TCFD **REPORT**

WE **CARE**

Lerøy's Sustainability Ambition

Lerøy Seafood Group's (hereinafter LSG or the Group) goal is to create the world's most efficient value chain for sustainable seafood. To achieve this goal, we must look at how we can reduce our greenhouse gas emissions, and also at how climate change affects our value chain and the potential opportunities it can provide for us.

To reduce our impact on climate change, we have set ambitious targets for reducing our greenhouse gas emissions by 2030. Through Science Based Targets Initiative, LSG has committed to reducing its Scope 1,2 and 3 emissions by 46% overall. Lerøy has an ambition to be climate neutral by 2050.

To secure the value chain against climate related risks with potential to affect to our operations, we use a great deal of resources to identify risks and put in place measures to secure our operations. We also explore the opportunities that climate change can give us and that can strengthen our operations. Among other things, we are working on a project "Sustainability in daily operations" to ensure that all our employees, in our various subsidiaries, are aware of how they can affect climate emissions in daily operations. As a starting point, all employees have been given opportunity to complete an online training course on environmental, social and economic sustainability. The main goal for the project is to enable the employees to make sustainable choices in their everyday work life.

The Group is currently re-calculating its Science-Based Target base year (2019) and will deliver its recalculated application to Science Based Targets Initiative. The Group will also set a Forest, Land and Agriculture (FLAG) Science-Based Target and deliver an application to Science Based Targets Initiative in accordance with Science Based Targets recommendations and given time horizon.

About Lerøy Seafood Group

Lerøy Seafood Group is a fully integrated and world-leading seafood supplier, with more than 70 subsidiaries around the world and a history dating back to 1899. The Group has three core business segments comprising of production of salmon and trout ("Farming"), catches and processing of white fish ("Wild Catch"), and processing, product development, marketing, sales, and distribution of seafood ("VAP (value-added products), Sales & Distribution").

We currently employ around 6000 people worldwide, delivering seafood to shops, restaurants, canteens, and hotels in more than 80 countries. We are a proud supplier of seafood, corresponding to approximately 1.75 billion meals every year.

Our head office is located in Bergen, Norway. Lerøy has fishing vessels and fish farms in operation along the entire Norwegian coast. In addition to production and packaging plants in Norway, we have processing and distribution in Sweden, Denmark, Finland, France, the Netherlands, Portugal, Spain, Italy, and Turkey. We also have sales offices in the USA, Japan, and China.

The TCFD Recommendations

Recommendations

There is a growing demand for decision-useful, climate-related information, and creditors and investors are increasingly demanding access to risk information that is consistent, comparable, and clear. The Task Force on Climate-related Financial Disclosure (TCFD) developed the TCFD disclosure recommendations to augment market transparency and stability. Additionally, TCFD encourages the standardized reporting structure for financially material climate-related risks and opportunities to give investors, lenders, and insurers enhanced comparability when assessing and pricing pertinent companies.

The TCFD recommendations are structured around four thematic areas that represent core elements of how organizations operate: governance, strategy, risk management, as well as metrics and targets. Moreover, the framework separates into three main categories: risks related to the transition to a lower-carbon economy, risks related to the physical impacts of climate change, and climate-related opportunities. The TCFD has also incorporated financial impact as an integral part of its disclosure recommendations.

In line with the TCFD disclosure recommendations, TCFD is an integrated part of LSG's annual financial reporting, and the report is reviewed by the Audit committee and the Board annually.

TCFD Recommendations

Governance

The organization's governance around climate related risks and opportunities

Strategy

The actual and potential impacts of climate-related risks and opportunities on the organization's business, strategy, and financial planning

Risk Management

The process used by the organization to identify, assess, and manage climate related risks

Metrics and Targets

The metrics and targets used to assess and manage relevant climate=related risks and opportunities

TCFD Content Index

Governance	Strategy	Risk Management	Metrics and Targets
Disclose the organization's governance around climate-related risks and opportunities.	Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's business, strategy, and financial planning where such information is material.	Disclose how the organization identifies, assesses, and manages climate-related risks.	Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.
Recommended Disclosures	**Recommended Disclosures**	**Recommended Disclosures**	**Recommended Disclosures**
a) Describe the board's oversight of climate-related risks and opportunities.	a) Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term.	a) Describe the organization's processes for identifying and assessing climate-related risks.	a) Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process.
b) Describe management's role in assessing and managing climate-related risks and opportunities.	b) Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning.	b) Describe the organization's processes for managing climate-related risks.	b) Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks.
	c) Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario. a 2°C scenario	c) Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management.	c) Describe the targets used by the organization to manage climate-related risks and opportunities and performance against the targets.

CDP Climate and TCFD

LSG has reported to the Carbon Disclosure Project (CDP) Climate questionnaire since 2013, as well as CDP Water (since 2020) and CDP Forests (since 2020). Reporting to the CDP has been an important step for the Group to better identify and manage the climate-related impacts of our business activities. 2022 was the first year where our CDP report was aligned with the TCFD framework. Climate scenario analysis was first developed in 2020/2021 and advanced in 2023. The TCFD's focus and guidance on our climate-related financial impact and scenario analysis is an important process, both to ensure transparency, and to improve our understanding of how climate-related issues can affect us, and how we will mitigate expected climate changes in the future.

In 2022, LSG achieved a B score in CDP Climate and we have ambitions to improve the score in 2023, by working systematically with our climate and sustainability strategy and initiatives as well as by further developing our reporting routines. Since we started to collect and report our emissions data in 2010, we have established a solid reporting foundation. Our TCFD assessment has played an important role in further developing this, as it helps us to continuously assess what short- and long-term actual and potential risks are relevant to us. Thus we are able to identify gaps and build mitigation strategies around them to ensure future-proofing of LSG.

The Corporate Sustainability Reporting Directive (CSRD) and TCFD

The CSRD aims to improve the way companies report sustainability information as sustainability reporting will be on an equal footing with financial reporting. Investors will have access to the information they need to assess investment risks arising from climate change and other sustainability issues. The CSRD also incorporates the concept of "double materiality". This means that companies have to report not only on how sustainability issues might create financial risks for the company (financial materiality), but also on the company's own impacts on people and the environment (impact materiality).

CSRD requirements also incorporate recommendations of the TCFD.

The CSRD will be applicable from January 2024.

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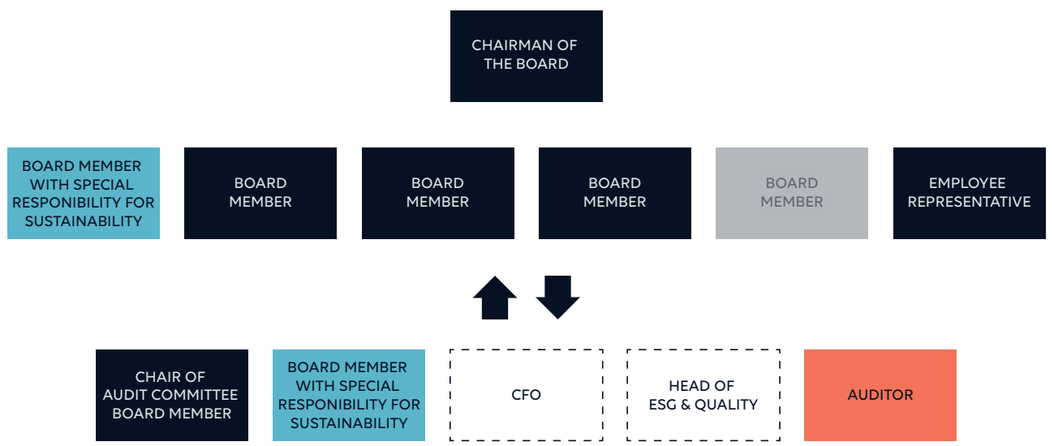
Governance

Disclose the organization's governance around climate-related risks and opportunities



Board-level oversight

Climate-related risks and opportunities are integrated into LSG's overall governance mechanisms. The Board of Directors (BoD) has the ultimate responsibility for the company management, including oversight of ESG (incl. climate-related) strategic planning, and risk and opportunity management. The Chairperson of the Board has the overall responsibility for the management of climate-related issues in The Group. The Board has a responsibility to ensure that The Group's activities pertaining to climate issues are included in the company's strategy. This includes defining, monitoring, and ensuring that climate-related targets are achieved.

The BoD has appointed one designated member with an extended responsibility for ESG and climate-related issues. This Board member holds quarterly meetings with the Head of ESG & Quality. Discussion points at these scheduled meetings include The Group's ESG and climate strategy and its developments, as well as the necessity for any adjustments to the strategy. They also review policies to be approved and amended (the Board is the ultimate approver of all policies in the Group) as well as plans of action, budgets, and business plans. Further discussion points include climate-related KPIs, current and future projects, news, trends, and experiences regarding various ESG and climate-related issues. In addition to the scheduled quarterly meetings with the responsible Board member, the Head of ESG & Quality maintains a continuous dialogue with the BoD regarding relevant ESG and climate-related issues. The Board also reviews and provides strategic guidance regarding risk management. Climate-related risks are included in the Group's overall risk analyses.

Performance objectives are set by the Corporate management and approved by the Board. The Performance objectives are measured quarterly and they also constitute a part of the discussion between the responsible Board Member and Head of ESG & Quality. A report regarding the Group's performance objectives and their development is produced and sent to the Board's responsible for ESG for quarterly reviews. Discrepancies and (negative) trends regarding target achievement are reported to the Board which decides if any corrective actions should be taken in order to achieve the defined targets.

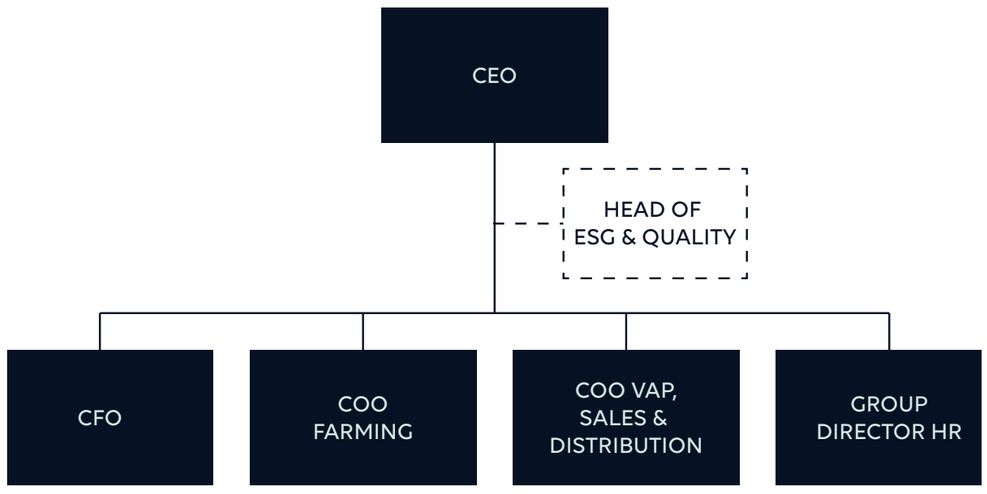
Through this structural setup, ESG and climate-related issues receive direct oversight from the Board. We believe that having oversight on the highest executive level is crucial for our success as a sustainable business.

Management-level oversight

The CEO is the highest management level responsible for ESG and climate-related issues and is responsible for assurance of both assessing and managing climate-related risks and opportunities. The Head of ESG & Quality reports directly to the CEO of the Group. Lerøy considers this way of working highly effective taking into consideration the proximity of decision-making and ability to influence decisions regarding climate-related issues.

The ESG & Quality Department manages climate-related issues on a daily basis. The department plays a central role regarding management, coordination, and reporting of climate-related issues. The team dedicated to climate-related issues provides oversight, support, and coordination regarding climate-related matters across the Group, as well as reporting on ESG and climate-related issues both internally and externally. Each company in the Group is responsible for implementing climate-related actions (incl. monitoring and reporting) in their respective areas. Climate-related data is collected from the companies in the Group and is communicated both internally and externally.

Lerøy has defined various ESG related KPIs and a number of these are audited annually (please, visit our Annual report 2022 for complete overview). Two of the Group's strategic KPIs are related to the Group's emissions of greenhouse gases. The Group's management team reviews climate related KPIs monthly. Strategic projects related to reduction of greenhouse gas emissions have been initiated in order to achieve the goals that have been set. These projects address our most significant emission areas: sustainable fish feed, transportation, and alternative fuel sources. The Group management team reviews strategic projects on a monthly basis and compiles these with the results achieved. If necessary, corrective measures are implemented.



Strategy

Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material.

Identified climate-related risks and opportunities

Climate-related risks and opportunities influence LSG' strategic and financial planning and consider both short-, medium-, and long-term time horizons, likelihood of impact, as well as financial impact, in the assessments of these risks and opportunities. The following definitions of time horizons and financial impact are applied:

Time horizon	Year
Short-term	0 – 5
Medium-term	5 - 10
Long-term	10 +

Financial impact	Percentage of revenue
Low impact	< 5%
Medium impact	5%
High Impact	> 5%

In 2020/2021 the Group conducted its first climate scenario analysis using the TCFD framework. The analysis was based on in-depth interviews with 20 key internal and external Group stakeholders and identified LSG's main risks and opportunities related to climate change, in combination with objective climate research correlating to the respective geographical locations. The results of the analysis were discussed with the Group's management team and serve as building blocks for the Group's future climate-related strategy. During Q2 of 2023 a new assessment on the identified risks was completed to evaluate their impact using a risks and opportunities matrix (R&O Matrix) where time horizon, likelihood of impact, and financial impact were considered. The new evaluation of risks and opportunities triggered a need for an expansion of our scenario analysis. On the foundation of the new R&O Matrix, 6 top climate-related risks were selected as a focal point of their own individual scenario analysis. The scenario analysis can be found in a separate published document (addendum to the main document). A summary of each scenario analysis can be found further down in this report under the Strategy chapter.

LSG is a subsidiary company of Austevoll Seafood ASA. We understand the importance of assessing climate-related factors and their potential financial impact. In conducting this assessment, we have carefully taken into account marginal differences in our revenue. This approach recognizes the distinctive financial context of our company and ensures a thorough evaluation of the potential consequences. When categorizing the financial impact, we consider the specific circumstances of each of our subsidiaries, including their annual income and revenue composition. For instance, a marginal impact of 5% on the revenue of one of our smaller subsidiaries might be classified as high due to their reliance on core business operations for generating profit. We understand that even a small decrease in revenue can have significant implications for their financial health. They may experience reduced profitability, cash flow constraints, or challenges in meeting financial obligations more prominently compared to our larger subsidiaries. On the other hand, we also recognize that our larger subsidiaries, with their higher annual income and more diversified revenue streams, may have a different impact

profile. A 5% reduction in revenue for them might be considered a lower impact due to the presence of alternative income sources, such as different segments, services, or investments. Their financial resilience and ability to absorb such impacts set them apart from our smaller subsidiaries.

By incorporating these marginal differences in revenue, our assessment allows us to tailor strategies and allocate resources effectively to address the identified climate-related impacts. It supports us in enhancing the resilience of our portfolio as a whole and enables informed decisions that align with our objectives.

The below table summarizes the risk and opportunities considered in our climate-related risk assessments.

Risk type		Description of risk	Mitigation Strategy
Current & Emerging regulation		LSG is continuously monitoring the actual and potential impacts of existing and emerging regulations, both in our production countries and in the markets we serve. The risks connected to these regulations are always included in our risk assessments.	
	1.	**Grow-out seawater licenses for salmon and trout (being allowed to produce a certain volume):** Grow-out licenses are given to enterprises in politically adopted allocation rounds. The number of these is already limited, which is a risk we currently account for. Moreover, the allocation rounds may become even stricter and more selective in the future due to environmental concerns. This is highly relevant to LSG, as a large-scale producer of seafood.	To mitigate this risk, we stay in close contact with relevant authorities. By facilitating clear communication both ways, we stay up-to-date on potential upcoming changes to the licensing scheme, which makes it possible to plan accordingly.
Current & Emerging regulation	2.	**Uncertainty related to the EU Taxonomy and how this will impact Lerøy in the short term:** As the seafood sector is among the sectors for which some of the EU Taxonomy criteria are yet to be developed, there is uncertainty associated with what share of LSG's business activities will be classified as "green". If a significant percentage of our activities are deemed to not be Taxonomy aligned, this will affect our access to capital.	In order to prepare and progress towards EU Taxonomy, LSG is working on getting all relevant reporting in place, in line with best-practice procedures. We also cooperate closely with other organizations in the sector to identify gaps, exchange experiences and improve our reporting. Lerøy has employed a dedicated resource who is responsible for coordination of implementation of the EU Taxonomy. The Group has also involved a consultancy company (PWC) who is assisting with getting the right systems in place in order to be prepared for implementing and reporting in accordance with the upcoming requirements.
	3.	**Carbon pricing and taxes:** LSG transports products to overseas markets by air freight. Any carbon taxes will have a significant financial impact, making products more expensive and thus less competitive. Norway, for example, which accounts for approximately 98% of the Groups Scope 1 emissions and 53% of the Group's Scope 2 CO2 emissions, will seek to more than triple its tax on carbon dioxide by 2030. Lerøy uses Marine Gas Oil (MGO) and diesel in its operations (both in farming and wild catch), and taxation on fossil fuels will impact the cost of fuel significantly.	Our number one priority to mitigate this risk is to lower our emissions. We prioritize targeting the activities producing the most GHG emissions (MGO, fish feed, and air freight), as reductions in these categories will significantly lower our overall GHG emissions. We are also actively participating in various R&D activities and projects that explore potential use of alternative fuels.
	4.	**Stricter requirements for ASC certifications:** It is imperative for Lerøy to continue to meet the criteria for the ASC certifications. If these criteria are not met and the products loose their certifications, this could lead to loss of market share and decreased profitability.	It is of high importance to us to keep our certifications, and we ensure that we stay up-to-date on their associated requirements.
	5	**New legislation and requirements concerning the use and disposal of Styrofoam and plastics:** Stringent regulations concerning the use and recycling of plastics in all markets may increase operating costs. As such, LSG will have to allocate capital to invest in new types of packaging material and transportation boxes.	As this risk is highly relevant to LSG, we participate in projects focused on developing new types of sustainable packaging.
	6.	**Taxation on, or prohibition of the use of soy in fish feed:** Due to the issues and stigma associated with soy production globally, there is a risk that the purchasing and/or use of the commodity will be regulated. Traditionally (and currently), soy has been and is the dominating ingredient in fish feed. If the price of soy increases, this will incur significant costs for LSG. Moreover, if the use of the commodity in feed production is banned, LSG will need to find new alternatives. The current alternatives to soy-based feed on the market are either underdeveloped or highly priced. It is Lerøy's hope that both these aspects will improve in the coming years.	In order to avoid risks associated with soy, LSG is determined to significantly reduce the use of soy over time. We are involved in multiple projects focused on alternative feed ingredients (blue mussels, sugar kelp, etc.), we also keep close communication with our feed providers, in order to push the development of feed in the right direction

	7.	**Norwegian traffic-light system regulation:** Norwegian Traffic Light System (TLS) – under the traffic light system, Norway is divided into 13 production areas that are colored every other year based on sea lice levels and their impact on wild salmon populations. Production capacity is then adjusted by 6%. The TLS came into force in October in 2017, and aims to regulate sustainable growth of Norwegian aquaculture based on environmental aspects. Climate change and the associated increase in surface water temperature, periods of extreme regional ocean warming, and lower salinity of coastal waters increase the physiological stress on salmon and increase susceptibility to salmon lice. The TLS in combination with climate change poses financial risks to Lerøy Seafood Group as a number of its operations are located in less favorable production zones. In case salmon lice infection pressure increases, it may exceed the limit values in Norwegian regulations and lead to increased costs for the company, fines, downgrading of fish, reduced fish welfare and, in worst case, fish mortality.	Lerøy is focusing on keeping average numbers of mature female sea lice as low as possible. Monitoring and controlling sea is one of the priority focus areas in Lerøy. The company uses targeted measures to reduce the number of lice by reducing exposure in the sea, using Recirculating Aquaculture System (RAS) technology, biological delousing using cleaner fish as well as developing technology, such as semi-closed facilities to help control sea lice levels.

Technology		Based on our risk assessment, we have identified a variety of risks connected to the emergence of new technologies:	
	1.	**Unsuccessful investments in new technologies:** This may pose a financial and operational risk. In this regard, a relevant example pertaining to LSG would be to invest in a new fleet whose performance proved insufficient after a short period. This would mean that we again would need to invest in new technology, which would incur significant costs and may further affect our operations in the transition time.	In order to avoid this, thorough assessments need to be conducted prior to purchase/ implementation. In order to implement new technology, we need to ensure that procedures are in place to minimize the potential impact of our operations.
	2.	**Technological developments in alternative protein production:** As developments in alternative-protein technologies are increasing, this may pose a threat to LSG if consumers shift from seafood to these alternative protein sources. Also, recently there have been developments in production of alternative "seafood" form plants, microbes and animal cells. It is expected that plant-based seafood options are to expand in restaurants, grocery stores, and online marketplaces.	The development of new protein sources is unavoidable. Therefore we are also engaged in projects developing new and high-quality forms of both marine protein (mussel meal, sugar kelp, and microalgae) as well as plant based protein products to be able to meet customer needs and requirements.
	3.	**Technological developments in land-based fish farming:** Land-based farming poses a threat to LSG, as this moves production closer to the market, eliminating the need for long-distance transport, especially air freight.	We are currently administrating multiple projects pertaining to land-based farming of juvenile fish (post-smolt), in many of our Norwegian locations. Moreover, we are participating in multiple land-based projects administered by other actors.

Market		Globally, we are seeing an increased focus on how food production is connected to climate change, which is creating changes in market patterns.	
	1.	**Change in consumer needs and behavior:** An example relating to this is younger consumers (with increasing purchasing power) changing their eating habits and having a greater focus on climate-related issues. Alternative protein sources can potentially threaten LSG's market position, causing a negative financial impact.	We cooperate closely with grocery chains and other actors to conduct market research projects and reputation assessments. This way, we can assess consumer patterns and adapt accordingly
	2.	**Increasing demand for climate-conscious food:** Climate action is becoming increasingly important for consumers, especially in Norway, where we deem it poses the largest market risk. Consumers set higher demands and requirements for the products they purchase. There may be an increase in demand for certified fish, and this may have a financial impact if these requirements are not met.	In order to meet these demands, we stay vigilant when it comes to fulfilling certification requirements. Moreover, we are actively working on decreasing our negative impact on the climate and environment, to increase the probability of staying compliant as the requirements become stricter. Lerøy Seafood Group has set a target to be the most sustainable seafood producer in the word. The company has defined specific KPIs that are monitored and (if necessary) adjusted to achieve the defined targets. The company is also ensuring transparency regarding its operations and is reporting its ESG performance in accordance with Global Reporting Initiative (GRI). The reporting is verified by a third party (PWC).

Reputation		If LSG is unsuccessful in contributing to the transition to a low carbon economy, and/or fails to communicate its sustainability efforts and developments, there is a risk that this could be detrimental to our reputation and negatively affect our business. LSG is a well-known name to consumers, and given our brand recognizability, the risks associated with a tarnished reputation are significant.	
	1.	**The use of soy in fish feed is increasingly affecting our reputation:** The use of soy in fish feed is becoming more and more controversial, as consumers' awareness of the issues connected to its production (deforestation, land-use change, etc.) is increasing. Even though 100% of the soy used in our feed is certified, the use of soy alone can impact our reputation.	First and foremost, we are actively working towards deforestation-free soy through our supplier requirements. We have signed the Cerrado Manifesto in support of expanding existing environmental legislation as it pertains to soy production. We must also endure that we communicate our efforts, to ensure that customers know we are actively trying to better the industry as a whole.
	2.	**Growing awareness of the use of air freight in transportation may harm the overall reputation of seafood:**	LSG is working on decreasing the amount of product transported by air, which will have a positive impact on our GHG emissions. Optimizing our transportation logistics is high on the agenda, as this affects both our emissions, reputation, and the final balance sheet
	3.	**Negative portrayal of aquaculture industry in media:** If the media is portraying the aquaculture industry in a negative manner regarding environment it can cause a negative effect on the company. LSG is dependent on its image and reputation to be able to market and sell its products.	To mitigate this risk, we take full responsibility for negative environmental impacts, monitor them closely and are working actively to reduce the effect of these impacts. We also work actively to innovate our operations, both to future-proof the Group, and to push the industry as a whole in the right direction.

Acute physical		Acute physical risks, such as storms, hurricanes, floods, and heavy precipitation of rain and snow are considered highly relevant risks for LSG. Such events may impact LSG's direct operations, or cause disruptions in the supply chain. For LSG, any events delaying production have a financial implication. Due to the uncertainty of the timing of events, LSG must be prepared for such scenarios. Through our acute physical risk identification process, we identified the following as the most significant:	
Direct operations	1.	Extreme weather events such as storms and waves can have direct implications on production sites and fishing operations, as they can increase the risk of tarnishing/ breakage of installations. This may lead to major material damage and could cause LSG to lose production capacity short term which will have a direct impact on revenue. Material damage on production sites further increases the risk of escapes. Extreme weather can damage our fleet performance, so that fishing operations are not possible, directly impacting production capacity and revenue. In 2022 there were no damages due to extreme weather events, however in 2021 two small boats and two buoys had to be replaced due to extreme weather, which in total incurred a cost of 800 000 NOK. Though this was not detrimental to our production, it exemplifies that this is indeed a relevant risk the company shall be aware of.	All LSG's farming locations are certified according to NS 9415, which means that they are sturdy enough to endure extreme weather.
	2.	Extreme weather can cause oil spills along the Norwegian coastline, further impacting aquaculture. If there are no healthy fish in Norwegian waters, operations standstill, directly impacting revenue.	We have agreements with local actors to access their oil spill emergency equipment, in case it is needed. We also have our own equipment, which is tested regularly.
	3.	Extreme weather events pose direct health and safety risks on all sites and fleets.	We have developed robust procedures to ensure the health and safety of our employees.
	4.	Facilities in coastal areas are increasingly exposed to landslides.	We are currently in the process of improving our facilities to mitigate this risk if it occurs.
	5.	Extreme weather events can lead to changes in water quality, leading to disease, parasites, and algae that can kill the fish overnight. This will have a direct impact on our operations and revenue. Any events impacting the biology in the ocean, especially algae bloom, is potentially a risk that can have a large impact on LSG's operations.	We have developed procedures to be implemented if this was to occur.
Supply chain		Extreme weather, such as drought and floods can affect the production of raw materials that LSG depends on in feed (soy, wheat, rapeseed oil, corn). This can impact both the availability and cost of raw materials.	We conduct risk assessments for all ingredients used for our feed, in order to mitigate this risk.

Chronic physical		Part of our operations within aquaculture and 100% of our fishing activity take place in the sea. Any changes in sea levels or temperature can potentially impact the company's long-term livelihood.	
	1.	Sea temperatures affect the migration patterns of wild fish. Changes in sea temperatures lead the cod stock further north. This causes the fishing zones to move, directly impacting the transportation radius of trawlers, increasing fuel use and hence costs. It poses a large challenge for coastal fishing if cod is no longer found along the Norwegian coastline. There is a financial risk if LSG cannot prove to its investors that we can take advantage of our full fishing quota. Changes in sea temperatures also lead other fish stocks north and closer to the coast. These species can make holes in the cages that can result in escapes of farmed fish. Increased sea temperatures also provide better conditions for salmon lice. This currently makes operations in the south more challenging and can also affect aquaculture in the north in the long term. Changes in oxygen levels, increased precipitation, changes in sea levels in fjords can lead to poorer conditions for farming, increasing the risk of disease and mortality.	Some species will be affected more than others, but it will be important for LSG to monitor this development in the long run. Higher sea temperatures may mean that we need to diversify our products and look into other species than the ones we are currently producing. To fight sea lice (which will become more relevant if the temperature of the water rises), Lerøy has used MNOK 825, 27 in 2022.

Opportunity type		Description of opportunity
Market shifts	1.	Alternative transportation solutions (blue wrap or sub-chilling) to increase the durability of fresh fish will eliminate or reduce dependency on air freight of fresh fish. This may reduce costs, greenhouse gas emissions and improve reputation. We are currently involved in multiple projects to test various alternative transportation solutions. Simultaneously, we are developing new cooling methods making it possible to transport more products by sea, rather than by air.
	2.	Innovations enabling the production of fish feed ingredients in markets closer to home, potentially in lab-based controlled environments, may eliminate or reduce the dependency on supply of overseas raw materials such as soy. This will also reduce transportation, further reducing costs and emissions. We are involved in multiple projects to facilitate feed production closer to home (blue mussels, sugar kelp, microalga, and insect meal). For now, we are focusing on the Norwegian market, as we see great potential here. We are planning on expanding these projects, in order to create new revenue streams.
	3.	Moving towards more climate-friendly packaging, with a focus on recycling, is a clear signal to the customer that LSG has ambitions regarding mitigating climate change and ensuring sustainability. This may have a positive impact on reputation and revenue growth. We actively work to improve our packaging. We are involved in multiple projects to create more sustainable alternatives, all while maintaining product safety.
	4.	There are large opportunities associated with reaching young and future consumers who are concerned about climate change, as this can have a positive impact on the revenue. To realize this opportunity, the key will be communication, transparency, innovation, and education. We will continue to contribute on educational platforms, to teach the younger population about our developments and the health benefits of seafood.

New positioning:	1.	A shift in market preference from whole fresh, to refined fillets or frozen fish may increase market share, directly impacting revenue, and lower costs and emissions from air freight. Our strategy to realize this opportunity is to make it convenient for customers to purchase frozen and fillet fish.
	2.	There are large opportunities associated with the perception of seafood and aquaculture as a contributor to sustainable food production for a growing world population. We will leverage the fact that marine proteins, when produced properly, have a significantly lower climate footprint than land-based proteins. We will need to continue to improve our products and be proactive in informing the market about the benefits of marine protein.
	3.	Organizations such as EAT, European Green Deal, World Resources Institute (WRI) are all pointing to aquaculture as a contributor to sustainable future food requirements. This may influence market perception. We are collaborating with EAT in a working group targeting issues in aquaculture, to show our dedication to bettering our own production and pushing the sector as a whole in a sustainable direction.
	4.	A growing population will increase the global demand for food and protein. If seafood continues to be viewed as a healthy and sustainable protein and there will be opportunities for new and growing markets, which will in turn impact revenue growth. To realize this opportunity, efficiency and innovation will be very important. We want to be able to provide sustainable food for a growing population but need to ensure that we do not compromise on our climate commitments in the process.
	5.	Investments in low-carbon solutions could lead to eligibility for financial support schemes from for instance Enova (a Norwegian government-owned company aiming to contribute to the restructuring of energy use and energy production). We are already involved in multiple projects aimed at substituting fossil fuels with renewable sources, some of which Enova is involved in.

Collaborative efforts:		LSG sees a large potential to improve our competitive advantage by collaborating with suppliers to reinforce efforts to shift to climate-friendly solutions.
	1.	There is a lot of potential for improvements in the fish feed industry, and by collaborating with our suppliers, we can ensure that we are at the forefront of sustainable feed developments. We engage in quarterly meetings with our feed suppliers to discuss developments, and we are working closely with other actors to develop and promote sustainable feed.
	2.	Work actively with transportation providers to be at the forefront of low-emission goods transportation. This will potentially improve reputation, reduce overall emissions and costs through avoided carbon or fuel taxes. We have, in the last few years, kicked off collaborative projects with our transportation suppliers, in order to realize this opportunity.
	3.	Active communications with authorities and involvement in policy making will reduce climate-related risks and enable LSG to be ahead of any regulatory changes. LSG has established roles within our organization with the responsibility of this, in order to ensure that we keep up with potential and actual developments.

The impact of climate-related risks and opportunities on the Group's strategic and financial planning

Our strategy and financial planning have been influenced by climate-related risks and opportunities in several business areas as demonstrated in the table below:

Areas influenced by climate-related risks and opportunities	Description
Products and services	LSG's goal is to become the leading and most profitable global supplier of sustainable high-quality seafood. In order to ensure operational sustainability, the Group has to find new and innovative ways to operate.
	Firstly, we need to ensure that our current operations are optimized. We are committed to working towards highly sustainable seafood production in all our sites, and thoroughly documenting our progress, we want to become a trusted name as climate and environmental concerns grow in the market. By ensuring that our products are safe and sustainably produced, we can educate the public on the benefits of marine protein.
	Through our joint venture (Ocean Forest) with the NGO Belona Holding AS, we are producing macroalgae, sugar kelp, blue mussels, and polychaetae near several of our farming sites. The purpose of this is to absorb excess nutrients (mainly nitrogen and phosphorus), as well as carbon sequestration, from our salmon and trout production. Moreover, these species (especially blue mussels and sugar kelp) are high-quality and sustainable sources of protein. The mussels, for example, can be converted to meal and be a key ingredient in sustainable fish feed. This business venture has great potential. Today, we are already producing blue mussels at 2 locations and sugar kelp at 4 locations. Our ambition is to gain the knowledge, technology, and customer base to be able to make this an important revenue stream.
	We also include 1,5–2% insect meal in some of our freshwater feed, as a replacement for fish meal. From a nutritional point of view, it is considered a high-quality and sustainable protein source, however, today, it is a very costly ingredient. Once the market for insect-based feed solutions grows, as we assume it will be (based on market projections), adding a larger share of insect meal to our feed will be feasible.
Supply chain and/ or value chain	The volume of fish transported by air has increased in the past years, due to increased sales to Asia, Australia, and the USA. We work closely with our air transportation suppliers to identify the best airfreight solutions for the environment. The Group is aware that transporting seafood by air has a significant climate impact and we work closely with transport suppliers and customers, as well as Bellona, to find future-proof transportation solutions. Initially, we will strive to increase sales of processed products and try to send more products by sea if possible. The Group has also put procedures in place to check and assess our largest suppliers in terms of their ESG (including climate-related issues) strategy and performance.
Investment in R&D	LSG has a large focus on innovation and views this as the core of our sustainability strategy going forward. We are committed to forming alliances, entering new (and further developing existing) partnerships in order to achieve our targets and goals. Examples of R&D projects already in place, aiming to reduce our GHG emissions:
	1. **Production of sugar kelp:** Producing sugar kelp is a very efficient way of binding CO2 already dissolved in the sea. Farming sugar kelp does not require any input of freshwater, fertilizer, pesticides, or land. The plant captures the nitrogen, phosphorus, and carbon directly from the ocean. On average, 1.000 kg (wet weight) of sugar kelp contains 26 kg carbon equal to 100 kg CO2 – which is higher than the same volume for wood. This project has shown promising results so far, and we are making efforts to expand it in the years to come.

Investment in R&D	2.	**Production of blue mussel meal:** Ocean Forest AS, our joint venture with Bellona, also focuses on the production of blue mussels, not for human consumption but mainly as a source of marine protein. We have conducted a series of growth studies with Atlantic salmon demonstrating that blue mussel is an excellent fish meal replacement.
	3.	**Innovative raw material for fish feed:** The Group has an ongoing program focused on developing new innovative raw materials for fish feed. Historically, LSG has been a leader in the industry, when it comes to the use of Omega-3 fatty acids produced from microalgae. We use the microalgae to increase the level of Omega-3 in our feed compared to industry standards. In 2021, we produced 100 tons of microalgae and in 2022, the production number reached approximately 300 tons. Moreover, we have introduced Camelina oil in our feed, whilst banning ethoxyquin. In 2020, we were the first company to start using insect meal in all our freshwater feed delivered by one of our feed suppliers.
	4.	**Project 50/50-5:** This is an ongoing project aimed to reduce non-recyclable plastic by 50 %, including a reduction in total plastic consumption. All companies in the Group will contribute to achieving the goal and have established sub-projects with goals for each company. Data is systematically collected from the companies every month, in order to track the developments.
Operations		The Group has established different innovative measures to contribute to reduction of the environmental impact of our activities. Examples are:
	1.	**Water usage:** We have carried out a risk assessment using WRI aqueduct tool regarding water withdrawal from areas with medium to high risk of water stress. Our targets for decreasing water consumption have been revised accordingly (for more information, please, visit www.leroyseafood.com, Sustainability Library 2022). In addition, we have devised strict protocols and procedures to make sure that we never draw on more water than we are allowed to. We do this based on extensive risk analysis and preventive actions. We have, among other things, invested in water saving technology and equipment in several locations and this will continue to be a priority. This also protects local habitats and wildlife in addition to reducing our impact on local water levels. We also continue our effort to switch all flow-through systems to RAS (Recirculating Aquaculture Systems). The RAS technology allows Lerøy Seafood Group to produce fish with up to 99% reduction in water use compared to conventional flow-through systems.
	2.	**Wastewater:** We continue our work with water treatment and discharge quality. All our processing factories, new and old, are equipped with either fat separators and/or UV light treatment. In some factories, where it's necessary, we also have chemical treatment of wastewater in addition to mechanical treatment.
	3.	**Waste handling and sorting:** Improving our handling and sorting of waste is a continuous priority for LSG. Sorting waste for reuse and material recovery will greatly impact our environment through the reduction of unwanted, hazardous and non-biodegradable waste in the environment. We have implemented strict sorting regimes in all our locations and strive, in collaboration with our waste handling companies, to make sure that all our waste is handled correctly by us and the recipient of the waste.
	4.	**Electricity:** The Group has established different measures to reduce environmental impact; from obtaining power from land, hybrid fleets, floating solar cells, to service boats.
	5.	**Organic non-edible materials:** Organic non-edible materials from all our activities represent about 11,9 % of our total volume produced. The Group strives to increase the share produced for human consumption by 50% by 2024.
	6.	**Recycling:** The Group is actively involved in the process of recovering plastic waste from the oceans through different programs, in order to protect marine wildlife. One of the activities is focused on recycling our fish farming nets, yarn, and old trawls.
	7.	**Use of organic sludge from smolt production:** The Sludge from smolt production is either used for Biogas production or as fertilizer in agriculture.

Time horizon	Year
Short-term	0 – 5
Medium-term	5 - 10
Long-term	10 +

Financial impact	Percentage of revenue
Low impact	< 5%
Medium impact	5%
High Impact	> 5%

Scenario analysis: summary
(please, find full version of the analysis at the addendum of the report) is a process of analysing future events by considering alternative possible outcomes. It is meant as a tool for companies to make strategic risk management decisions, providing insights and clarifying predictable and uncertain elements in different futures. It is meant to help frame and evaluate the strategic and financial consequences of climate change. In line with the recommendations laid out by the TCFD, this delivery is a qualitative scenario analysis.

Identification of risks
Climate-related risks and opportunities influence Lerøy's strategic and financial planning and consider both short-, medium-, and long-term time horizons, as well as financial impact, in the assessments of these risks and opportunities. The following definitions of time horizons and financial impact are applied:

Following risks have been included in this scenario analysis:

- The risk of not being able to catch the quota due to extreme weather conditions and changed fishing grounds due to sea temperature rise and changes in oxygen levels.
- The risk of decreased fish health in aquaculture due to sea temperature rise, changes in oxygen levels, and increase run-off.
- The risk of shortages or price increases of fish feed raw materials due to climate-related events in the sourcing country.
- The risk of financial impacts related to fossil fuel regulations such as increased fuel prices due to carbon taxation and the phasing out of fossil fuels in the maritime sector as well as future electricity price developments.
- The risk of decreased aquaculture quotas due to the climate-related events affecting fish health under the Norwegian Traffic Light System Regulation for aquaculture.
- The risk of decreasing demand for LSG's products due to behavioural changes in customers and stricter requirements to fulfil.

Scenarios
The presented scenarios are descriptions of hypothetical, plausible futures (not forecasts) that help companies answer the question, "What would be the potential implications for our strategy if the future, described in a scenario, came to pass."

The assessed scenarios are mainly based on existing publicly available scenarios:

1. Well-below 2°C scenario: Transition Risk Increase • IEA World Energy Outlook (WEO) 2021
   I. IEA Sustainable Development Scenario (SDS)
   II. IEA Net Zero Emissions (NZE)
2. 4°C scenario: Physical Risk Increase
   I. IPCC 5th (RCP 8.5) and 6th AR (SSP5-8.5)
   II. Business-as-usual (BAU) Scenario

The six scenarios inform the identified Transition risks and Physical risks:

A. Transition risks are related to the financial risks of not being prepared for the socio-economic changes of a world striving to meet the Paris ambition of limiting global warming to well-below 2°C.

B. Physical risks are related to the financial risks of not being prepared for the physical changes of a world where ambitious climate policies fail or fall short, and the global warming of the world pushes towards 4°C.

Narrative 4°C (RCP 8.5/SSP5-8.5)
The Business-as-Usual scenario of 4°C warming is characterized by a lack of coordinated policies to limit climate change, leading to escalating physical risks. In this scenario, economic growth takes precedence over climate action, resulting in excessive resource consumption. Fossil fuels remain the primary energy source, and energy intensity remains high. Under this scenario, the growth of greenhouse gas emissions continues, leading to further global warming and enduring changes in the climate system.

Risk: Ability to catch the quota
LSG's wild catch operations face a significant climate-related financial risk: being unable to harvest the quota. Adverse weather conditions and increased swell size restrict fishing days a jeopardise safety at sea. Adapting to changing weather patterns and the migration and dispersion of fish stocks may require expanding fishing operations to distant areas and investing in vessel capacity and equipment. Potential conflict over the allocation of quotas, due to a northward movement of fish species further complicate matters.

Risk: Fish health
While LSG's northern fish farms might profit from sea surface temperature rise, the likelihood of the occurrence, frequency, and severity of Marine Heatwaves (MWHs) and lower salinity due to precipitation and runoff increases simultaneously, increasing the production risk.

Especially for LSG's southern aquaculture operations, increased risks for diseases or pathogens and lice infections, lower oxygen content in the waters, and Harmful Algal Bloom (HAB) potentially threaten the production. Not only poses the production output a potential financial risk to LSG but also cost associated with climate change adaptation, such as increased veterinary and medicine costs for de-liceing fish or a potential northward move of facilities.

Risk: Shortages and price development of fish feed raw materials
There is some uncertainty about the extent to which climate change will affect the production of raw materials for fish feed, as different models take into account different variables, such as the occurrence of extreme weather events and adaptation measures taken, which affect projected yields. While some models project increases in crop yields due to CO2 fertilisation, it is important to note that these yield increases will be outweighed by increasing demand due to global population growth. Crop prices are likely to rise. However, it is important to note that short-term price increases in one raw material can be met by increasing the share of another raw material to some extent. While this mitigates this risk in the short term, over the long term, climate change is likely to pose a financial risk to the raw materials needed for fish feed.

Narrative well-below 2°C (RCP 2.6/ SSP1-2.6 & IEA SDS and NZE)
In this envisioned scenario of achieving a smooth transition to limit global warming to well below 2°C, there is a notable increase in climate policy ambition and coordinated global action against climate change, starting in the near future. The scenario assumes that global CO2 emissions reached their peak in 2020 and are now rapidly declining. This transition presents both risks and opportunities for various stakeholders. In this well-below 2°C scenario, transitional risks and opportunities emerge, as most economies adopt a high carbon price and heavily rely on renewable energy sources for global power generation.

Risk: Fossil Fuel Regulations
Given Norway's emission reduction targets, the increasing pressure to decarbonize the maritime sector through the EU Maritime Fuel Regulation, and the continuing effects of climate change, it is likely that similar regulations will be adopted for fishing vessels. The development of low or zero-emission technologies will be crucial in this context. Furthermore, at present, and based on projections of EU Emissions Trading System (ETS) price developments, the inclusion of the fishing industry in the EU ETS is expected to cost LSG less than the Norwegian non-ETS carbon tax by 2030. However, the uncertainty of whether the fisheries sector will be included in the ETS and the fluctuating carbon prices under the ETS limit LSG's planning. Nevertheless, the cost of using mineral oils will increase by 2030, whether under the ETS or a non-ETS carbon tax, and pose a financial risk to LSG. On the other hand, equipping the fleet with low-carbon technology will also be costly. Future electricity price development is also a risk factor that shall be taken into consideration.

Risk: Norwegian Traffic Light System Regulation
As LSG's farms operate spread over Norway's coast, financial risks, such as a reduction in Maximum Allowable Biomas (MAB) in a production zone, stemming from the Traffic Light System (TLS) are dispersed. Climate change and the associated increase in surface water temperature, periods of extreme regional ocean warming, and lower salinity of coastal waters increase the physiological stress on salmon and increase susceptibility to salmon lice. A part of LSG's aquaculture is located in production zones that have historically seen reductions in MAB or at least no increases. Adapting to these conditions involves the cost of relocating or investing in new technology. Continuing operations without adaptation involve the cost of the reduction of MAB in these production areas.

Risk: Market Changes
There is an increasing interest in sustainable fish products and the trend is likely to continue as climate change progresses and awareness about environmental sustainability increases. LSG has a large share of its products certified by the MSC and ASC that focus on sustainable and responsible fishing and farming practices. However, the requirements for certification may become stricter through stakeholder pressure. Losing certification for products could have financial effects on LSG, as sustainability-aware customers might avoid those products resulting in a loss of LSG market share.

Risk Management

Disclose how the organization identifies, assesses, and manages climate-related risks.

LSG has set ambitious Science-based targets to actively reduce our overall carbon footprint and also focus on reducing the environmental impact of the Group's activities. Setting Science-based targets was a "defining moment" for the Group and enabled us to look at climate-change management from a wider perspective. To achieve the targets, it is important to have a systematic and methodical assessment of climate-related risks and opportunities in place.

The identification, assessment, and management of climate-related risks and opportunities is an integral part of LSG's multidisciplinary risk and opportunity management. In order to systemize our risk management process, we utilize a **Material Climate-Related Risk and Opportunity Assessment and Response Matrix (R&O Matrix).** The identification and assessment process is conducted through in-depth interviews and discussions with relevant internal and external stakeholders, representing different organizational levels and functions (internally) and interested parties (externally), thus providing an accurate and balanced picture of the risks and opportunities faced by the Group.

Once the risks are identified, the impact and likelihood (high/ low) of each risk and opportunity are determined. Following, based on where on the R&O Matrix the risk falls, the group establishes which mitigation strategy will be the most beneficial response strategy: Mitigate, Transfer, Accept, or Control. Based on each risk's categorization, we develop, review and implement response plans, based on internal and external recommendations.

Metrics and Targets

Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.

Greenhouse Gas Emissions

Lerøy's greenhouse gas emissions are reported in accordance with the GHG Protocol Accounting and Reporting Standard. The Group uses the operational control approach for consolidating GHG emissions accounting. Emissions from operations, over which the Group has operational control, are included in Scope 1 and 2 reporting. Indirect upstream and downstream emissions relating to the Group's operations are accounted for in Scope 3 reporting. The Company has reported its Scope 1, 2 and 3 emissions since 2019.

In 2022, the total GHG emissions from the Group's activities were 1 217 274 tCO2e. This includes our Scope 1 emissions, location-based Scope 2 emissions and Scope 3 – indirect emissions from our value chain emissions.

Scope 1 includes all use of fossil fuels from stationary combustion or transportation, in owned, leased, or rented assets. It also includes any direct emissions from the use of refrigerants.

Scope 2 emissions include indirect emissions related to purchased electricity as well as district heating/ cooling in assets over which the Group has operational control.

Scope 3 comprises indirect emissions from our value chain activities. The Scope 3 categories have been assessed and included by relevance. The categories included in the Scope 3 inventory are Purchased goods and services (fish feed, EPS boxes, plastic bags/ sheets, single use hygiene plastic items, vacuum packaging/ film, cardboard/ carton boxes, rope and feeding tubes as well as municipal water), Capital goods (construction materials for new constructions), Fuel and energy related activities (Well to Tank (WTT) calculations from consumption data for Scope 1 and 2), Upstream transportation and distribution (sea transportation, service boats and well boats as well as transportation of produced products to customers), Waste generated in operations (data on waste volumes and waste composition), Business travel (data on business related air travel), Employee commuting (data on estimated emissions form employee commuting), Downstream transportation and distribution (transportation of products carried out by customers themselves), Processing of sold products (use of electricity for storage of fish in the country of consumption before the products is sold to end customer as well as estimated emissions related to third party processing), End of life treatment of sold products (organic waste estimated share (%) of non-edible fish).

Science-based Emission Reduction Targets

The Group works purposefully to reduce our carbon footprint, both within our own operations and across our value chain. In 2020, the Group set a Science-Based Target (SBT) which has been approved by the Science Based Targets initiative. By committing to the SBTs, the Group set a strategic direction that defines our climate-related objectives and measures to be implemented in order to achieve an ambitious reduction target:

Lerøy Seafood Group has committed to reducing absolute Scope 1, 2, and 3 GHG emissions by 46 % by 2030 from a 2019 base year.

This target is aligned with a 1.5°C pathway. 2019 was identified as a base year as this was the first year all operating segments across the Group were included in the carbon accounting across all scopes.

We aim to reach our target by concentrating our efforts on three strategic areas that combined constitute 88 % of the Group's total emissions:

1. Fish feed
2. Goods transport
3. Fleet (MGO)

For more information regarding our ESG related work, please, visit Lerøy's Sustainability Library 2022 (https://www.leroyseafood.com/en/sustainability/sustainability-library-2022/).

GHG Emissions 2020 - 2022

Scope	Unit	2020	2021	2022
Scope 1	tCO2e	127 810	141 523	169 913
Scope 2 (location based)	tCO2e	9 937	9 581	8 970
Scope 2 (market based)	tCO2e	50 409	49 208	44 843
Scope 3	tCO2e	1 284 642	1 157 174	1 038 392
Total emissions (includes location- based Scope 2)	tCO2e	**1 422 388**	**1 308 278**	**1 217 274**
Energy consumption (Scope 1 & 2)	Mwh	683 761	752 471	874 516

SCENARIO ANALYSIS ALIGNED WITH THE TCFD RECOMMENDATIONS: **METHODOLOGY & BACKGROUND**

The growing attention to climate change and its financial impacts has created a call for businesses to disclose how climate change is affecting their financial performance and strategy. Historically, reporting of climate risk has been largely non-existent and highly fragmented. To bridge this information gap, the Financial Stability Board created the Task Force on Climate-related Financial Disclosures (TCFD), which came to develop a set of recommendations on climate change disclosures in the financial sector. In particular, the TCFD developed a framework for disclosing climate-related risks to businesses.

The TCFD recommendations take an investor-focused approach to climate-related reporting with the aim of providing investors with the information to ensure their investments are resilient to climate change risks and built for long-term value creation. The TCFD, therefore, recommends the use of Scenario Analysis in the disclosure of climate-related risks and opportunities. Scenario analyses aligned with the TCFD framework help companies explore different futures and the implications of climate-related circumstances on business strategy. It is one of the cornerstones of a complete TCFD report on climate-related risks and opportunities.

Scenario analysis is a process of analysing future events by considering alternative possible outcomes. It is meant as a tool for companies to make strategic risk management decisions, providing insights and clarifying predictable and uncertain elements in different futures. It is meant to help frame and evaluate the strategic and financial consequences of climate change.

Methodology

In line with the recommendations laid out by the TCFD, this delivery is a qualitative scenario analysis. TCFD recommendations state the importance of the development of a sound scenario narrative, before proceeding to quantifying the scenarios. Quantifications should be an objective for future maturity reporting levels. The quantification of our identified risks and opportunities, as well as mitigation strategy, can be found in our separately published TCFD report.

The defined scope and boundary of this project between CEMAsys, Austevoll Seafood ASA (AUSS) the owner of Lerøy Seafood Group ASA, and Lerøy Seafood Group ASA (LSG), were determined in collectiveness based on an analytical frame of six risks specified in the business area of LSG.

Identification of risks

Climate-related risks and opportunities influence LSG's and AUSS' strategic and financial planning and consider both short-, medium-, and long-term time horizons, as well as financial impact, in the assessments of these risks and opportunities. The following definitions of time horizons and financial impact are applied:

Time horizon	Year
Short-term	0 – 5
Medium-term	5 - 10
Long-term	10 +

Financial impact	Percentage of revenue
Low impact	< 5%
Medium impact	5%
High Impact	> 5%

CEMAsys facilitated a workshop with representatives from LSG to identify material climate-related risks and opportunities based on the framework of TCFD.

The workshop was focused on identifying the possible risks and opportunities that could occur for LSG related to climate. The risks and opportunities identified were so placed in a risk and opportunities matrix to start the process of quantification and determine impact by giving a time horizon, financial impact, and likelihood score, in order to determine which risks and opportunities to include in the scenario analysis. In addition, TCFD's recommendations of including scenarios that explore alternatives that will significantly alter the basis for business-as-usual assumptions in a changing environment and society due to the implications of climate change were considered when the six risks where chosen.

Based on discussions between LSG and CEMAsys, the following risks have been included in this scenario analysis:

- The risk of not being able to catch the quota due to extreme weather conditions and changed fishing grounds due to sea temperature rise and changes in oxygen levels.
- The risk of decreased fish health in aquaculture due to sea temperature rise, changes in oxygen levels, and increase run-off.
- The risk of shortages or price increases of fish feed raw materials due to climate-related events in the sourcing country.
- The risk of financial impacts related to fossil fuel regulations such as increased fuel prices due to carbon taxation and the phasing out of fossil fuels in the maritime sector.
- The risk of decreased aquaculture quotas due to the climate-related events affecting fish health under the Norwegian Traffic Light System Regulation for aquaculture.
- The risk of decreasing demand for LSG's products due to behavioural changes in customers and stricter requirements to fulfil.

Scenarios

The presented scenarios are descriptions of hypothetical, plausible futures (not forecasts) that help companies answer the question, "What would be the potential implications for our strategy if the future, described in a scenario, came to pass."

The assessed scenarios are mainly based on existing publicly available scenarios:

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    a. IEA Sustainable Development Scenario (SDS)
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    b. Business-as-usual (BAU) Scenario

The six scenarios inform the identified Transition risks and Physical risks:

A. Transition risks are related to the financial risks of not being prepared for the socio-economic changes of a world striving to meet the Paris ambition of limiting global warming to well-below 2°C.

B. Physical risks are related to the financial risks of not being prepared for the physical changes of a world where ambitious climate policies fail or fall short, and the global warming of the world pushes towards 4°C.

Narrative 4°C (RCP 8.5/SSP5-8.5)
The Business-as-Usual scenario of 4°C warming is characterized by a lack of coordinated policies to limit climate change, leading to escalating physical risks. In this scenario, economic growth takes precedence over climate action, resulting in excessive resource consumption. Fossil fuels remain the primary energy source, and energy intensity remains high. Under this scenario, the growth of greenhouse gas emissions continues, leading to further global warming and enduring changes in the climate system. This significantly increases the probability of severe, pervasive, and irreversible impacts on both people and ecosystems. Unfortunately, climate considerations are not given priority by consumers when making decisions. Water becomes a crucial resource with limited availability, and climate-related conflicts intensify due to poor agricultural practices and living conditions. A considerable number of individuals, classified as climate refugees, migrate towards northern regions in search of a more secure life. As the planet warms, the frequency and severity of extreme weather events, such as flooding, heavy precipitation, and rising sea levels, escalate. These events can have detrimental effects on operations and the value chain.

Despite the ambition for economic growth, the scenario falls short, as the rise in temperatures leads to GDP losses due to increased physical risks. Impacts from climate change-related extreme events are projected to increase further with warming. Increased urban flood damage from extreme precipitation is a critical climate-related risk in most regions, including South America and Europe. Increased drought stress and associated water restrictions and wildfires are expected in southern Europe, Australia, and parts of Africa, Asia, and North America. The global mean sea level will continue to rise during the 21st century.

Risk: Ability to catch the quota
LSG's wild catch operations face significant climate-related financial risk if they are unable to meet their quotas. LSG is primarily focused on catching species such as cod, haddock, saithe and shrimp in the North Sea, Norwegian Sea and Barents Sea. The occurrence of more severe weather conditions, including high winds, storms, storm surges and large waves, can severely affect safety at sea and limit the number of viable fishing days. As a result, these conditions can adversely affect fishermen's livelihoods. Traditionally, local knowledge of sea conditions has been relied upon; however, under new and changing weather patterns, this knowledge may no longer be sufficient. In such circumstances, fishing operations may need to expand to more distant and more dispersed areas, potentially targeting different fish stocks. This expansion will require increased investment in vessel capacity to ensure safety in rougher seas and when fishing further from shore. There is also a need for updated fishing gear to meet the challenges of deeper waters and more diverse catch compositions. Furthermore, the migratory patterns of fish stocks can disrupt the allocation of fishing quotas. The limited number of fishing days available, coupled with the dispersal of fish stocks over a wider geographical area and the possibility of changes in fishing quotas, makes it increasingly difficult to meet fishing quotas.

Extreme winds are defined here in terms of the strongest near-surface wind speeds that are generally associated with extreme storms, such as tropical cyclones (TCs), extratropical cyclones (ETCs), and severe convective storms. The characteristics of extreme winds have changed over time. Globally, the proportion of category 3-5 tropical cyclone instances and the frequency of rapid intensification events have increased over the past 40 years. While negative surface wind speed trends (stilling) were found in the tropics and mid-latitudes of both hemispheres, positive trends were reported at high latitudes of plus 60 degrees. TCs and ETCs have shifted poleward, and projections show that the mean intensity of storms as well as the frequency of the strongest storms will increase with climate change, especially in ocean basins.

In the North Atlantic, vertical wind shear, which inhibits TC genesis and intensification, varies in a quasi-dipole pattern. This pattern of variability creates a protective barrier of high shear along the USA coast during periods of heightened TC activity in the tropics and appears to be a natural part of the Atlantic Ocean–atmosphere climate system. Vertical wind shear can either enhance or inhibit the development of tropical cyclones. When vertical wind shear is low, it allows for the organisation and strengthening of a storm's core. Conversely, high vertical wind shear can disrupt the storm's structure, preventing it from intensifying or even causing it to weaken. Due to greenhouse gas forcing, the vertical wind shear is projected to erode. Following the RCP8.5 emissions scenario, the magnitude of the erosion of the barrier equals the amplitude of past natural variability (time of emergence) by the mid-21st century. Thus, a potential strengthening of TCs is expected in the North Atlantic. As the swell size is determined by the strength and persistence of wind blowing over a large area of the ocean's surface, the North Sea, the Norwegian Sea, as well as the Barents Sea are expected to be influenced by storms and increased swell size.

With ongoing climate change, essential physical and chemical conditions of the ocean are changing. As temperature, oxygen, and acidity levels are causing marine animals' habitats to be restricted, several species of fish are moving. In recent years, a northward expansion of the distributional range of several fish species has been driven by warming. Countries or regions in the northern part might benefit from a northward shift of the new distributional range, and the effect of temperature rise may be positive for the commercial fish species which Norway currently exploits. According to the RCP8.5 scenario, large-scale redistribution of maximum fisheries yield potential is projected, including a 30-70% increase in yield of high latitude regions such as Norway's Exclusive economic zone (EEZ).

While the redistribution of fisheries comes with an increase in the projected maximum yield, the movement of fish might also entail negative consequences. Pronounced range expansions of species in the north, due to warming and habitat changes, affect the concentration of fish stocks and impedes the fishermen's effectivity. For example, the area occupied by the Atlantic mackerel increased from 0.4 to 2.5 million square kilometres between 1997-2016 and is projected to further expand into Greenland waters under the RCP8.5 scenario. Cod and haddock stocks have already expanded their range, and a further expansion is expected under RCP8.5. Furthermore, as species migrate across political or management boundaries, conflict over the allocation of quotas may arise. A recent example of such conflict is the quota allocation of North Sea mackerel.

In conclusion, LSG's wild catch operations face a significant climate-related financial risk: being unable to harvest the quota. Adverse weather conditions and increased swell size restrict fishing days and jeopardise safety at sea. Adapting to changing weather patterns and the migration and dispersion of fish stocks may require expanding fishing operations to distant areas and investing in vessel capacity and equipment. Potential conflict over the allocation of quotas, due to a northward movement of fish species further complicate matters.

Risk: Fish health
For LSG's aquaculture operations, the health of its farmed fish poses a potential climate-related financial risk. Marine life is sensitive to temperature changes, and most species perform poorly outside their optimal temperature range. Salmonids have a relatively narrow range of temperature for optimal growth and thrive in the temperature range between 9-14°C. In 2012, optimum conditions for salmon farming were documented at a latitude of 62-64° (from Stad to Fosen) along the Norwegian coast. For the farms currently located at optimum or higher temperatures, ocean warming has the potential to decrease production, as increased temperature poses increased risks for diseases or pathogens and lice infections, lower oxygen content in the waters, increased harmful algal blooms (HABs), and increases in runoff.

High temperature can affect disease progression through a direct negative effect on host immune system function or through a direct effect on the parasite replication rate. Furthermore, lice become more resistant in warmer waters. The occurrence and growth of parasitic organisms are temperature dependent, as shorter generation time is associated with increased temperature. The most common parasite in salmon farming is sea lice. This parasite is more common in southern waters than in the Arctic, and ocean warming can contribute to increasing its prevalence in the north. It is likely that infections will be more frequent as the temperature increase with associated increased costs for fish treatments to avoid or reduce mortality of farmed fish, as well as limiting infestations on wild salmon.

Regarding HABs in aquaculture, climate models project increased precipitation and runoff that will likely lower the salinity of coastal water, strengthening the stratification, and influencing the availability of nutrients for algae. Towards the end of the century, runoff is projected to increase by 7% on an annual basis in RCP8.5. Especially in northern Norway, increases in runoff are mostly expected in the spring and autumn. In addition, several coastal areas are prone to eutrophication. Many eutrophic habitats that host recurring HABs already experience extreme temperatures, low dissolved oxygen, and low pH, making these

locations potential sentinel sites for conditions that will become more common in the future as global changes progress. Increase temperature can also favour HABs via accelerated growth and an expanded realised niche. Reduced pH can increase the toxin production of several harmful algae.

LSG's aquaculture operations are spread out across the Norwegian coast. While most of the aquaculture operations are located north of the lower threshold latitude of 62° for optimum salmon farming conditions. A part of LSG's aquaculture operations are located south of this threshold latitude. Consequently, the fish in these farms are particularly threatened by the effects of climate change. Sea surface temperature rise projections for the North Sea and Skagerrak coast of Norway indicate a temperature increase of between 2-5°C in the average surface water temperature for a far future (2081-2100) scenario according to RCP 8.5. On the other hand, the remaining farms are likely to profit from sea surface temperature rise along Norway's coastline as water temperatures will be closer to salmonids' optimal temperature range.

On the other hand, abrupt changes in biophysical conditions can increase production risk and lead to considerable variations in industry profit levels. Discrete periods of extreme regional ocean warming (marine heatwaves, MHWs) have increased in frequency for the northeast Atlantic, with an approximate doubling from 1982 to 2016. The occurrence of MHWs is predicted to be coupled to sea surface temperature rise. If these extremes are close to the fish tolerance and occur in combination with oxygen depletion, this can result in extreme physiological stress and increased susceptibility to disease. Recent MHWs led to unprecedented levels of vibriosis infections along the Baltic Sea and North Sea coasts. While LSG's northern fish farms might profit from sea surface temperature rise, the likelihood of the occurrence, frequency, and severity of MHWs and lower salinity due to precipitation and runoff increases simultaneously, increasing the production risk.

Especially for LSG's southern aquaculture operations, increased risks for diseases or pathogens and lice infections, lower oxygen content in the waters, and HAB potentially threaten the production. Not only poses the production output a potential financial risk to LSG but also cost associated with climate change adaptation, such as increased veterinary and medicine costs for de-liceing fish or a potential northward move of facilities.

Risk: Shortages and price development of fish feed raw materials

For LSG's aquaculture operations, future shortages and rapid price developments of fish feed raw materials pose a potential climate-related financial risk. As a result of global warming and changes in weather patterns and extreme weather events, key raw materials for fish feed production could be affected by reduced yields. As fish feed contains several different raw materials, this analysis focuses on the four ingredients that make up the largest proportion: wheat, fishmeal, fish oil, and soybeans. The analysis takes a closer look at how climate change is affecting crops in the main sourcing regions: Europe, Brazil, and USA.

Globally, the effects of climate change are putting pressure on agriculture and increasingly hampering efforts to meet human needs. Over the past 50 years, human-induced warming has slowed agricultural productivity growth in mid and low latitudes. Climate-related hazards that cause crop losses are increasing. Drought-related crop losses have occurred on about 75% of the world's cropland and have increased in recent years. Heat waves have reduced wheat and rice yields. The combined effects of heat and drought reduced global average yields of soybean, and wheat by 12.4%, and 9.2% respectively.

Europe (Wheat & Soybeans)

Under the RCP 8.5 scenario, Europe is projected to experience several climate-related changes that may affect wheat yields by the end of the century. These changes include rising temperatures, changing precipitation patterns and potential shifts in extreme weather events.

In Europe, crop losses due to drought and heat have tripled over the last five decades, highlighting the importance of assessing multiple stresses. Under RCP 8.5, heat extremes and droughts are projected to become more frequent and widespread by mid-century. The impact of climate change on wheat yields varies between regions in Europe. In a scenario with a modelled temperature increase of 4°C, yield losses will be higher in the southern regions, while in the northern regions' losses will be lower or yields will even increase. However, the benefits of a longer growing season in northern and eastern Europe are offset by an increased risk of early spring and summer heat waves. In addition, warming is causing range expansions and changes in host-pathogen associations of pests, diseases, and weeds, affecting the health of European crops with a high risk of contamination of cereals. Regionally predicted reductions in rainfall may lead to herbicide carry-over. Due to rising temperatures and changes in precipitation patterns, damage and losses from river flooding are projected to increase significantly in Europe during the 21st century, which may lead to the contamination of crops.

Wheat is a largely non-irrigated, rainfed crop in Europe, and due to regional changes in precipitation, eight out of ten models show a projected yield increase in northern Europe under RCP 8.5, ranging from 5% to 16%, whereas all but one model project decreases in southern Europe around 2050, reaching up to -49%. The effect of CO2 fertilisation of wheat due to the increase in atmospheric CO2 under RCP 8.5 is a key driver of the projected yield increases in northern Europe. However, the effects of climate extremes such as heat stress and drought are likely to be underestimated in these models. There are therefore large uncertainties in these results. The world bank estimates an increase in the nominal prices of wheat from 211 USD/t to 259 USD/t by 2030.

When it comes to soybean production in Europe, models applying the RCP 8.5 suggest that climate change will lead to an expansion of suitable production areas for the period 2040-2069 by 37.7%. While yield reductions due to droughts are a potential risk, studies suggest that the positive effects of CO2 and temperature on photosynthesis in many European regions will outweigh the potential negative effects of droughts. Thus, the suggested average productivity would rise by 8.7%. However, the effect of heat stress on the soybean yield potential has not been assessed and is likely to dampen the projections. Cold spells and wet conditions at harvest will remain major challenges for soybean production in Europe for some time, while drought and heat will become increasingly important. The world bank projected the prices for soybeans to increase from 407 nominal USD/t in 2020 to 584 nominal USD/t by 2030.

Brazil (Soybean)

Brazil is one of the world's largest soybean producers and the RCP 8.5 scenario could have a significant impact on soybean yields in the country. However, specific projections may vary by region within Brazil. In general, the impacts of climate change on soybean production in Brazil are likely to be complex. Increased temperatures, changes in precipitation patterns, and the potential for more frequent and intense extreme weather events, such as droughts, heavy rains, or fires, could all affect soybean yields.

The Amazon Forest is highly vulnerable to drought and has been severely affected by the unprecedented droughts and higher temperatures observed in 1998, 2005, 2010, and 2015/16, which have been attributed to climate change. An increase in the frequency and geographic extent of meteorological drought is projected for the eastern part of Brazil, while the opposite is projected for the western part of Brazil. In addition, Brazil is very likely to experience an increase in the intensity and frequency of heat waves under RCP 8.5. In the period between 2016 and 2020, Brazil experienced an additional 3.1 days of heatwaves compared to the period between 1986 and 2005. Thus, regional temperature increases, coupled with drought and anthropogenic land-use change, are projected to increase the frequency and intensity of fires. On average, people in the region will be exposed to between 1 and 26 additional days of high fire risk in 2017-2020 compared to 2001-2004, depending on the sub-region. Due to the strong relationship between drought and fire occurrence, the Cerrado region is modelled to experience a 95% increase in area burned under RCP 8.5. In addition, while annual precipitation is decreasing in most regions, there has been an overall increase in extreme precipitation and a significant intensification of heavy precipitation since the early 20th century. All of these climate-related factors affect projected soybean yields. While crops can be contaminated by river flooding due to heavy rainfall, they are also threatened by droughts, fires, pests, and diseases due to rising temperatures.

On the other hand, some studies suggest that the above negative effects and the accelerated life cycle of the soybean crop are offset by the positive effect of increased CO2 on crop water productivity, which overcomes the negative effects of increased temperature and water stress on rainfed Brazilian soybeans under RCP 8.5. As a result, Brazilian soybean yields are projected to increase by 1% to 32% by 2050, depending on the production area.

USA (Soybean)

Climate change and extreme weather events have impacted North

American agroecosystems with crop-specific effects that vary in direction and magnitude by event and location. Climate change has generally reduced agricultural productivity by 12.5% since 1961, with progressively greater losses moving south from Canada to Mexico and in drought-prone rain-fed systems while favourable conditions increased yields of maize, and soybeans in regions like the USA Great Plains. Heavy exploitation of limited water supplies, especially in the western USA and deteriorating freshwater management infrastructure, have heightened the risks of freshwater supply security. Climate change will continue to shift North American agricultural suitability ranges and intensify production losses of key crops. In the absence of mitigation, incremental adaptation measures may not be sufficient to address rapidly changing conditions and extreme events, increasing the need for cross-sectoral coordination in the implementation of mitigation and adaptation measures.

Climate hazards are projected to intensify further across North America. Heatwaves, as well as wildfire activity, will intensify. Humidity-enhanced heat stress, aridification and extreme precipitation events that lead to severe flooding, erosion, debris flows and ultimately loss of ecosystem function, life and property are projected to intensify. Hotter droughts and progressive loss of seasonal water storage in snow and ice will tend to reduce summer season stream flows in much of western North America, while population growth and extensive irrigated agriculture will continue to place high demands on those flows. Under the RCP8.5 a temperature rise of 4-6 degrees Celsius is projected for the USA and especially in the southeast of the USA days with a temperature of more than 40 degrees Celsius are projected to increase by 45 days.

While the observed impacts of climate change on soybean yield and productivity in North America are positive, models that do not account for CO2 fertilization project a significant negative effect on the soybean yield in North America under RCP8.5. However, models accounting for the positive effects on crop growth due to increased levels of atmospheric CO2 project that soybean production is likely to increase in the USA by 2100 under RCP8.5. Depending on the model chosen and whether the soybeans are rainfed or irrigated, Soybean yield under RCP8.5 is projected to fall between 11,427 – 15,481 kg/ha-1 in the USA compared to the baseline scenario (8,895 – 14,011 kg/ha-1).

Fishmeal & Fish oil

Fish meal and fish oil (FMFO) are essential ingredients in the production of fish feed. They provide protein, omega-3 fatty acids and other essential nutrients to farmed aquatic organisms. There are several sources of FMFO, including the small pelagic species: anchovies, herring, menhaden, capelin, sardines, and mackerel. While pelagic fishing occurs throughout the world, the main fisheries are located along the Peruvian and Chilean coasts in the cold Humboldt Current. This area is one of the four Eastern Boundary Upwelling Systems, which are characterised by wind-driven oceanic upwelling and consequently high primary productivity. The stock of these fisheries is highly variable due to the short life span of the species and environmental elements such as sea surface temperature and other climatic/hydrological patterns such as El Niño.

Climate change has a global impact on the productivity of fisheries and aquaculture, and through globalised markets, shifts in distant regions can have strong economic consequences for Europe, the world's largest importer of fish products. For example, declining catches of small pelagic fish such as the Peruvian anchoveta are leading to a reduction in production and an increase in the price of fishmeal and fish oil used in aquaculture feeds. Thus, a decline in Peruvian anchovy can reduce the profits of European aquaculture, which relies on fishmeal and fish oil.

Globally, the projected wild catch yield under RCP 8.5 decreases by 16.2% to 25.2% by the end of the 21st century. Projections of the overall catch potential in the Peruvian EEZ paint a drastic picture. According to the results of the dynamic bioclimate envelope model under the RCP8.5 scenario, the average fishing potential in the Peruvian EEZ is predicted to decrease by 30.21% by 2050 and by 55.3% by 2100. Although less extreme, the dynamic size-based food web model suggests a decrease in average catch potential under RCP8.5 of 8.88% by 2050 and 22.68% by 2100 within the Peruvian EEZ. Predictions of the overall fishing potential in the Chilean EEZ show a mixed picture. According to the results of the dynamic bioclimate envelope model under the RCP8.5 scenario, the average catch potential within the Chilean EEZ is predicted to increase by 10.19% by 2050 and by 34.81% by 2100. On the other hand, the dynamic size-based food web model predicts a decrease of 3.6% by 2050 and 3.38% by 2100 in the average fishing potential within the Chilean EEZ under RCP8.5.

Nevertheless, the relationship between the maximum catch potential and the price evolution of FMFO is quite complex and is affected not only by varying environmental changes, along with the accessibility of fisheries, the intensity of demand from a growing human population, and the availability of alternative substitutes for FMFO. The FMFO model can take these variables into account by using nodes to define the main production activities, such as fishing and fishmeal production, and consumption activities, such as commodity markets, while the links are commodity trade flows between producers and consumers. According to this model, projected FMFO prices increase to €2282/t (fishmeal in the national enterprise scenario) and €1921/t (fish oil in the national enterprise scenario) by 2050 under RCP8.5. In the World Market scenario under RCP 8.5, FMFO prices are significantly lower by 2050, increasing to 1269€/t (fishmeal) and 1306€/t (fish oil).

The Food and Agricultural Organization (FAO) has also looked at future projections of production and price trends for FMFO, albeit over a shorter time horizon. In 2030, production of both fishmeal and fish oil is expected to increase by 11% and 13% respectively over the outlook period compared to 2020, although the share of capture fisheries production reduced to fishmeal and fish oil is expected to decrease slightly (17% in 2030 compared to 18% in 2020). The expected increase in fishmeal and fish oil production is due to the overall increase in capture fishery production in 2030 compared to 2020, combined with the increase in fishmeal and fish oil production from fish waste and by-products of the processing industry. Between 2020 and 2030, the share of fish waste in total fishmeal is projected to increase from 27% to 29%, while the share of fish oil is projected to decrease slightly from 48% to 47%.

Between 2020 and 2030, the FAO expects a sharp decline in FMFO prices (in real terms). However, both prices are from historically high levels, and in 2030 fishmeal prices will still be 28% higher than in 2005 when the major price increases began. This situation is even more pronounced for fish oil, where the real price in 2030 is expected to be 70% higher than in 2005. All things considered, this suggests that the conversion of capture fisheries and fish waste into fishmeal and fish oil will remain a lucrative activity over the projected period.

Outlook

There is some uncertainty about the extent to which climate change will affect the production of raw materials for fish feed, as different models take into account different variables, such as the occurrence of extreme weather events and adaptation measures taken, which affect projected yields. While some models project increases in crop yields due to CO2 fertilisation, it is important to note that these yield increases will be outweighed by increasing demand due to global population growth. Crop prices are likely to rise. However, it is important to note that short-term price increases in one raw material can be met by increasing the share of another raw material to some extent. While this mitigates this risk in the short term, over the long term, climate change is likely to pose a financial risk to the raw materials needed for fish feed.

Narrative well-below 2°C (RCP 2.6/ SSP1-2.6 & IEA SDS and NZE)

In this envisioned scenario of achieving a smooth transition to limit global warming to well below 2°C, there is a notable increase in climate policy ambition and coordinated global action against climate change, starting in the near future. The scenario assumes that global CO2 emissions reached their peak in 2020 and are now rapidly declining. This transition presents both risks and opportunities for various stakeholders. In this well-below 2°C scenario, transitional risks and opportunities emerge, as most economies adopt a high carbon price and heavily rely on renewable energy sources for global power generation. As the demand for fossil fuels diminishes, their prices experience a significant decline. Furthermore, there is a growing awareness among consumers and investors, who are becoming increasingly environmentally conscious. Consequently, the demand for more sustainable products from the LSG sector is witnessing a substantial rise. In order to fulfil the objective of the Paris Agreement, which is to limit global warming to well below 2°C, stricter regulations are expected to be implemented. These regulations are highly likely to directly impact the LSG sector, as the world transitions towards a lower-emission economy.

Policy assumptions include:

- Norway:

- Norwegian Government target of 50% reduction in emissions by 2030 from domestic and fishing vessels
- Long-term strategy for climate neutrality by 2050

- Inclusion of Norwegian fishing vessels in the EUFuel Maritime initiative by 2028
- Increase of the Norwegian carbon price to NOK 2 000 by 2030
- Inclusion of the fishing sector into the EU's Emission Trading Scheme
- The Norwegian Traffic Light System regulation will continue the way it currently does

In February 2020, the Norwegian government submitted an updated Nationally Determined Contribution (NDC) in accordance with the Paris Agreement. The revised target is to reduce greenhouse gas emissions by at least 50% and up to 55% by 2030 (excluding carbon uptake by forests), compared to 1990 levels, in line with the EU's decision to strengthen its 2030 goal. Norway contributes to social and economic cohesion in Europe through the EEA and Norway Grants, with a significant portion of the funds aimed at protecting the environment and promoting innovative green and blue economies in the beneficiary states. The impact of the Commission's 'Fit for 55 package' on Norwegian companies is not yet clear. However, Norway has indicated that it intends to prioritize interventions that support the core objectives of the European Green Deal in the next financing period of the Grants. Further, Norway pledged to the EU to reduce its non-ETS emissions by 40% by 2030. Non-ETS emissions are those that fall outside the scope of the European Emissions Trading Scheme (ETS), which Norway joined in 2008. Thus, Norway's carbon price will increase to NOK 2 000 by 2030 to reach this goal. The fisheries sector is not yet covered by the ETS, but there are proposals to extend the scope of the ETS to include the maritime sector. Therefore, the carbon emissions of the fishing sector might fall under the carbon taxation of the EU. The Norwegian Traffic Light System (TLS) came into force in October 2017, aiming to regulate Norwegian aquaculture's sustainable growth based on environmental impacts. Within Norway's 13 Production Zones, the environmental state is assessed biannually and determines whether the Maximum Allowable Biomass (MAB) is increased by 6%, stays the same, or decreases by 6% for the next two years.

Risk: Fossil Fuel Regulations

For LSG's wild catch operations, fossil fuel regulations such as carbon taxation and the phasing out of fossil fuels pose potential climate-related financial risks. Global fuel use and greenhouse gas emissions from wild capture fisheries account for 4% of global food system production emissions. In Norway, the fishing fleet represents only 5% of the total number of vessels but is responsible for a significant proportion of CO2 emissions. Although the number of fishing vessels has decreased in recent decades, their total engine power has increased, highlighting the need for a transition to alternative energy sources to improve fishing efficiency. The development of low or zero-emission vessels is underway to meet stringent emission requirements and possible new regulations as climate change progresses.

The Norwegian government has set an ambitious target to reduce emissions from domestic shipping and fishing vessels by 50% from 2005 levels by 2030. They are actively working on policy instruments and evaluating new measures needed to achieve this target. While zero and low-emission criteria have been mentioned for ferries, high-speed passenger vessels, and aquaculture service vessels, fishing vessels have not yet been included in zero and low-emission solutions. Aquaculture service vessels, which are smaller and operate locally, are well suited to using shore-side electricity. Therefore, the government plans to gradually introduce zero and low-emission requirements for the feed barge fleet and aquaculture service vessels operating in a given area from 2024. For fishing vessels, however, the focus has been on incentivizing emission reduction projects through initiatives such as the Enova Fund, which supports the introduction of new technologies.

While Norway has not implemented regulations on the use of fossil fuels in wild-caught fisheries, it remains important to monitor developments in international organizations such as the International Maritime Organisation (IMO) and the European Union (EU) regarding energy efficiency regulations for ships. The IMO introduced the Ship Energy Efficiency Management Plan (SEEMP) in 2013, emphasizing the importance of reducing fossil fuel consumption and managing the environmental performance of ships over 400 gross tonnages and 5000 gross tonnages. The FuelEU Maritime initiative, part of the EU's Fit for 55 package, aims to decarbonize the maritime sector and increase demand for renewable and low-carbon fuels. While the FuelEU Maritime regulation currently applies to larger ships over 5000 gross tonnages calling at European ports, the European Parliament intends to review the rules by 2028 and consider extending the emission reduction requirements to smaller ships or increasing the use of clean energy from outside the EU.

Given Norway's commitment to reducing CO2 emissions and complying with the Paris Agreement, the country has adopted the carbon tax on mineral oil as the main instrument for reducing greenhouse gas emissions in the fisheries sector. The carbon tax rate, currently NOK 2.53 per litre of mineral oil, is expected to increase annually in order to meet Norway's emission reduction targets. While the price per emitted tonne of CO2e is NOK 927, it is planned to increase to NOK 2 000 per tonne of CO2e by 2030 (in 2020 NOK). However, the rate for non-ETS emissions is regularly reviewed as part of the Norwegian government's budget process, leading to short-term uncertainties in price movements.

Norway joined the European Emissions Trading Scheme (ETS) in 2008, which operates on the principle of "cap and trade" to limit greenhouse gas emissions from covered companies. The fishing industry is currently not covered by the ETS, but proposals have been made to extend the scope to the maritime sector. The price per tonne of CO2e emitted under the ETS is determined by supply and demand, resulting in a variable price. While the price of a tonne of CO2e under the ETS was around €25 per tonne CO2e in January 2020, it was around €90 in January 2023. The price is projected to vary between €80 and €160 by 2030, depending on the models used.

In addition, electricity prices are expected to rise as a result of higher carbon prices, as Norway "imports" electricity prices from the European continent. Higher carbon prices lead to a significant redistribution in favour of Norwegian hydropower as long as Norway has a surplus of electricity. However, Norwegian electricity prices do not increase as much as continental electricity prices for a given increase in carbon prices. Thus, Norway receives relatively lower electricity prices than the continent, and the price difference between Norway and the continent increases as the carbon price increases. As a result, Norway becomes relatively more competitive in terms of attracting industry. The simulated average electricity price in Norway is between 34 and 57 €/MWh in 2030 and between 37 and 59 €/MWh in 2040. Given Norway's emission reduction targets, the increasing pressure to decarbonize the maritime sector through the EU Maritime Fuel Regulation, and the continuing effects of climate change, it is likely that similar regulations will be adopted for fishing vessels. The development of low or zero-emission technologies will be crucial in this context. Furthermore, at present, and based on projections of ETS price developments, the inclusion of the fishing industry in the EU ETS is expected to cost LSG less than the Norwegian non-ETS carbon tax by 2030. However, the uncertainty of whether the fisheries sector will be included in the ETS and the fluctuating carbon prices under the ETS limit LSG's planning. Nevertheless, the cost of using mineral oils will increase by 2030, whether under the ETS or a non-ETS carbon tax, and pose a financial risk to LSG. On the other hand, equipping the fleet with low-carbon technology will also be costly.

Risk: Norwegian Traffic Light System Regulation

For LSG's aquaculture operations, the Norwegian traffic light system (TLS) regulation poses a potential climate-related financial risk. The TLS came into force in October 2017 and aims to regulate the sustainable growth of Norwegian aquaculture based on environmental impacts. The Report to the Storting 16 2014-2015 (Meld.St. 16) lays the foundation for the TLS. Demand for salmon was high, but volume growth had stagnated. The Norwegian government, therefore, wanted the Ministry of Trade, Industry, and Fisheries (MTIF) to develop a system that would prioritize environmental aspects when allocating growth in the form of Maximum Allowable Biomass (MAB). MTIF commissioned a steering committee to establish an expert group to report annually on the status of environmental aspects. While the TLS is modular, allowing the system to adapt to future changes in factors affecting the environmental sustainability of Norwegian aquaculture production, the only environmental indicator considered so far is the level of salmon lice in wild salmon.

As the spread of salmon lice to wild salmon is a local phenomenon rather than a farm-specific issue, the Norwegian coast has been divided into 13 individual production zones, which in turn are intended to be as biologically independent from each other as possible. Within each production zone, the expert group's annual analysis of the spread of salmon lice to wild salmon should be used as the basis for the Steering Committee's review of the state of the spread of salmon lice. This review of the salmon lice situation is used by the Ministry of Trade, Industry, and Fisheries in its biennial decision on whether a production zone should receive a further allocation of MAB, maintain its current level of MAB, or have its MAB reduced. Production areas where the spread of salmon lice does not exceed sustainable levels are categorized as green and

can be allocated an additional 6% MAB. In amber production zones, there will be no increase or decrease in MAB, while in red production zones, there will be a 6% reduction in MAB. In green production zones, 1% growth could be purchased at a fixed price of NOK 120,000 and the remaining 5% could be purchased at auction. (please, see referance nr. 11 in Sources & Referances at the end of the document).

Since its entry into force in 2017, the MTIF has categorized the 13 production zones with the TLS in 2018, 2020, and 2022. This has resulted in a net increase in the MAB of 23,772 tonnes in 2018, 23,786 tonnes in 2020, and 13,078 tonnes in 2022. However, Production Zone 3 (Karmøy to Sotra) Production Zone 4 (Nordhordland to Stadt) Production Zone 5 (Stadt to Hustadvika), areas in which LSG operates. A part of LGS's aquaculture operations were classified as either yellow or even red production zones from 2018 onwards. As a result, there was no room for further growth and the MAB was reduced by 6% in some years. Production Zone 6 (Nordmøre and Sør-Trøndelag) in which LSG operates the largest share of its farms, was classified as a yellow zone in 2018 but is classified as a green zone since 2020. Production zones 11 (Kvaløya to Loppa) and 13 (Øst-Finnmark), where the LSG's remaining farms are located have been classified as green zones since the start of the TLS, and, consequently, an additional 6% MAB could be allocated there in 2018, 2020, and 2022.

As explained above (risk: fish diseases), climate change and the associated increase in surface water temperature, periods of extreme regional ocean warming, and lower salinity of coastal waters increase the physiological stress on salmon and increase susceptibility to salmon lice. Conventional technology under the TLS is therefore not expected to meet Norway's production target of 5 million tonnes in 2050. However, new production technology that is better able to reduce the spread of sea lice provides better conditions for growth.

Enclosed or semi-enclosed pens have the advantage of preventing the spread of sea lice by providing a physical barrier between the fish inside and outside the cage. However, this technology is more energy intensive. In addition, such technology is still affected by the TLS when operating in a red zone, as the reduction in MAB counts is per production zone and not per facility. One technology that operates outside the TLS would be ocean-based farming solutions. These take advantage of the large distances between sites provided by the vast offshore areas, reduce the risk of lice, and use the depth of the water and stable water currents to improve salmon welfare. However, this technology is still under development and the proposed Norwegian aquaculture tax, which will add a 25% tax burden to the existing 22%, is likely to restrict the flow of capital from investors.

As LSG's farms operate spread over Norway's coast, financial risks, such as a reduction in MAB in a production zone, stemming from the TLS are dispersed. A part of LSG's aquaculture is located in production zones that have historically seen reductions in MAB or at least no increases. Adapting to these conditions involves the cost of relocating or investing in new technology. Continuing operations without adaptation involve the cost of the reduction of MAB in these production areas.

Risk: Market Changes

For both LSG's wild capture and aquaculture operations, market changes such as changing customer behaviour and stricter certification requirements pose potential climate-related financial risks. As the European market is LSG's largest market and salmon products represent the largest share of this market, market changes in the European salmon market are assessed.

The global salmon market was valued at $3355.11 million in 2022 and is expected to grow at a CAGR of 5.7% to reach $4688.19 million by 2028, while the European salmon market reached 1.7 million tonnes in 2022 and is expected to reach 2.1 million tonnes by 2028, a CAGR of 3.3%. Thus, although the European salmon market is expected to grow, it is expected to grow less than the global salmon market by 2028. Taking into account projected changes in global supply and international economic conditions, the models predict higher salmon prices in 2024 and 2025, as increased demand and higher production costs will support global salmon prices. With considerable uncertainty remaining, the models predict an average salmon price of NOK 90 per kg by 2025. (please, see referance nr. 30 in Sources & Referances at the end of the document).

Price is an important purchasing factor in the European fish market. With the exception of customers in northern European countries, studies have shown that European fish consumers are price sensitive. At EU level, 68% of consumers would increase their fish consumption if prices were lower. However, the European economy is expected to grow and households are likely to be able to afford salmon in the future. While the GDP of the EU17 OECD countries is expected to increase by 21% by 2030, GDP per capita is expected to increase by 20%.

In addition to price, the sustainability of fish and aquaculture products (FAP) will become an increasingly important factor in purchasing in the European market for individuals and retailers. Environmental information on FAP is of particular interest to young people and socio-professional categories with the highest levels of education and wealth. In general, the carbon footprint of fish is around 3,49 kg CO2e/kg compared to beef at around 26,61 kg CO2e/kg. Farmed Atlantic salmon have an even lower carbon footprint of around 3,3 kg CO2e/kg and can be seen as a more sustainable alternative when looking at carbon emissions. In the context of growing concern about the state of the world's fish stocks, ecolabels have become a growing feature of international fish trade and marketing. The topics covered by ecolabels can vary widely: bycatch issues, fishing methods and gear, sustainability of stocks, ecosystem conversation, and even social and economic development.

95% of LSG's catch is certified by the Marine Stewardship Council (MSC) and 69% of LSG's aquaculture volume is certified by the Aquaculture Stewardship Council. While the MSC promotes sustainable fishing practices, the ASC promotes responsible aquaculture operations. The MSC certifies fisheries of sustainable fish stocks, where fishing operations are carefully managed to maintain the structure, productivity, function, and biodiversity of the marine ecosystem, and where the fishery complies with relevant laws and has a management system that allows it to respond quickly to changes in the status quo. The ASC certifies farms that actively minimise their impact on the surrounding natural environment, through biodiversity protection measures, feed requirements, pollution parameters, and disease mitigation requirements. Furthermore, the ASC accounts for the social impact of aquaculture by imposing requirements based on the core principles of the International Labour Organisation (ILO).

With continued climate change, increasing awareness of the need for stricter regulations and higher sustainability standards in the fishing industry, and scientific knowledge advances, there might be calls for more rigorous standards and improved criteria for certification. Here it's worth noting that the evolution of eco-label requirements also depends on the collaborative efforts of stakeholders such as NGOs, governments, industry representatives, scientists, and consumer advocates.

Furthermore, consumer interest in plant-based alternatives is growing and is poised for a rapid rise like other alternative protein products. LSG plans to offer additional plant-based alternative products in the future and has ongoing projects in the R&D phase.

In sum, there is an increasing interest in sustainable fish products and the trend is likely to continue as climate change progresses and awareness about environmental sustainability increases. LSG has a large share of its products certified by the MSC and ASC that focus on sustainable and responsible fishing and farming practices. However, the requirements for certification may become stricter through stakeholder pressure. Losing certification for products could have financial effects on LSG, as sustainability-aware customers might avoid those products resulting in a loss of LSG market share.

Scenarioer iht. IPCC og IEA

2oC Scenario

IPCC RCP2.6

IEA Sustainable Development Scenario

4oC Scenario:

IPCC RCP8.5

IEA High Emission Business as Usual

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