Office of the Auditor
General of Norway

The Office of the Auditor General's investigation of the authorities' work on the Alexander L. Kielland accident

Document 3:6 (2020–2021)

Cover page:

Photo of the Alexander L. Kielland platform after it was righted. Photo: Sven Tønnessen/Norwegian Petroleum Museum

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To the Storting

The Office of the Auditor General hereby presents Document 3:6 (2020–2021) The Office of the Auditor General's investigation of the authorities' work on the Alexander L. Kielland accident.

The document has been divided into the following sections: Conclusions, Elaboration of conclusions, Recommendations, the Minister's response and the Office of the Auditor General's statement to the Minister's response.

The Office of the Auditor General uses the following terms for criticism, ranked according to severity:

1. **Extremely serious** is used in circumstances where the consequences for society or the affected citizens are extremely serious, such as a risk to life or health.
2. **Serious** is used in circumstances that may have significant consequences for society or affected citizens, or where the sum of errors and omissions is so great that this must be considered serious.
3. **Highly reprehensible** indicates circumstances that have less serious consequences, but concern matters of principle or great importance.
4. **Reprehensible** is used to characterise inadequate management where the consequences are not necessarily serious. This may apply to errors and omissions that have financial consequences, violation of regulations or matters that have been addressed earlier and that have still not been corrected.

The Office of the Auditor General, 9 March 2021

For the Board of the Auditors General

Per-Kristian Foss
Auditor General

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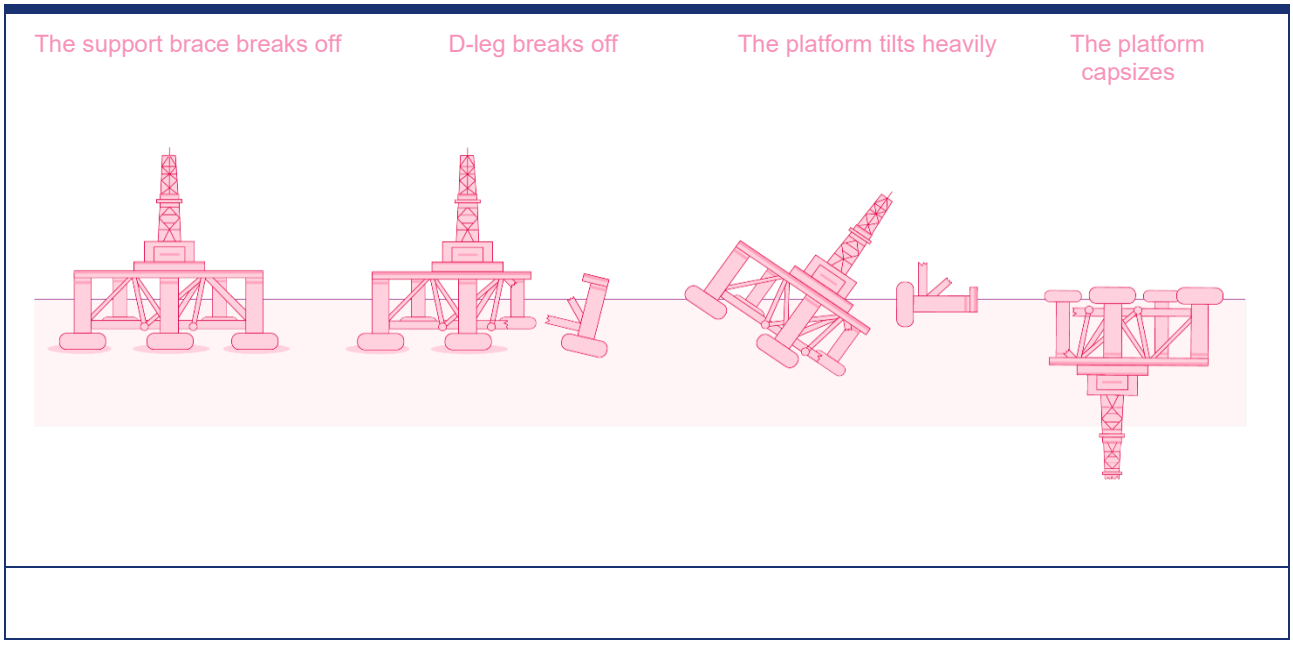
The Norwegian Ministry of Labour and Social Affairs, the Norwegian Ministry of Health and Care Services, the Norwegian Ministry of Justice and Public Security and the Norwegian Ministry of Trade, Industry and Fisheries

The Office of the Auditor General's investigation of the authorities' work on the Alexander L. Kielland accident

Alexander L. Kielland was a semi-submersible drilling platform used as a flotel on the Ekofisk field in the North Sea. On 27 March 1980, the platform lost one of its five legs in rough sea and the platform capsized within 20 minutes. The sequence of events is illustrated in figure 1. The final death toll was 123 fatalities and 89 survivors. The accident is considered the worst in Norwegian industrial history. The Government set up a commission of inquiry the day after the accident. The police also investigated the accident and the commission of inquiry and the police cooperated on gathering information. The Commission's report was published in March 1981 (NOU 1981: 11).

Figure 1 Illustration of the sequence of events



Source: The Office of the Auditor General based on the Official Norwegian Report NOU (1981: 11) *The Alexander L. Kielland accident*

The Commission concluded that the accident was due to a fatigue crack in a brace supporting one of the platform's legs. According to the Commission, the fatigue crack was caused by an error during the planning and construction of the platform. To recover more victims and gain more information about the causes of the accident, the platform was righted in 1983. The Commission then carried out new investigations and submitted an additional report. Later that year, the platform was sunk in Nedstrandsfjorden.

The Kielland Network, which represents many of the survivors and the victims' families, has campaigned for a new inquiry into the accident. In April 2019, representatives from the Network met with the Standing Committee on Scrutiny and Constitutional Affairs to discuss the possibility of a new inquiry. The Committee stated "[t]hat significant work has been put into investigating the causes of the accident, but there are still individual aspects of the case complex that are worth close scrutiny". Following thorough assessments, the

Committee concluded that it would not recommend that a parliament-appointed commission of inquiry be set up according to the Storting's rules of procedure. Based on this, the Committee put forward a proposal that the Storting in plenary should instruct the Office of the Auditor General to investigate the matter. Therefore, on 19 June 2019 in decision 634, cf. Innst. 411 S (2018–2019) (Recommendation to the Storting) – the Storting requested the Office of the Auditor General to investigate how the authorities have fulfilled their responsibilities in connection with the accident involving the Alexander L. Kielland platform on 27 March 1980, when it comes to:

- investigation and clarification of the causes of the Alexander L. Kielland accident and whether the inquiry has adequately examined the issue of liability surrounding the accident.
- follow-up of recommendations from the investigation work, including the implementation of measures to prevent new accidents.
- follow-up of the survivors and the surviving relatives.

The investigation has been based on the following decisions and assumptions from the Storting:

- the principle that the petroleum activities shall be conducted in a responsible manner and that the authorities have the right to supervise this, cf. Innst. S. no. 90 (1965–66) (Recommendation to the Storting), Ot.prp. no. 72 (1982–83) (legislative Bill) *Act relating to petroleum activities* and the Petroleum Act
- The Norwegian Working Environment Act, which with some exceptions was made applicable to the petroleum activities on the Norwegian continental shelf from 1977, cf. Innst. O. no. 10 (1976–77) (Recommendation to the Storting)
- The Norwegian Maritime Code of 1893 and the Regulations on commissions of inquiry
- St.meld. no. 67 (1981–82) *(White paper) The accident with the Alexander L. Kielland platform*, cf. Innst. S. no. 157 (1983–84) (Recommendation to the Storting)

The report was submitted to the Norwegian Ministry of Labour and Social Affairs, the Norwegian Ministry of Health and Care Services, the Norwegian Ministry of Justice and Public Security, the Norwegian Ministry of Trade, Industry and Fisheries and the Norwegian Ministry of Petroleum and Energy in a letter of 16 November 2020. In correspondence in the period from 27 November to 15 December 2020, the ministries have submitted comments which have been incorporated into the report and this document.

1 Conclusions

- There is no basis for conducting a new inquiry into the Alexander K. Kielland accident.
- The authorities did a thorough job of clarifying the causes of the accident but some weaknesses may have contributed to undermining trust in the inquiry.
- The issue of liability surrounding the accident was never fully examined.
- The authorities have followed up the recommendations from the inquiry.
- The surviving relatives did not receive follow-up and the follow-up of the survivors was inadequate.

2 Elaboration of conclusions

2.1 There is no basis for conducting a new inquiry into the Alexander L. Kielland accident

The Alexander L. Kielland accident was a tragic accident that many people are still deeply affected by. The investigation shows that 82 per cent of the survivors and 64 per cent of the surviving relatives have little or no trust in the inquiry. The Office of the Auditor General fully understands that it is important to receive answers to the questions asked after the accident. Nevertheless, following an overall assessment, we find that there is no basis for conducting a new inquiry. Although we have found some weaknesses in the inquiry, these are not significant enough to cast doubt on the commission of inquiry's main conclusion regarding the causes of the accident.

The Office of the Auditor General finds that it is unlikely that a new inquiry would produce significant new information about the causes of the accident. The investigation shows that much of the technical evidence no longer exists. Although it is currently possible to conduct new analyses and simulations of the causal factors, this would require detailed information about the use of the platform and about the fatigue crack in the brace that broke, among other things. It will be difficult to obtain more reliable information about this today than the Commission had in 1980. Therefore, the results of new analyses will be uncertain.

One weakness is that the inquiry did not adequately examine the liability of the private companies. However, it would be difficult today to find reliable and accurate information about how the companies in practice fulfilled their responsibility for safe operations. It has been over 40 years since the accident and therefore, there will be some uncertainty regarding new information from witnesses. Key documents are also missing and it is uncertain whether all the archives are complete.

2.2 The authorities did a thorough job of clarifying the causes of the accident but some weaknesses may have contributed to undermining trust in the inquiry.

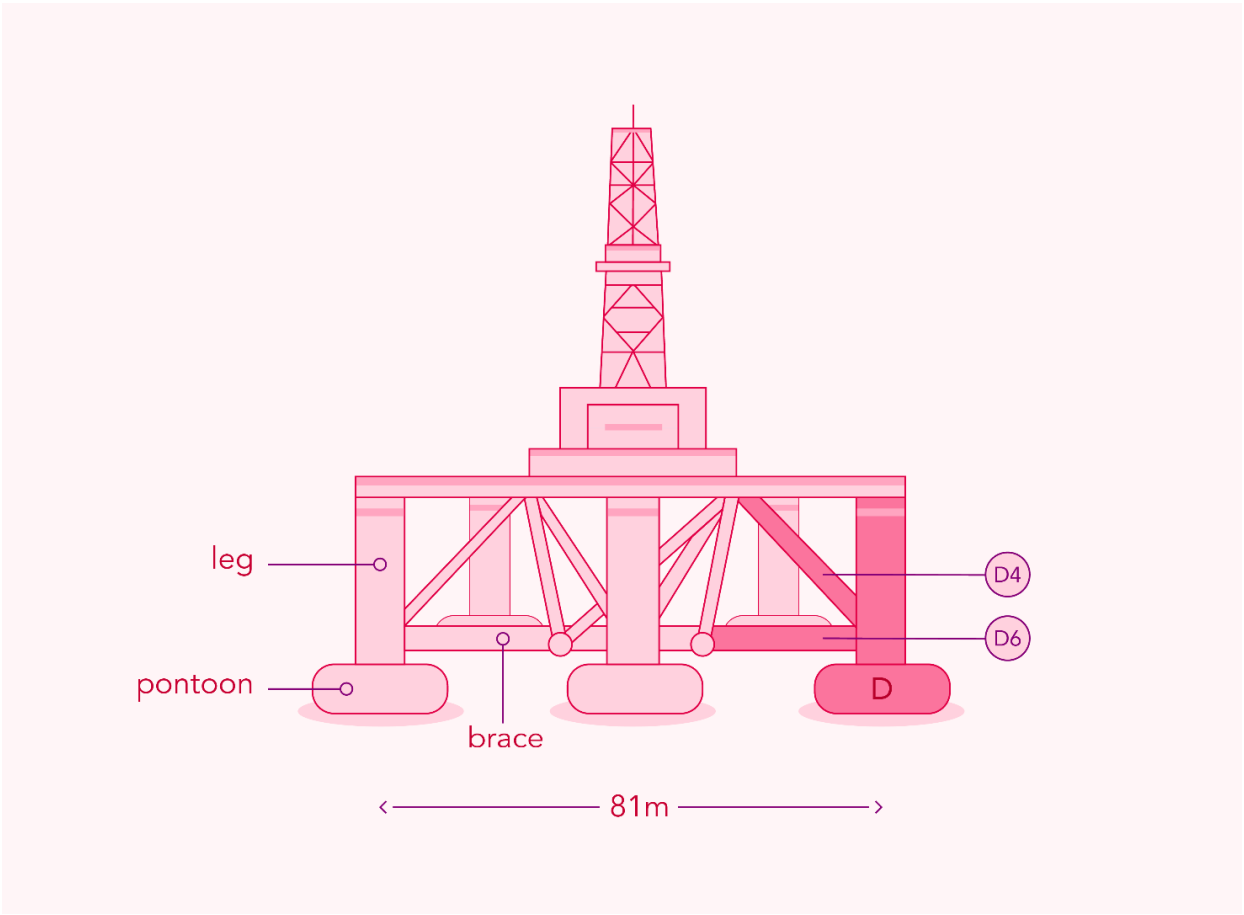
2.2.1 The Commission met the competence requirements

The Ministry of Justice had the overall responsibility for the inquiry and appointed a commission of inquiry according to the Norwegian Maritime Code of 1893. According to the Act, the commission of inquiry was required to have the necessary technical, nautical and legal expertise, and the investigation shows that the Commission met these competence requirements. The Commission had members with investigative experience and from business and industry and the trade unions. The Commission also used external specialist environments to conduct technical investigations.

2.2.2 The Commission conducted thorough technical investigations and there is broad consensus that the accident was due to a fatigue crack in a brace

The designer, the shipyard and the operator of the platform had different interests for assigning liability for the accident, but there was nevertheless broad consensus regarding the Commission's conclusion that the fracture was due to fatigue. In our view, this agreement, together with the thorough technical investigations conducted by the Commission, supports the Commission's conclusion on the triggering cause of the accident.

Figure 2 Illustration a Pentagone platform with legs and braces



Source: The Office of the Auditor General based on the Official Norwegian Report NOU (1981: 11) *The Alexander L. Kielland accident*.

In other words, the Commission concluded that the triggering cause of the accident was a fatigue crack in one of the braces on the platform, more specifically brace D6 (see Figure 2). A fatigue crack had developed where a support for a hydrophone was welded to the brace, and the crack grew into a fracture. The investigation shows that the Commission conducted thorough technical investigations to clarify the causes of the fracture.

The Commission received broad support for its conclusion on the cause of the accident from the designer of the platform (Forex Neptune), the French shipyard that built the platform (CFEM), and Phillips Petroleum that hired the platform. In connection with the action for damages against the designer and the shipyard, the French Commercial Court appointed an expert committee that was given the mandate to conduct a critical review of the work of the Norwegian Commission. The French expert committee also agreed with the conclusion of the Norwegian Commission that the fracture in brace D6 was due to fatigue. They described the technical investigations that the Commission had carried out as being thorough and sound.

2.2.3 The Commission's explanation of how the fatigue crack developed was thoroughly investigated and documented

The French experts and the Norwegian Commission agreed that the fracture on brace D6 was due to fatigue, but they disagreed on how the fatigue crack had occurred.

The Norwegian Commission concluded that the fatigue crack developed due to an error that was made during the planning and construction of the platform. The combination of poorly executed welding, the use of low-quality steel and inappropriate method for attaching the hydrophone holder led to fatigue cracks developing in the brace. The cracks in the weld between the hydrophone holder and the brace constituted a

weak point where fatigue cracks developed and extended to the brace. These cracks continued to grow into a fracture. The Commission found paint residue in the cracks in the weld and concluded that the cracks had occurred during the construction of the platform.

The investigation shows that the French experts considered the Commission's case papers and came to different conclusions. Although the French experts agreed that the steel and the weld had weaknesses, they found that this could not explain how the fatigue cracks in the brace had occurred. They concluded that it was most likely that the hydrophone holder had been subjected to a collision, either with the seabed or another vessel, and that the fatigue cracks had occurred after this. Our investigation shows that there has been no evidence that such a collision had occurred. No damage that could have stemmed from a collision was found on the brace or the hydrophone holder during subsequent investigations.

In our view, the Commission conducted very thorough technical investigations of how the fatigue crack in the brace occurred. The Norwegian Commission's explanation is also better examined and documented than the French experts' explanation.

2.2.4 The Commission did not focus on excluding other causal explanations

Since the accident, there have been discussions about whether the accident may have been caused by the platform's anchoring or an explosion. In our view, the Commission's technical investigations were insufficient to rule out these causal explanations, but today, none of the theories appear to be probable explanations for the triggering cause of the accident. However, the consensus on the Commission's conclusions could have been greater if it had continued to investigate and document other possible causal explanations.

Alexander L. Kielland was designed and built as a drilling platform, but shortly after it was handed over to Stavanger Drilling, the owner decided to turn it into an accommodation platform. Therefore, temporary living quarters were placed on the platform deck. Its use as living quarters meant that the platform was anchored using eight anchors instead of ten. This anchoring pattern was not in line with the operating manual. The platform was connected to a production platform by a gangway and in bad weather, Alexander L. Kielland was towed away from the production platform using anchor wires.

The Commission conducted analyses of how much load the anchor system could transfer to the braces. The analyses were carried out using the weather conditions on the day of the accident and extreme cases, but not the weather conditions in which the platform had actually operated over time. The Commission concluded that the loads from the anchor system were not heavy enough to cause either the crack growth or the fracture in brace D6. The loads from waves were by far the most important factor.

Several key players disagreed with the Commission and argued that the anchoring with eight anchors imposed a greater strain than if the platform had been anchored with ten anchors. Both the shipyard and the designer were of the opinion that the load helped to develop the fatigue cracks in brace D6, thereby speeding up the fracture. The French experts, on the other hand, agreed with the Commission that the loads from the anchoring system could not have caused the fracture in brace D6, and that wave action was the most important factor for crack growth. However, they thought that any errors in the towing of the platform on the night of the accident could have helped speed up the time of the accident.

Our investigation shows that neither the Commission, the French experts nor the involved companies provided accurate information about how often the platform was towed during its operational lifetime and how the towing was carried out. Nor did any of them calculate whether the loads from the anchor wires were strong enough to break off the brace that was weakened by a fatigue crack. This means that none of the parties could document how the anchoring and towing affected the crack growth and thus the timing of the fracture.

The investigation shows that the Commission brought along an explosives expert on the first inspection of the torn off D-leg. The expert concluded that there were no indications of an explosion. However, he only carried out visual inspections of the fracture surfaces on the braces that were available. The D4 brace (see Figure 2), which some believe was damaged by an explosion, was submerged under water and therefore was not inspected. The investigation shows that the Commission secured material samples from the platform that were important in explaining why brace D6 broke off. However, the Commission did not secure material that could confirm or disprove other causal explanations. It also did not carry out technical analyses of brace D4 when this was brought ashore.

The Commission found no other circumstantial evidence of an explosion, such as damage to the deck or scorched paint. Witness descriptions also did not give clear indications that there had been an explosion. Based on this, the Commission concluded that there had been no explosion. The French experts supported the Commission's conclusion.

The investigation shows that the explosion theory was investigated more closely after the Commission had concluded its work, following the initiative of the Kielland Fund's technical advisers, among others. Technical examinations of pieces from brace D4 were carried out and the findings from these could be circumstantial evidence of an explosion, but they could also have other explanations. A report commissioned by the Public Prosecutor' Office in Rogaland in 1987 established that the technical circumstantial evidence did not provide sufficient indications that such an explosion had occurred. Neither the shipyard, the designer nor the French experts supported the explosion theory. In our view, the explosion theory today seems unlikely.

2.2.5 The authorities conducted thorough investigations into the rapid capsizing, but it is uncertain whether certain doors and hatches were open or closed

The Office of the Auditor General finds that the Commission has conducted thorough investigations of factors affecting the platform's stability and of the capsizing, both before and after the platform was righted. There was broad consensus that capsizing was inevitable after the D-leg had broken off. It is still uncertain whether some doors and hatches were closed at the time of the accident and whether the weather conditions indicated that they should have been. This is primarily important for the reason why the platform capsized so quickly and the probability that more people could have survived. In our view, these are questions that it is not possible to find reliable answers to today.

The investigation shows that the Commission conducted analyses of the platform's stability and the capsizing process. Based on these analyses, the Commission concluded that the stability of the platform was good during normal operations.

At the time of the accident, several doors and hatches were open. This contributed to water penetrating faster than if these had been closed. Several people thought that the Commission had overlooked or had been wrong about which doors and hatches were open at the time of the accident. The investigation shows that the Commission also inspected these openings after the platform had been righted. However, due to the damage during the capsizing and the attempts to right the platform, it was impossible to establish for sure which had been open at the time of the accident. The uncertainty concerned doors and hatches that according to the Commission were not of significant importance for how quickly the platform became filled with water.

The rapid capsizing prevented many of those on board from putting on survival suits and evacuating the platform. The Commission considered that this explained to some extent why there were so many fatalities. It was agreed that if all the water and weather-tight openings on the platform had been closed, it would have stayed afloat much longer. However, there was disagreement about whether the weather conditions indicated that several openings should have been closed. All the parties also agreed that if the platform had not capsized so quickly, there would probably have been more survivors.

2.2.6 The authorities involved Det Norske Veritas, which was a party in the case, in the investigation into the accident

The Office of the Auditor General finds that it was reprehensible that the authorities involved Det Norske Veritas in the inquiry and the righting operation, as they were a party in the case.

The rules on impartiality in the Norwegian Courts of Justice Act applied to the commission of inquiry. Someone who is a party in the case or sits on the board (or a deputy member) of an institution that is a party in the case, is legally incompetent. Det Norske Veritas and the Norwegian Maritime Directorate had been responsible for the safety inspections of the platform. Therefore, their work was investigated by the Commission and thus, they were parties in the case.

Although the Commission did not order technical reports directly from Det Norske Veritas, they contributed calculations to some of the documentation reports. Det Norske Veritas also prepared several reports that the Commission partly used in its conclusions. Later, the Norwegian Ministry of Trade engaged Det Norske Veritas in connection with the work of righting the platform. In connection with this, Det Norske Veritas also assessed the cause of the accident. Due to its role as an inspecting organisation during the righting

operation, Det Norske Veritas conducted physical inspections of the wrecked platform. After the platform was righted, Det Norske Veritas was on board the platform by virtue of being a party in the case.

2.2.7 The commission of inquiry's work is vaguely presented in the Commission's report

In the view of the Office of the Auditor General, the presentation of the Commission in the inquiry report may have contributed to misunderstandings about the Commission's work and conclusions.

The investigation shows that the commission of inquiry's report (NOU 1981: 11) has no reference list and direct source references in the text. It also lacks details about interviews and technical investigations. This makes it difficult to understand how the Commission has used documentation reports, written documentation and interviews when drawing its conclusions.

The commission of inquiry wanted to write a report that everyone – also those with no technical expertise – could read. Nevertheless, the Commission used many technical terms without explaining these. Therefore, it was difficult for readers with no prior technical knowledge to understand all the Commission's arguments and conclusions.

The investigation shows that the commission of inquiry did not define key concepts of accident analysis. Therefore, it is difficult to understand how the Commission concluded that various factors (a fracture on brace D6, towing, anchoring, stability, capsizing, etc.) contributed to the platform losing its leg and capsizing and the deaths of 123 people. It is also unclear how the Commission thought these factors might have interacted.

In its report, the Commission emphasised supporting what it thought had happened. As a result, some investigations, and assessments the Commission had made in connection with other possible causes, were not described. Therefore, the report does not provide an insight into the assessments the Commission made with a view to ruling out other causes of the accident.

2.2.8 The survivors and the surviving relatives were not given information while the investigation was ongoing, but since then the Norwegian Ministry of Justice has ensured transparency

In the view of the Office of the Auditor General, a lack of transparency towards the survivors and the surviving relatives in connection with the initial inquiry may have contributed to undermining confidence in the Commission's work. It is positive that since 1987, the Norwegian Ministry of Justice has ensured good transparency about the written material from the commission of inquiry in cooperation with the National Archives of Norway. Among other things, the Commission's archive has been digitised and is freely available to everyone.

The Commission had a duty of confidentiality and could exempt information from public disclosure while the investigation was ongoing. The investigation shows that the Commission did not inform the public about the work during the inquiry, other than communicating certain facts. Most of the documentation reports were also exempt from public disclosure while the inquiry was ongoing. The survivors and the surviving relatives received no information about the inquiry in 1980-1981, either from the Commission or the authorities. However, the parties in the case received information during the inquiry and they were allowed to comment on the investigations that the Commission were to conduct. During the additional inquiry in 1983, the Kielland Fund, which represented the survivors and the surviving relatives, was considered a party to the case and became closely involved.

The Norwegian Ministry of Justice handed over the material from the commission of inquiry to the National Archives of Norway in 1987 and presupposed that there would be a free right of access. In 2019, the archive was digitised, and today the entire material is freely available to everyone.

2.3 The issue of liability surrounding the accident was never fully examined

2.3.1 The authorities did not rectify known weaknesses in the regulations and the control system before the accident

In the view of the Office of the Auditor General, it is serious that the authorities were aware of several weaknesses in the regulations and the control of mobile facilities before the Alexander L. Kielland accident occurred, without taking action.

The Norwegian Ministry of Industry had the overall regulatory responsibility for controlling the petroleum activities until the Norwegian Ministry of Petroleum and Energy was established on 11 January 1978. On 1 January 1979, the regulatory responsibility for safety and emergency preparedness in the petroleum activities was transferred to the Norwegian Ministry of Local Government and Labour, where the Norwegian Petroleum Directorate was the responsible agency. The Norwegian Maritime Directorate (an agency under the Norwegian Ministry of Trade) was responsible for coordinating the control of the mobile facilities.

The principle that the petroleum activities shall be conducted in a responsible manner and according to the applicable regulations was established in the 1960s. However, in the 1970s, the Norwegian Maritime Directorate and the Norwegian Petroleum Directorate faced challenges when developing the regulations and carrying out inspections, partly due to the lack of expertise and capacity.

The Norwegian Working Environment Act entered into force on the Norwegian continental shelf in 1977. Investigations show that there were several challenges associated with the working conditions on the Norwegian continental shelf when the Alexander L. Kielland accident occurred. Safety work was a low priority for the companies and there were many accidents and near misses and the registration of these was poor.

Many of those on board the Alexander L. Kielland platform had not received adequate safety training. This was due to the regulations being unclear, inadequate training capacity and that the authorities granted exemptions from the safety training requirements.

The investigation shows that the authorities were also aware of several other weaknesses in the control system and the regulations before the accident.

- The safety regulations were poorly adapted to mobile facilities, including when it came to stability and design requirements.
- There were different safety requirements for fixed and mobile facilities.
- There was an unclear division of roles and responsibilities between
  - The Norwegian Maritime Directorate and the Norwegian Petroleum Directorate
  - the authorities and private actors
  - the owner and operator of mobile platforms
- The agreement the Norwegian Maritime Directorate had with the Det Norske Veritas regarding supervisory tasks was not adapted to the control system for mobile facilities.

2.3.2 The authorities did not conduct a complete examination of the responsibilities of Stavanger Drilling and Phillips Petroleum

The Office of the Auditor General finds it highly reprehensible that the authorities did not conduct a complete examination of the responsibilities of Stavanger Drilling and Phillips Petroleum after the accident. The Commission placed little emphasis on considering how the owner (Stavanger Drilling) and the operator (Phillips Petroleum) fulfilled their responsibilities. The ministries and the directorates also did not assess how the companies had fulfilled their responsibilities, even though only they could impose sanctions on the companies involved for violation of the safety regulations.

The Norwegian Ministry of Justice gave the commission of inquiry a mandate to clarify the causes of the accident and to recommend measures to prevent new accidents. It was not evident from the mandate that the Commission was to examine the issue of liability. However, the rule for commissions of inquiry under the Norwegian Maritime Code required the Commission to comment on “circumstances that may justify criminal liability or other liability for the owner, captain, crew or others”. No evidence has emerged that the Commission was in dialogue with the Ministry about the mandate when it came to examining the issue of liability.

In Innst. S. no. 166 (1976–77) (Recommendation to the Storting), the Industry Committee underlined the operator’s responsibility for compliance with safety regulations for installations on the continental shelf. The regulatory requirements on internal control were laid down a few years before the accident, but the companies’ work on introducing them had fallen short. The investigation shows that the Commission has not considered how Stavanger Drilling and Phillips Petroleum had handled the responsibility for internal control on the Alexander L. Kielland platform. The Commission generally provided little information through documents and interviews about how the platform had been operated. Documents from Stavanger Drilling were particularly important for assessing the operation of the platform. The police did not seize relevant

documents immediately after the accident. Several deck logs, which could have provided important information about the operation of the platform, were never found. Thus, the Commission missed valuable information that was difficult to obtain from other sources. Therefore, the report from the commission of inquiry did not provide a complete basis for assessing the issue of liability.

The investigation shows that witnesses were questioned too late and that documents were not obtained immediately after the accident. This is difficult to avoid when it is necessary to set up a special commission of inquiry after an accident and it takes time to appoint competent and impartial members. It also takes time for the Commission to convene and draw up a work plan for the investigation.

The ministries and the directorates had the authority to issue orders in their areas of authority and to stop operations or withhold approvals. The authorities were aware that there were violations of several of the safety regulations, but they made no independent assessment of whether the responsible companies had fulfilled their responsibility for safe operation. It is not evident from our document review that the authorities imposed sanctions on Stavanger Drilling and Phillips Petroleum.

The police conducted a separate investigation but based themselves on the Commission's assessments of the causes of the accident. The Commission concluded that the accident was due to system errors and weaknesses in the control of the planning, construction and operation of the platform. The safety regulations for petroleum activities were drawn up so that only individuals, and not companies, could be punished with fines or imprisonment for violating these rules. The police found no basis for prosecuting individuals for violation of the safety regulations.

Most of those on board the platform lacked basic safety training and the police investigated this further. The Norwegian Working Environment Act set requirements for proper safety training and authorised penalities for non-compliance by companies. The police issued fines on the companies that had employees on the platform, for violating the statutory training requirements. However, none of the companies accepted the fines and the fines on Phillips Petroleum and another company with employees on board were subsequently significantly reduced. Most of the company fines were eventually dismissed.

2.3.3 The Commission made a thorough assessment of the follow-up of the authorities and Det Norske Veritas

In the view of the Office of the Auditor General, the Commission made a thorough assessment of the authorities and Det Norske Veritas' follow-up of the platform through the planning, construction, and operation.

The investigation shows that all the required inspections of the Alexander L. Kielland platform were carried out. However, there were weaknesses in the implementation of the inspections and the regulations. This meant that the safety follow-up of the platform was not good enough, either during the planning, construction, or operation. The Commission considered that the Norwegian Maritime Directorate's case processing was not good enough when approving the platform's stability, anchoring system, and crew. The Commission also criticised Det Norske Veritas' approval and supervision of the platform during the planning, construction, and operation. The French experts agreed with the Commission's assessments in this area.

There have been discussions about whether the cracks on the brace could have been discovered by Det Norske Veritas during the last annual inspection in the autumn of 1979. Both the Commission and the French experts agreed that it was unlikely that the cracks could have been detected. The reason for this was that this would require inspection methods that were not laid down in the regulations and that the area around the hydrophone holder was not considered a risk area to be prioritised during an inspection.

2.4 The authorities have followed up the recommendations from the inquiry

2.4.1 The authorities did a thorough job of considering measures

The authorities had a good basis for implementing safety measures after the Alexandar L. Kielland accident. The investigation shows that immediately after the accident, both the Norwegian Ministry of Local Government and Labour and the Norwegian Maritime Directorate initiated work to assess measures to improve the safety on board mobile facilities. The results from the reports largely coincided with the Commission's recommendations, but they complemented each other in some areas. The majority of the

Municipal and Environmental Protection Committee endorsed the Commission's recommendations, cf. Innst. S. no. 157 (1983–84) (Recommendation to the Storting).

2.4.2 The authorities implemented many measures to improve safety

In the view of the Office of the Auditor General, the authorities have followed up the weaknesses that came to light after the Alexander L. Kielland accident, by developing regulations and the control system.

The investigation shows that the Commission's main recommendations and the recommendations from the authorities' investigation work were followed up, mainly through legislative amendments. This meant that the safety regulations were better adapted to mobile facilities, among other things. The authorities also set more stringent safety training requirements and initiated work to increase training capacity. The safety work on board platforms was also enhanced.

The authorities also implemented several measures to strengthen the control of mobile facilities. In 1981, the Norwegian Maritime Directorate established a separate unit that was assigned responsibility for offshore affairs, so that they could follow up mobile facilities in a more comprehensive way. In 1982, the Norwegian Ministry of Trade and Det Norske Veritas entered into a new agreement on the control of mobile facilities. This agreement clarified roles and responsibilities. It took several years for the authorities to agree on a new control regime that clarified the division of responsibilities between the authorities. Important clarifications were made in connection with the Norwegian Petroleum Act in 1985.

The investigation shows that the development of the current safety regime on the Norwegian continental shelf has been a long-term process. In the current regulations, the overall regulatory responsibility of the Petroleum Safety Authority Norway has become clear. Furthermore, the division of responsibility between the authorities, the owner and the operator has been clarified in the regulations. Cooperation between the authorities, business and industry and the trade unions has also been strengthened.

2.4.3 There has been a significant improvement in safety on mobile facilities

Although there has been a significant improvement, serious incidents still occur on mobile facilities. Therefore, in the view of the Office of the Auditor General, the Norwegian Maritime Directorate and the Petroleum Safety Authority Norway must continue to closely follow up safety on mobile facilities.

The investigation shows that since 1980 there has been a significant improvement in safety on mobile facilities used in the petroleum industry. The number of fatalities and accidents on the Norwegian continental shelf has been significantly reduced. However, the number of injuries on mobile facilities is still higher than on fixed facilities, compared with the number of working hours. The conditions for safety delegates and elected representatives have improved considerably since 1980, but the Petroleum Safety Authority Norway's supervision shows that cooperation with the employees is still not good enough in some companies.

Since 2000, the Petroleum Safety Authority Norway has carried out systematic assessments of the risk of accidents on the Norwegian continental shelf. Thus, the safety authority has a sound basis for following up areas where there is a risk of accidents. The risk of accidents on mobile facilities has been reduced over time. There have been no major accidents on the Norwegian continental shelf since 2000, except for helicopter accidents. However, there have been several serious incidents involving structural safety and stability.

2.5 The surviving relatives did not receive follow up and the follow up of the survivors was not good enough

The Norwegian Ministry of Social Affairs held the overall responsibility for health services in 1980. Today, the Norwegian Ministry of Health and Care Services holds this responsibility. The public authorities' responsibility to follow up survivors and surviving relatives after accidents was weakly regulated in 1980. However, Norwegian research within crisis psychiatry was at the forefront at this time and therefore, experts had a good knowledge of the needs of survivors and surviving relatives in the wake of a disaster.

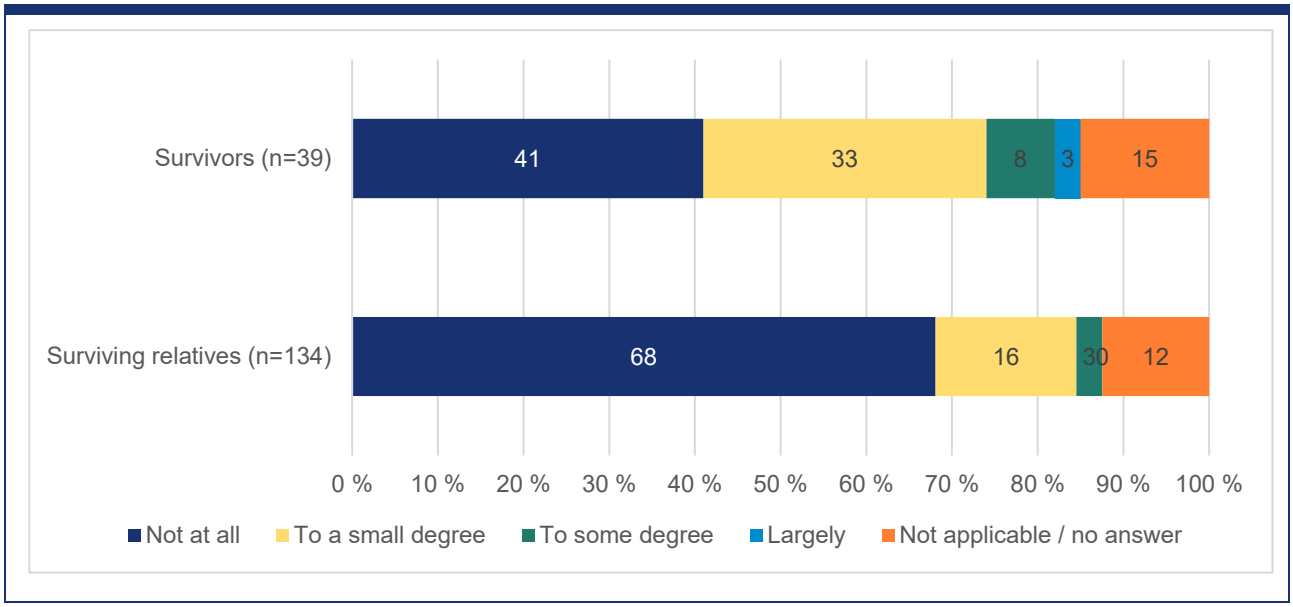
2.5.1 The authorities did not ensure follow up of the surviving relatives

The Office of the Auditor General finds it serious that the Norwegian Ministry of Social Affairs chose not to provide follow up of the surviving relatives following the Alexander L. Kielland accident. Through the medical community, the Ministry understood that the surviving relatives needed follow-up.

The investigation shows that the surviving relatives received little information after the accident. There was great variation in how the death notification was communicated and many people found this out through the media. Some of the relatives of the victims who were not found said that they were not informed of the death of their relatives. In this group, as much as 88 per cent experienced that they did not receive the information they needed about the circumstances surrounding the deaths. The authorities did not provide any information to the surviving relatives, but for a time supported the Kielland Fund's information work.

The investigation shows that already the day after the accident, the medical community pointed out that the surviving relatives needed help and follow-up. The steering committee set up to follow-up the survivors attempted to organise a follow-up programme for the surviving relatives as well. However, the Norwegian Ministry of Social Affairs did not prioritise using resources for this and the project was never implemented.

Figure 3 The health authorities have ensured adequate follow-up of those affected by the Alexander Kielland accident (n=173) Per cent



Source: The Office of the Auditor General's survey of survivors and surviving relatives. 49 survivors and 195 surviving relatives received the questionnaire. Of these, 39 survivors and 134 surviving relatives have responded.

Today, a larger proportion of the surviving relatives than of the survivors find that the health authorities' follow-up at the time was inadequate. Figure 3 shows that 68 per cent of the surviving relatives and 41 per cent of the survivors found that the health authorities did not ensure adequate follow-up of those affected by the accident *at all*. The survey also contained the response alternative "*to a great extent".* None of the survivors or the surviving relatives chose this response. A larger proportion of the surviving relatives than the survivors also found that the authorities' handling of the accident has had a negative impact on their quality of life.

2.5.2 The survivors were followed up, but several people today find that they did not receive the help they needed

The Office of the Auditor General finds it highly reprehensible that the Norwegian Ministry of Social Affairs did not provide adequate follow-up of the survivors of the Alexander L. Kielland accident. Although the survivors received a good offer of help compared with the norm in 1980, many today find that they did not receive the help they needed. The follow-up was centrally managed, and the Norwegian Ministry of Social Affairs did not make sure to involve and guide the local support system. In our view, there was an unfortunate mix of research on and follow-up of the survivors of the Alexander L. Kielland accident. However,

the results of the research have been important for developing the current system for following up those affected by major accidents.

A total of 54 of the 89 survivors needed medical follow-up and were sent to the hospital when they arrived ashore. The survivors who were not physically injured were sent to a hotel and returned home the day after the accident. Thus, these received no psychiatric follow-up in the acute phase to process their experience of the accident. The survivors who were admitted to hospital received better follow-up and many had consultations with a psychiatrist. Nevertheless, 72 per cent of the survivors still experience today that they received little or no help from health personnel in the days following the accident.

Stavanger University Hospital received support from experts in disaster psychiatry the day after the accident. This contributed to the establishment of a plan for long term follow-up of the survivors. All the survivors received an information letter with advice on how to deal with common reactions. They were also encouraged to contact the health service where they lived. However, there was little knowledge about disaster psychiatry in the municipalities. Many people also refused to seek help. They were afraid of receiving a psychiatric diagnosis and of losing their jobs in the oil industry. This may have contributed to many not receiving the necessary follow-up. A total of 54 per cent of the survivors informed that they had no contact with the local health authorities in the time after the accident.

The long-term follow-up consisted primarily of a medical examination of everyone. The aim was to carry out the check-up as soon as possible to be able to provide help. One single psychiatrist was given the main responsibility for carrying out the check-ups. Since the survivors lived scattered around the country, it took a long time for everyone to be contacted and for some, it took as long as one year. There were still many people who did not want to receive psychiatric help. The medical community found this problematic.

The investigation shows that the survivors have participated in several research projects. The projects have been a combination of research and offers of help, with a declining emphasis on helping. The research shows that most of the survivors (61 per cent) have been doing well and have had few problems since the accident. Others have faced greater challenges and for some, the problems have grown over the years. The accident has had a negative impact on their participation in working life. Today, 74 per cent of the survivors find that the health authorities did not provide adequate follow-up *at all* or to *a limited extent* in the time after the accident.

2.5.3 The authorities have improved the system for following up people affected by accidents

Our assessment is that the system for taking care of survivors and surviving relatives after disasters has been significantly strengthened after the Alexander L. Kielland accident.

The investigation shows that following the Alexander L. Kielland accident, statutory requirements have been put in place that require all municipalities to have plans for psychosocial follow-up of those affected by major serious accidents.

The Norwegian Ministry of Health and Care Services has worked to strengthen the municipalities' expertise and capacity to follow-up those affected. In 1998, an escalation plan for mental health was introduced and the guidance of the municipalities has been strengthened. The municipalities are required to have contingency plans and psychosocial crisis teams or the equivalent. The investigation shows that the municipalities have been significantly strengthened in this field, but there are still variations in the municipalities' services. A lack of psychologists is a particular challenge.

The investigation also shows that the authorities today actively contact affected parties at an early stage. This can mean that the support system reaches more people. Routines have also been established to set up a joint information centre to meet the information needs of those affected. It has also become more common to establish support groups.

3 The Office of the Auditor General's recommendations

The Office of the Auditor General has no recommendations.

4 The Minister's response

The ministers in the Norwegian Ministry of Labour and Social Affairs, the Norwegian Ministry of Health and Care Services, the Norwegian Ministry of Justice and Public Security and the Norwegian Ministry of Trade, Industry and Fisheries find that the Office of the Auditor General has made a thorough review of the authorities' work on the Alexander L. Kielland accident and agree with the conclusions and comments of the Office of the Auditor General. The Norwegian Minister of Trade, Industry and Fisheries has no further comments.

The Norwegian Minister of Justice and Public Security takes it very seriously that so many survivors and surviving relatives have little or no confidence in the inquiry. She is satisfied that the Office of the Auditor General's main conclusion is that the authorities did a thorough job of clarifying the causes of the accident. The Minister considers the weaknesses in the authorities' handling of the accident that the Office of the Auditor General has uncovered in the further work for a transparent and good justice and public security sector.

The Norwegian Minister of Labour and Social Affairs points out that the Alexander L. Kielland accident was a disaster that hit those affected and the Norwegian petroleum activities hard. The Office of the Auditor General's report is an important contribution to the history of the accident and the follow-up of this. The Minister points out that the lessons learnt from the accident led to extensive changes in regulations and supervisory follow-up and laid the foundation for the current HSE regime in the petroleum activities. This regime, with functional requirements, clear accountability of the industry, system-based supervision and emphasis on bipartite and tripartite cooperation is well-adapted to this industry and over time has also contributed to positive development and a high level of safety in the Norwegian petroleum industry. These are crucial prerequisites in an industry with an inherent potential for major accidents.

The Norwegian Minister of Health and Care Services found it very regrettable that so many of those affected by the accident experienced little or not adequate follow up from the health authorities. He stresses that today we know that the surviving relatives should have received follow-up from the health authorities. Furthermore, the Minister points out that the health authorities did not involve the local support system enough in the follow-up of the survivors of the accident. The Minister also points out that several major changes have been made to the follow up of those affected by crises and disasters and that there has been a significant strengthening of mental health services in the municipalities and the specialist health service. There is some variation in the services offered in the municipalities, especially concerning access to expertise in clinical psychology. According to the Minister, the Government has allocated funds for the appointment of psychologists in the municipalities and the number has increased from 130 in 2013 to more than 600 in 2020. The Minister believes it is important that the municipalities think carefully through and plan how this expertise should be used.

5 The Office of the Auditor General's comment to the Minister's response

The Office of the Auditor General has no further comments.

The case will be submitted to the Storting.

Adopted at the meeting of the Office of the Auditor General on 16 February 2021

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