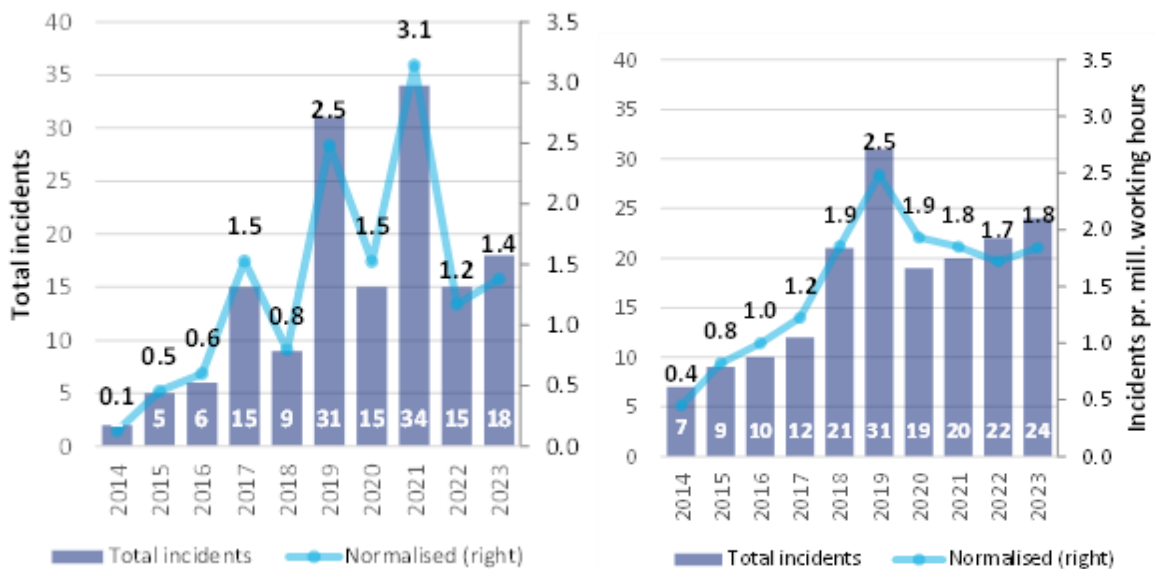


Figure 9-16 Number of incidents, <40 J on the left and >40 J on the right, on fixed facilities relating to erection/dismantling and use of scaffolding, as well as normalised against working hours for construction and maintenance, for the period 2014-2023.

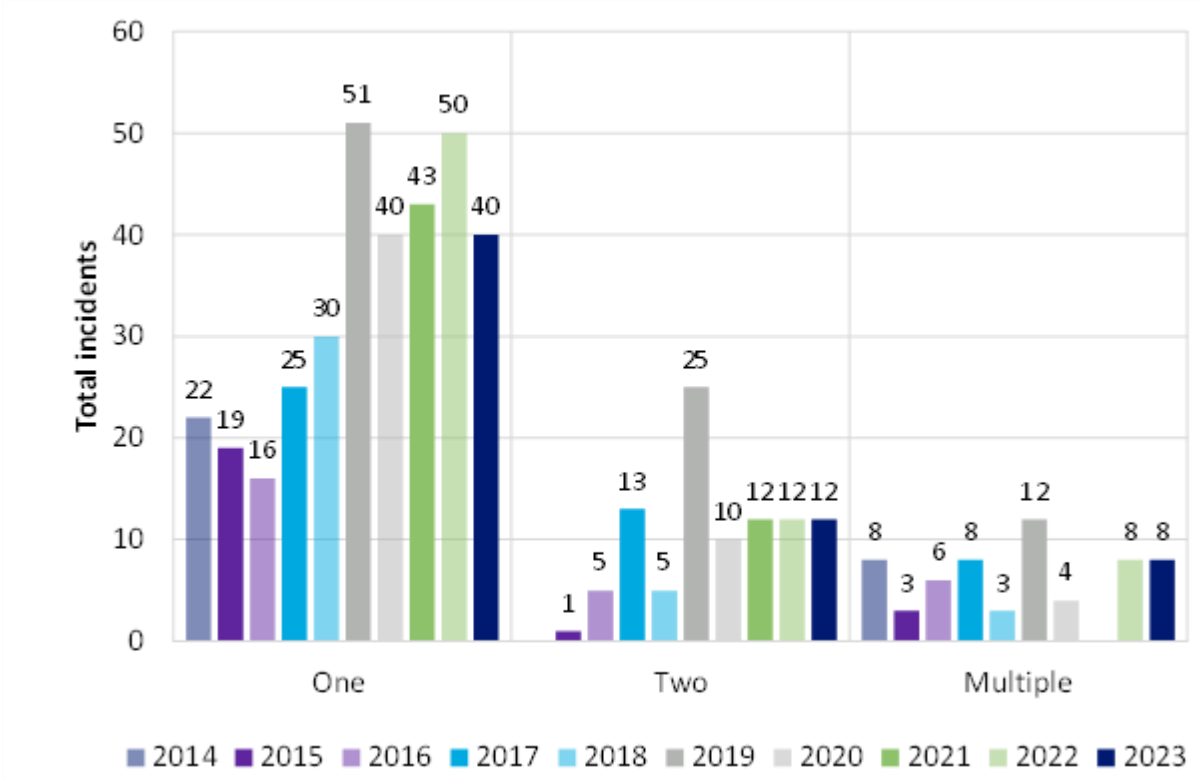


Figure 9-17 Absolute number of incidents (without personal injury) with persons exposed to dropped objects on fixed facilities, for the period 2014-2023.

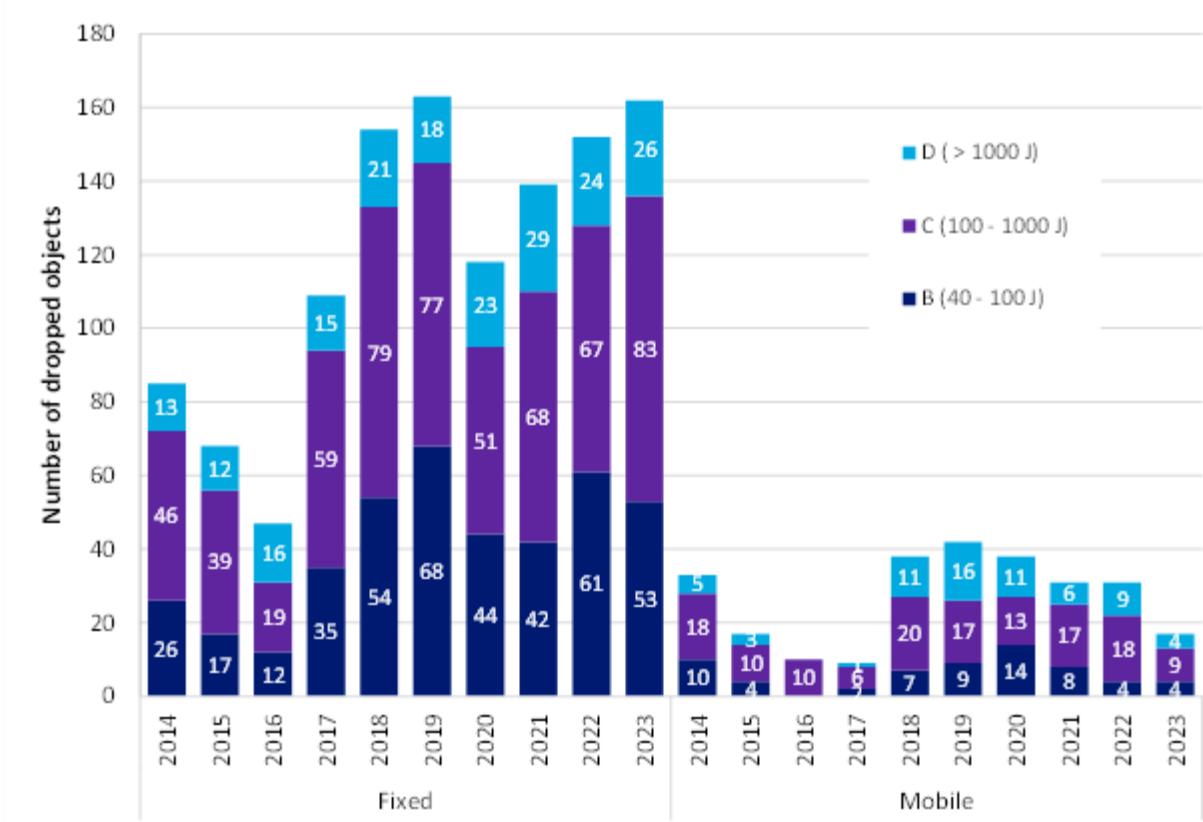


Figure 9-18 Number of objects by energy classes >40 J, for fixed and mobile facilities, for the period 2014-2023.

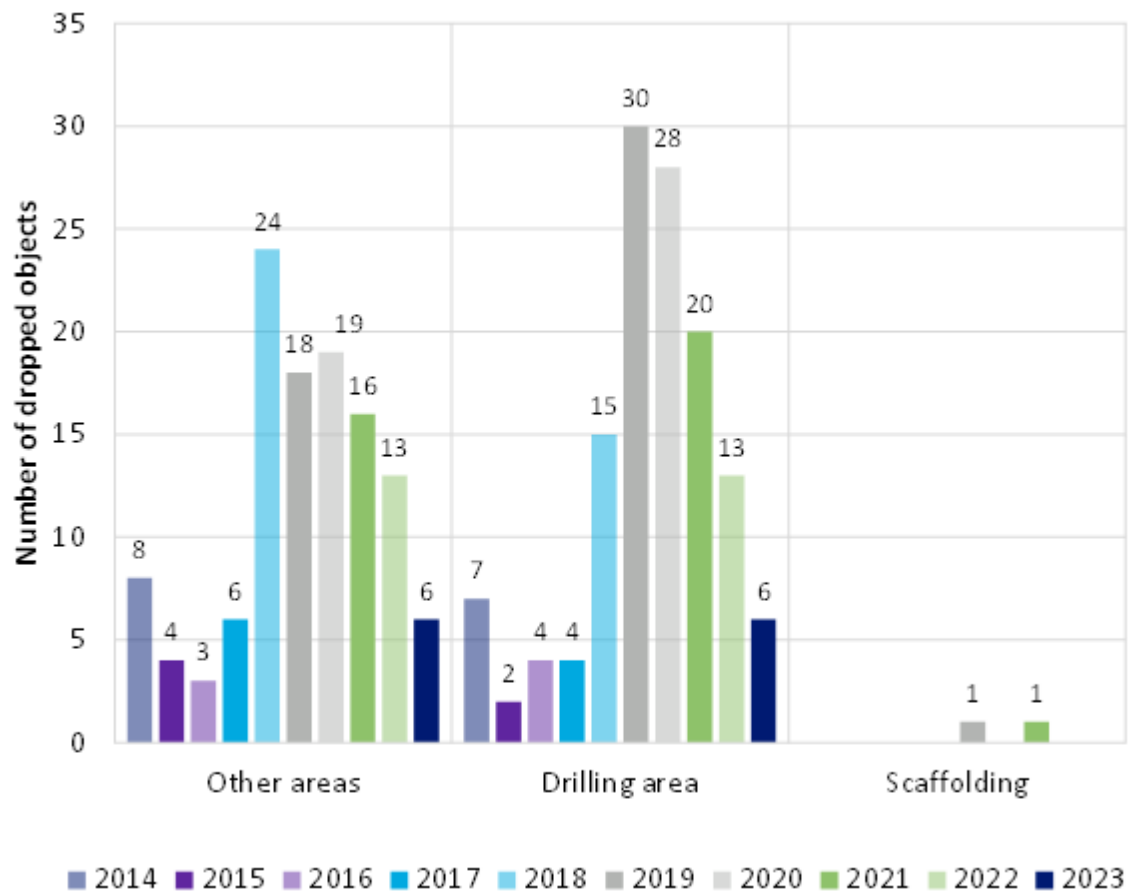


Figure 9-19 Total number of dropped objects for mobile facilities, involving energy <40 J – by main categories of work processes (numbers of dropped objects per year are shown above the columns), for the period 2014-2023.

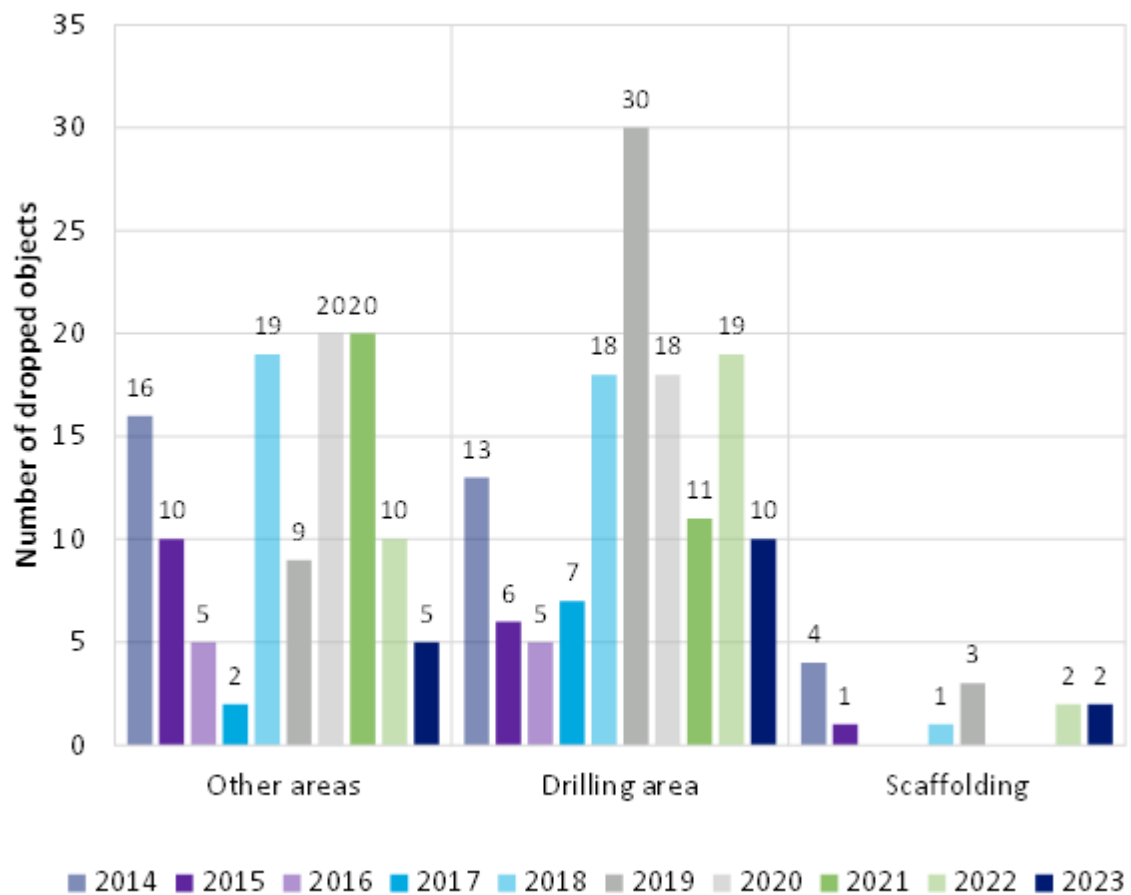


Figure 9-20 Total number of dropped objects for mobile facilities, involving energy ≥ 40 J – by main categories of work processes (numbers of dropped objects per year are shown above the columns), for the period 2014-2023.

9.3 Other DSHAs

The main report presents data for incidents that have been reported to Havtil, as well as for other DSHAs without major accident potential, such as DSHA 11, 13, 16 and 19.

10. Definitions and abbreviations

10.1 Definitions

See sub-chapters 1.10.1 - 1.10.3, as well as 5.2, in the main report.

10.2 Abbreviations

For a detailed list of abbreviations, see Havtil, 2024a. The most important abbreviations in this report are:

CODAM	Database for damage to structures and subsea facilities
BDV	Blowdown valve
BOP	Blowout Preventer
BORA	Barrier and operational risk analysis
DDRS/CDRS	Database for drilling and well operations
DSHA	Defined situations of hazard and accident
DHSV	Downhole safety valve
DSYS	Havtil's database of personal injuries and hours of exposure during diving activities
ESDV	Emergency shutdown valve
PM	Preventive maintenance
GM	Metacentre height of floating facilities
HSE	Health, Safety and the Environment
KG	The distance from the keel to the centre of gravity on floating facilities
KPI	Key Performance Indicator
CM	Corrective maintenance
Havtil	The Norwegian Ocean Industry Authority (formerly the Petroleum Safety Authority Norway)
RNNP	Trends in risk level in the Norwegian petroleum activity
WIF	Well Integrity Forum

11. References

Detailed reference lists can be found in the main reports:

Havtil, 2024a. Risk level in the petroleum activity – Norwegian Continental Shelf, Main report, 20.03.2024

Havtil, 2024b. Risk level in the petroleum activity – onshore installations, 20.03.2024

Havtil, 2024c. Risk level in the petroleum activity – Methodology report, 20.03.2024