



TCFD REPORT

2020



TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES (TCFD) REPORT 2020



Mapping of climate-related risk and opportunities in accordance with the recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD).

The Task Force on Climate-Related Financial Disclosures (TCFD) was established by the Financial Stability Board to improve companies' disclosure of climate-related financial information. The TCFD's recommendations are summarized in a framework for disclosing clear, comparable and consistent information about the risks and opportunities presented by climate change. The recommended disclosure includes critical questions relating to how climate risks are addressed by companies' boards and managements, and how climate-related risk management, strategy revisions, and targets are structured. In preparing this report, we have disclosed our climate-related risks and opportunities, including our corresponding climate-related risk management, and we have adhered to the TCFD's seven Principles for Effective Disclosures.

We have worked systematically to reduce our environmental impact for many years, and we consider ourselves well positioned to manage stricter climate requirements. However, due to the increasing pace of change in climate-related expectations, there is a need for a more systematic and strategic approach to climate-related risk and opportunity management, and a better understanding of the possible financial impacts of climate change in different emission pathways and time horizons. We see this as a requirement to ensure our position as a future-proofed, sustainable, and circular company.

OUR CLIMATE-RELATED RISKS AND OPPORTUNITIES

ACUTE PHYSICAL RISKS

Extreme weather events: More frequent extreme weather events, such as storms, waves, and ice, have several potential impacts on our fish production sites in the ocean:

- Damage to production facilities and infrastructure.
- Increase in accidents for employees.
- Increase in downtime due to harsh weather.
- Higher risk of fish escapes due to facility impairment.

Relevant studies done by the Norwegian Environmental Agency (2017, M406 report) shows an increase in extreme weather events with storms and increased precipitation of snow and ice. We already experience extreme weather situations, amongst others in Finnmark, where severe wind, snow and ice can occur at the same time. The risk of extreme weather will increase, and future weather events will become more extreme. An example is that a massive amount of ice on our pens, which are already heavy, cause lack of the floating capacity and the pens may start to sink. Extreme wind and waves may cause challenges for our employees to enter our sites to care for the fish. We might have situations where the fish manage to escape due to damages on the constructions. Overall, these risks might result in decreased harvest due to loss of fish, or lost opportunity to farm in the most exposed areas.

Availability and cost of raw materials from suppliers: Extreme weather in locations where our suppliers source feed raw materials may impact the price and availability of fish feed. For example, higher temperatures may impact supply of fish meal and fish oil in Peru, potentially increasing the cost of these raw materials globally, hence increasing the cost of our salmon fish feed. Droughts and floods may impact land-based inputs (soy, wheat, etc.) for fish feed. Corresponding cost increases will be passed on to Grieg Seafood.

<p>CHRONIC PHYSICAL RISKS</p>	<p>Increased water temperature: Higher average temperatures in sea water can cause damage to salmon health. Temperature increase can lead to elevated risk of algae bloom, which leads to lower oxygen levels, which can cause higher levels of fish disease and mortality.</p> <p>Extreme variations in water temperature: One study (Falconer et al 2020) shows that the industry is facing an increased risk of higher temperature variety within each day, which possess a higher treat on salmon production than the average increased temperature.</p>
<p>REGULATORY RISKS</p>	<p>Carbon tax: Grieg Seafood is increasingly transporting products by air freight, particularly to new markets. Any carbon taxes may have a significant financial impact and make our products less competitive. In 2020, the Norwegian government, through the Norwegian Climate Act, stepped up their 2030 climate goal, with the new ambition to reduce overall emissions by 50-55% by 2030. In order to reach these emission reductions, the government has established a series of taxation on fuels, including a consumption tax and a CO2 tax. This will increase our cost of consumption of fossil fuels in Norway, impacting our operating cost. We use diesel for feeding processes, lighting and other energy related activities. Even though we are testing out new technologies to reduce our overall carbon footprint from these sources, such as switching diesel engines used on sites with battery packs, electricity from grid or hybrid solutions, our largest direct source of emissions is still coming from the use of fuels for our boats, vehicles and on-site energy production from generators. Hence, if we do not substitute our fossil fuel consumption with renewable energy technologies, we will be taxed in the future.</p> <p>Increasing cost of carbon may change market dynamics in favor of local, land-based production or closed-containment technologies, leaving us with an obsolete business model and mode of production. Our own resilience to emerging climate-related regulations is also dependent on our suppliers' ability to adapt to new climate-related regulations that affect them. If they are not prepared to face these risks themselves it is highly likely that their increased operating cost would be passed on to us. Currently, our suppliers' ability to quickly adapt to changing regulations or market demands may be limited.</p>
<p>MARKET RISKS</p>	<p>Supply: We rely heavily on access to good quality, sustainably sourced raw materials for our fish feed. If climate change causes acute or chronic physical changes, the availability of these raw materials may become scarcer and hence more expensive. We are also reliant on our suppliers as invested partners to find more sustainable production and transportation methods as these could become more heavily regulated in the future.</p> <p>Demand: Climate change and increased consumer attention to climate-related issues can have a multitude of effects on the demand for protein sources. One of the main changes we monitor closely, is the risk from shifts in consumer preferences of preferring certified fish. This could potentially have a substantive financial impact if we are not able to meet these demands. Increased demand from grocery stores for environmental/climate-related certified products can already be observed in the market, not just in Norway but in the rest of Europe and throughout North America. We have been contacted by clients who want or even demand this. Certified products, such as ASC certified fish, can become a common customer demand, and the risk of not receiving the certification may impact our revenues. However, we are committed to expand the number of ASC certified locations, and at year-end, 41% of our net production was ASC certified.</p>
<p>TECHNOLOGY RISKS</p>	<p>Developments in land-based fish farming: If land-based fish farming increases in markets such as China and the US, we will be at a great disadvantage, particularly as we currently use air freight to reach consumer markets. R&D efforts in land-based farming technologies may increase as the cost of carbon rises, making land-based fish farming more competitive, and placing us at a competitive disadvantage. If the transport of fish could be accomplished at low carbon emission levels, however (i.e. via alternative freezing methods), we would still be well positioned.</p> <p>Developments in alternative protein: Climate change and a growing awareness of the meat industry's substantial carbon footprint is boosting efforts to develop alternative proteins, plant based or lab based. If alternative protein can be produced at a competitive cost and quality, it could affect demand for farmed fish.</p>

<p>REPUTATIONAL RISKS</p>	<p>Business models based on extensive use of air freight may see growing reputational pressure as climate awareness increases. This may impact our attractiveness to consumers, employees, and investors.</p> <p>Investor interest may decrease if we fail to develop a convincing narrative on our approach to sustainability (i.e. how we are going to cut emissions in line with the Paris Agreement).</p> <p>Consumer interest may also decrease if we fail to effectively communicate our dedication to sustainable and climate-friendly solutions. We provide certified fish as a part of our climate-related focus on offering more environmentally friendly and climate conscious products. With the growing focus on certified seafood from the public, this can be even more relevant for our future reputation.</p>
<p>OPPORTUNITIES</p>	<p>Low-emission protein source: Farmed salmon has a substantially better carbon footprint than meat-based protein, making it more resilient to climate-related regulations and shifts in consumer preference away from carbon-intensive protein sources.</p> <p>Renewable energy: Grieg Seafood sees opportunities in shifting from fossil fuels to electrical power at our locations in Norway in order to reduce emissions and lower our cost. Fuels from generators from on-site energy production is one of the largest direct sources of emissions in our sector, and we are testing new technologies to reduce the carbon footprint from these sources, such as switching diesel engines used on sites with battery packs or hybrid solutions. These are great opportunities which can also be beneficial economically in the long run. With the passing of the Norwegian Climate Act, there is a great opportunity for Grieg Seafood to reap the reputational benefits of eliminating fuel-related emissions because we still use fossil aggregates in several locations along the coastline of Norway. State-owned enterprises, such as Enova, are also distributing subsidies for switching to renewable energy, that we can apply for. By switching our locations from diesel to electricity, we will reduce emissions from these locations by 90%, and even more in the future with more renewable sources in the power grid in 2050 than in today's Nordic mix. We have already implemented initiatives to switch from diesel to electricity by installing off-grid electricity in some locations. Additionally, this activity is not only beneficial for the climate, but also has further environmental, pollution and water benefits. We have a policy that emphasizes our responsibility as to protect the biodiversity in the ocean.</p> <p>Early adaptation to climate changes: Grieg Seafood BC has adapted its operations to the consequences of a changing climate (i.e. increased amount and types of algae, and lower oxygen levels). This knowledge should be easily transferrable to other areas.</p> <p>Innovation: Grieg Seafood have tried to find more sustainable ways to store our fish for transportation. The opportunity to reduce the amount of ice in boxes that we transport fish in, can decrease both cost and emissions. Sub-chilling entails bringing the salmon to low temperatures without freezing more than 20% of its water. Approximately 10% of the overall weight in salmon transport is ice. Sub-chilling makes ice redundant, and reduces emissions and transportation cost. Sub-chilling does not just have economic benefits with a longer shelf life, but also gives the opportunity to transport the fish in shipping containers instead of airfreight, which is considerably cheaper and more environmentally friendly. Increased shelf life provides further market opportunities. This technology challenges existing regulations and definitions of fresh and frozen fish.</p> <p>New business regions due to ice cap melting. If the northern ice cap continues to melt, the North-East passage to China from Finnmark in northern Norway might open. In that case, Grieg Seafood Finnmark might benefit from transporting products to Asia with a low carbon footprint, given that appropriate freezing methods have been developed.</p>

TCFD MATRIX: RESULTS 2020			
#	DISCLOSURE	RESPONSE	REFERENCE
GOVERNANCE			
1	Describe the board's oversight of climate-related risks and opportunities.	<p>The Board exercises oversight of strategic, operational and financial matters, including the nature and extent of major risks. Therefore, the Board also has the highest-level responsibility to oversee developments in climate-related risks and opportunities. On the Board, the Audit Committee has a particular responsibility to monitor critical business risks, and address the quality and effectiveness of relevant risk reducing measures. The Audit Committee receives a risk review quarterly, and significant risks are reported further to the Board. Climate-risk has its own risk category in our overall risk management framework, but has not been treated as a separate risk category in the Audit Committee meetings, but rather as a part of the broader sustainability issues. However, climate-related risks and opportunities are increasingly recognized as crucial considerations to ensure the success of Grieg's business strategy, and there is consequently an ongoing effort to make these topics a prioritized agenda item.</p> <p>As of 2021, climate-related risks are assessed as a separate risk category, regularly reviewed by the Audit Committee. A clear strategy to address both risks and opportunities will be developed. The Board of Directors holds the group management team accountable for pursuing our strategies and for assessing risks related to climate change and the environment.</p>	For more information about our risk management, see Part 3 – Corporate Governance and the Board of Directors' Report in the Annual Report 2020.
2	Describe management's role in assessing and managing climate-related risks and opportunities.	<p>Grieg Seafood's management level action on sustainability and climate change is led by the Chief Sustainability Officer (CSO). The CSO leads a team with one dedicated person in each region who is responsible for climate and sustainability issues in their own region. The CSO reports to the Chief Technology Officer, who is a member of the executive management team. In mitigating and managing overall climate-related risks, we have mapped our climate risk and opportunities. We have further set targets to reduce emissions from our operations and from our value chain.</p> <p>We continuously work to ensure a coherent understanding of climate risks relevant to Grieg Seafood.</p>	For more information about our risk management, see Part 3 – Corporate Governance and the Board of Directors' Report in the Annual Report 2020.
STRATEGY			
3	Describe the climate-related risks and opportunities the organization has identified over the short, medium and long term.	<p>See "Our risks and opportunities" as presented in the table above.</p> <p>We have also developed a scenario analysis for climate-related risks, that analyses likelihood and impacts for different emission pathways and time horizons.</p>	
4	Describe the impact of climate-related risks and opportunities on the organization's business strategy and financial planning.	<p>Examples of impact are described in the table "Our risk and opportunities" above.</p> <p>Overall, we expect the impacts of climate-related risks to be moderate in the short term, but these impacts could become more severe in the medium to long term. Any significant physical change is likely to interfere with our current business model or damage our facility infrastructure, both of which could be costly. Similarly, the transitional risks related to increased climate-change regulation or significant changes in consumer preferences could likely affect our bottom line and access to capital. On the other hand, we see Grieg Seafood as being uniquely placed to mitigate these risks and take advantage of climate-related opportunities. In order to get a full overview over how these climate-related risks and opportunities may evolve and affect us, we will develop likelihood and impacts analyses under different emission pathways and time horizons.</p> <p>We will continue to address climate-related risk as part of our strategy. We have already developed some cost estimates, but more detailed financial planning is necessary.</p>	

TCFD MATRIX: RESULTS 2020			
#	DISCLOSURE	RESPONSE	REFERENCE
5	Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.	The resilience of our strategy under different emission pathways and time horizons is difficult to foresee, but we have developed scenarios analyses to ensure adequate management of and a strategic approach to our climate-related risks.	
RISK MANAGEMENT			
6	Describe the organization's processes for identifying and assessing climate-related risks.	<p>On a quarterly basis we perform a risk analysis, which is reported to the Board's Audit Committee. Climate-related risk has until 2021 been treated as an integrated part of other risk categories.</p> <p>We have initiated a formal process for identifying and assessing climate-related risks as a separate risk category, as part of our integrated risk identification, assessment, and management process. This is to ensure thorough monitoring of these risks and that proper actions are taken in our strategic and financial planning. The risk owner for climate-related risks is the CSO.</p> <p>The process for identifying and assessing climate-related risks is similar to our general risk and opportunity assessment. First, we identify overall company targets, and then identify relevant risks linked to these targets. The risks are classified into risk categories in terms of which area of the company they are likely to affect. Each risk category has a risk owner, who is responsible for monitoring and assessing the risks that fall under their category of responsibility. Identified risks are subsequently assessed against the risk appetite for each risk category. Each risk is assessed in terms of likelihood and potential impact with regards to long-term value creation and achievement of strategic targets.</p>	
7	Describe the organization's processes for managing climate-related risks.	<p>The process for managing risk in general, is carried out by the group management team and overseen by the Board. The Finance Department is responsible for maintaining a risk register, based on discussions with the group management team and the CSO. The risk owners have the direct responsibility to manage risks in their risk category. They are mandated to initiate measures to mitigate risks that exceed the risk appetite for the category, i.e. that interfere with the company's set targets and overall strategic goals. Risk management and mitigation progress is reported to the Audit Committee and further to the Board. High risk areas will be followed up closely until the risk is reduced to an acceptable level.</p> <p>Climate-related risks are a separate category of our risk framework. This will ensure regular assessment and risk management ownership at the correct level, particularly with regard to longer-term investments and strategic decisions.</p>	
8	Describe how processes for identifying, assessing and managing climate-related risks are integrated into the organization's overall risk management.	<p>Climate-related risks became its own risk category in our risk management framework in 2021. We recognized the integration of climate-related risk into the wider risk framework as a positive way for climate issues to be fully mainstreamed in our strategic operations. There is a need to understand the specific impact climate change will have on the resilience of our strategy and operations.</p> <p>To assess our management processes for climate-related risks and opportunities, we performed a scenario analysis in 2020.</p>	

TCFD MATRIX: RESULTS 2020

#	DISCLOSURE	RESPONSE	REFERENCE																				
METRICS & TARGETS																							
9	Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process.	We have estimated cost related to selected climate-related risks and opportunities.																					
		<table border="1"> <thead> <tr> <th>RISK / OPPORTUNITY</th> <th>TYPE OF FINANCIAL IMPACT</th> <th>ESTIMATED IMPACT FIGURE</th> <th>EXPLANATION</th> </tr> </thead> <tbody> <tr> <td>Regulatory risk</td> <td>Increased operating cost from pricing of GHG emissions</td> <td>MNOK 53</td> <td>If we substitute all use of fossil fuels for energy at our sites in Norway, we will save approx. MNOK 606 (over the installations lifetime of 20 years). With a 8.7% increase already regulated in 2021, this price will increase to MNOK 659. The potential financial impact figure of this risk is therefore MNOK 53.</td> </tr> <tr> <td>Regulatory risk</td> <td>Reduced revenue from decreased demand due to shifts in consumer preferences</td> <td>MNOK 35</td> <td>We base the calculation of the financial impact figure of this risk on the total harvested volume in 2020 of 82 873 tonnes GWT. Given a scenario where the common customer demand for ASC is 20% of our harvested volume, which pays NOK 2 more per kg ASC certified fish, we have calculated that this could represent a possible loss of income of MNOK 35.</td> </tr> <tr> <td>Acute physical risk</td> <td>Reduced revenue from decreased production capacity due to extreme weather events</td> <td>MNOK 200</td> <td>In a scenario where our pens are damaged, and 500 000 fish close to harvest weight of 5kg (and a market value of NOK 60 per kg) escape, the impact could be a loss of revenues of MNOK150. Damages on the constructions could possibly be up to MNOK 40 -50. The total cost of potential financial impact figure is approx. MNOK 200.</td> </tr> <tr> <td>Opportunity</td> <td>Reduced exposure to future fossil fuel price increases by switching to lower-emission sources of energy</td> <td>MNOK 610</td> <td>If we substitute all use of fossil fuels on our sites in Norway, it will save us MNOK 600 (over the installations lifetime of 20 years). The total saving by realizing this opportunity is MNOK 610, including 1.7% increase on the taxation of fuel.</td> </tr> </tbody> </table>	RISK / OPPORTUNITY	TYPE OF FINANCIAL IMPACT	ESTIMATED IMPACT FIGURE	EXPLANATION	Regulatory risk	Increased operating cost from pricing of GHG emissions	MNOK 53	If we substitute all use of fossil fuels for energy at our sites in Norway, we will save approx. MNOK 606 (over the installations lifetime of 20 years). With a 8.7% increase already regulated in 2021, this price will increase to MNOK 659. The potential financial impact figure of this risk is therefore MNOK 53.	Regulatory risk	Reduced revenue from decreased demand due to shifts in consumer preferences	MNOK 35	We base the calculation of the financial impact figure of this risk on the total harvested volume in 2020 of 82 873 tonnes GWT. Given a scenario where the common customer demand for ASC is 20% of our harvested volume, which pays NOK 2 more per kg ASC certified fish, we have calculated that this could represent a possible loss of income of MNOK 35.	Acute physical risk	Reduced revenue from decreased production capacity due to extreme weather events	MNOK 200	In a scenario where our pens are damaged, and 500 000 fish close to harvest weight of 5kg (and a market value of NOK 60 per kg) escape, the impact could be a loss of revenues of MNOK150. Damages on the constructions could possibly be up to MNOK 40 -50. The total cost of potential financial impact figure is approx. MNOK 200.	Opportunity	Reduced exposure to future fossil fuel price increases by switching to lower-emission sources of energy	MNOK 610	If we substitute all use of fossil fuels on our sites in Norway, it will save us MNOK 600 (over the installations lifetime of 20 years). The total saving by realizing this opportunity is MNOK 610, including 1.7% increase on the taxation of fuel.	
		RISK / OPPORTUNITY	TYPE OF FINANCIAL IMPACT	ESTIMATED IMPACT FIGURE	EXPLANATION																		
		Regulatory risk	Increased operating cost from pricing of GHG emissions	MNOK 53	If we substitute all use of fossil fuels for energy at our sites in Norway, we will save approx. MNOK 606 (over the installations lifetime of 20 years). With a 8.7% increase already regulated in 2021, this price will increase to MNOK 659. The potential financial impact figure of this risk is therefore MNOK 53.																		
		Regulatory risk	Reduced revenue from decreased demand due to shifts in consumer preferences	MNOK 35	We base the calculation of the financial impact figure of this risk on the total harvested volume in 2020 of 82 873 tonnes GWT. Given a scenario where the common customer demand for ASC is 20% of our harvested volume, which pays NOK 2 more per kg ASC certified fish, we have calculated that this could represent a possible loss of income of MNOK 35.																		
Acute physical risk	Reduced revenue from decreased production capacity due to extreme weather events	MNOK 200	In a scenario where our pens are damaged, and 500 000 fish close to harvest weight of 5kg (and a market value of NOK 60 per kg) escape, the impact could be a loss of revenues of MNOK150. Damages on the constructions could possibly be up to MNOK 40 -50. The total cost of potential financial impact figure is approx. MNOK 200.																				
Opportunity	Reduced exposure to future fossil fuel price increases by switching to lower-emission sources of energy	MNOK 610	If we substitute all use of fossil fuels on our sites in Norway, it will save us MNOK 600 (over the installations lifetime of 20 years). The total saving by realizing this opportunity is MNOK 610, including 1.7% increase on the taxation of fuel.																				
Going forward, we will continue developing key metrics to track risk management, including developing our scenario analyses. We will also consider the development of an internal carbon pricing scheme.																							

TCFD MATRIX: RESULTS 2020

#	DISCLOSURE	RESPONSE	REFERENCE										
10	Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks.	<p>We calculate emissions in Scope 1, 2 and 3. For details regarding our emissions, please see Annual Report 2020. Our emissions in 2020 are:</p> <table border="1"> <thead> <tr> <th>Emission scope</th> <th>Greenhouse gas emissions (tCO2e)</th> </tr> </thead> <tbody> <tr> <td>Scope 1</td> <td>40 184</td> </tr> <tr> <td>Scope 2</td> <td>3 059</td> </tr> <tr> <td>Scope 3</td> <td>146 350</td> </tr> <tr> <td>Total</td> <td>189 593</td> </tr> </tbody> </table>	Emission scope	Greenhouse gas emissions (tCO2e)	Scope 1	40 184	Scope 2	3 059	Scope 3	146 350	Total	189 593	See our Scope 1, 2 and 3 emissions in Part 2 – Sustainable Food – Reducing carbon Emissions, in the Annual Report 2020.
Emission scope	Greenhouse gas emissions (tCO2e)												
Scope 1	40 184												
Scope 2	3 059												
Scope 3	146 350												
Total	189 593												
11	Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets.	<p>We target a 35% reduction of total Scope 1, 2 and 3 emissions by 2030 (from a 2018 base year), and 100% reduction (Scope 1, 2 and 3) by 2050.</p> <p>Our Greenhouse Gas (GHG) emission reduction targets are classified as well-below 2°C (2030) and 1.5°C (2050), aligned with the Paris Agreement. Our emission targets have been approved by the Science Based Targets initiative.</p>											

CLIMATE-RELATED SCENARIO ANALYSIS



UNDERSTANDING THE FINANCIAL IMPACT

Our scenario analysis helps Grieg Seafood to understand the potential impact of climate change on our core business for the future, and is used to stress-test our strategical and financial planning. Grieg Seafood has performed a thorough assessment of 2C and 4C global warming impact on our salmon production, based on van Vuuren et al (2011) representative concentration pathways RCP 2.6 and RCP 4.5. We aim to meet the Paris Agreement criteria to reduce global warming below 2C pre- industrial levels, but assess the risks involved in a scenario where we fail to meet our ambitions. For more information, please see our efforts on climate action in the Annual Report 2020. We are currently increasing our production volume, and the assessments for 2030 and 2050 is based on our 2025 business strategy and the targeted production volumes.

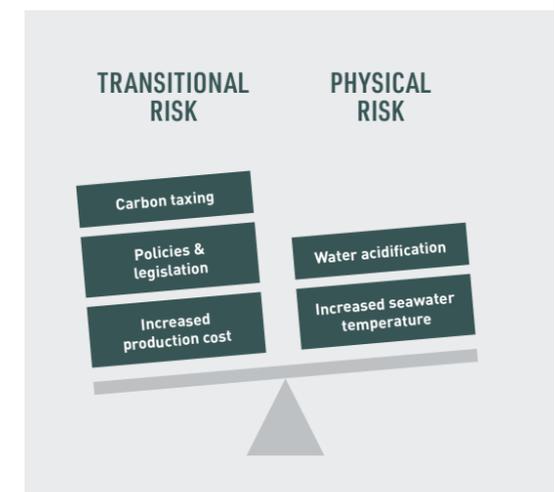
SIMPLIFYING ASSUMPTIONS

2 DEGREES GLOBAL WARMING (RCP 2,6)

In this scenario, we assume an orderly pathway (SSP1) according to Riahi et al (2017), where we expect that humanity will meet the Paris Agreement, low-carbon initiatives will be implemented, and the suppliers and intergovernmental policies that affect our business adapts to our common terms on reducing fossil dependency and emissions. We assume production of 2025 target volumes until 2030. How our production change towards 2050 is difficult to assume, but many initiatives and forecasts looks towards the ocean and aquaculture to provide more food for the future. With a 2C global warming, our business is well positioned to seize this opportunity for sustainable growth.

Main impacts

- Higher risk from transitional risks.
- Carbon taxing.
- Deforestation reduction initiatives increases cost on raw feed materials.
- Increased cost in procured aquaculture equipment.
- Policies and legislation that restricts production.

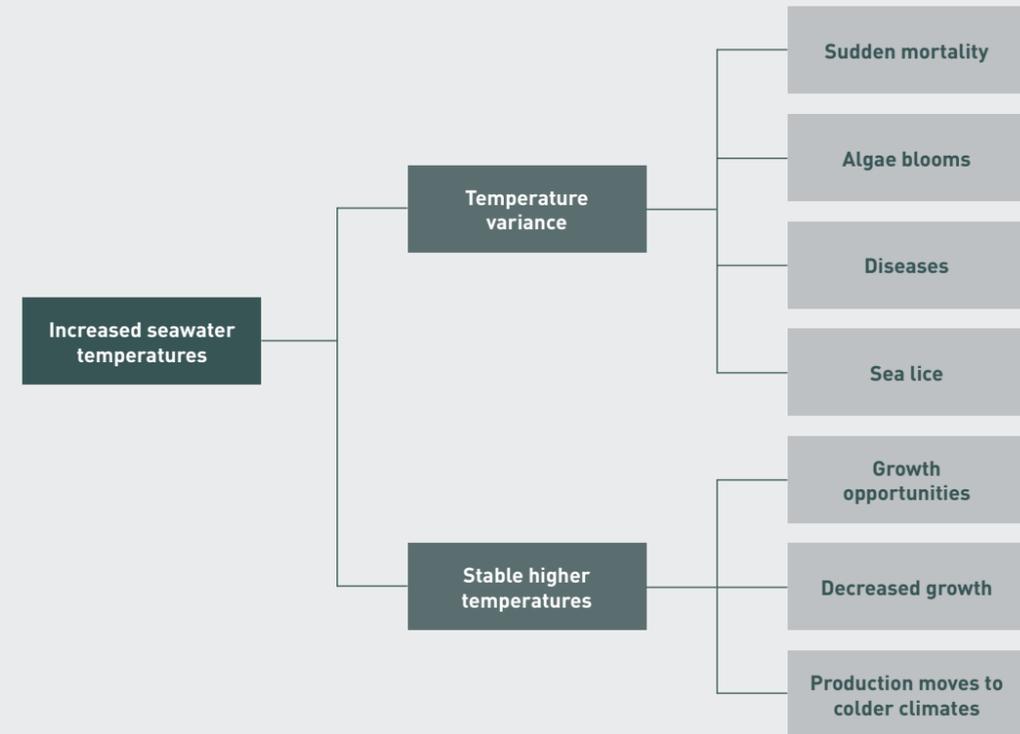
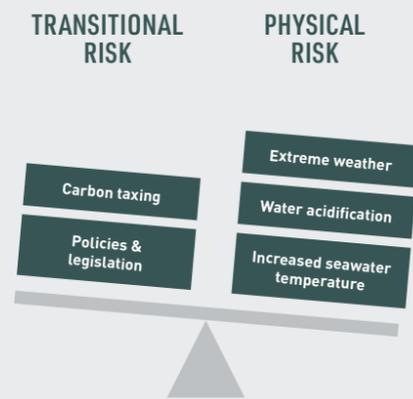


4 DEGREES GLOBAL WARMING (RCP 4,5)

Society goes the “highway” (SSP5) or the “... road divided” (SSP4). Grieg Seafood sees the necessity to differentiate our product to prove its sustainability value. This comes with an increased cost and risk of lower earning potential. Meeting our Paris agreement has probably given a higher margin for our competitors, and we must base our business viability on specific consumer groups. An increasing divide and average lower purchasing power make salmon a high-end product, probably increasing our consumer loyalty. This also comes with a higher environmental, society and governance (ESG) demand, which can be challenging to meet. We assume production of 2025 target volumes until 2030, but further increasing our volumes may be unlikely towards 2050. Pessimistic growth estimation from PwCs seafood barometer claims a potential 29% growth increase of the total Norwegian production.

Main impacts

- Temperature increases and daily temperature variations may increase events that are stressful for the salmon.
- Increased extreme weather increases the personnel risk (HSE) of operating exposed sites.
- More draughts and floods reduce the production of land-based feed ingredients, which increases feed cost.



MANAGING PHYSICAL RISKS AND OPPORTUNITIES

We have decided to investigate the impact that increased seawater temperature can have on our operations.

ASSESSING THE IMPACT ON INCREASED SEAWATER TEMPERATURE

Sea temperatures are increasing. Climate change does not affect the ocean or coasts uniformly. The rate of change is faster in some areas than others. Falconer et al 2020 used climate models (RCP 4,5) together with industry specific site temperature measurements to forecasts how the Norwegian aquaculture industry will be affected by the rising seawater effects of global warming. The study shows that the industry is facing an increased risk of higher temperature variety within each day, which possess a higher threat for salmon farming than the average increase in temperature. Another finding is also indicating a reduced day to harvest effect, which may lead to a lower production period in the sea. There is knowledge gaps and real-world complexities of aquaculture and climate change. Climate change is more than just temperature and is affected by multiple stressors. Research related to the effect on these stressors from climate change is currently under development. The project is called “Insight into fish health under climate change” and is carried out by NOFIMA. Grieg Seafood is a partner in this project and is closely following the findings of this research.

Our analysis shows that Grieg Seafood expects increased risks and costs related to global warming. 4C is a vast higher threat than 2C. However, the risks associated with global warming indicates a shift towards the necessity of alternating sites, increasing the post-smolt production on land and investing in heavy equipment for the sites that are exposed to harsh weather. This is in line with our current strategy, where large concrete production vessels, and overlay protected work boats have been introduced to our fleet the last years. Together with increased personnel training, education and specialization, communication investments and our high focus on improving our smolt facilities, we believe that we are prepared to meet the coming challenges of the future. Lice and its implications on our future production has high levels of uncertainty and varies between regions. The future effects of increased seawater temperature on lice levels in our regions, cannot be done without performing a comprehensive analysis. This is a topic we will further pursue in the future.

ASSESSING THE OPPORTUNITIES RELATED TO REDUCED DAYS TO HARVEST

According to Falconer et al, there is a possibility that increasing seawater temperatures may be beneficial in northern production regions⁶. The benefits are related to reduced days to harvest where we can produce the salmon in a shorter timespan than previously due to increasing seawater temperatures. There is a potential of reduced costs that we have investigated in this assessment. By comparing our regional production data, we see that there is a high variability of average number of days at sea. This has given us insights and experience in assessing the future potential of reduced days to harvest, which we have used as a basis for our calculations. We have performed calculations to assess this opportunity and has made the following simplifying assumptions:

1. Production volume and costs are based on our 2019 data.
2. The costs related to reduced days to harvest excludes feed and smolt and is estimated at 32% of our overall costs.
3. The other relevant production cost stays constant in the coming years.

By estimating the reduced costs involved in reducing our days to harvest, we find that the potential benefits are NOK 180-450 million. The estimated reduced days to harvest of this calculation is between one and a half to four months. It is highly uncertain that increased seawater temperature may reduce our production time with four months in the future, but that there are some benefits needs to be taken into our consideration.

Scenario scope	Reduced days to harvest	Cost savings (MNOK)	Reduced days to harvest (months)
2C 2030	10%	180	1.5
2C 2050	15%	270	2.4
4C 2030	20%	360	3.2
4C 2050	25%	450	4.0

MANAGING TRANSITION RISKS AND OPPORTUNITIES

We have decided to investigate the risks of increased cost from fishing and agricultural raw materials that are components in our fish feed.

ASSESSING THE RISKS OF INCREASING FEED COSTS

The table below shows our estimations on future cost increase from the effects of global warming. In this analysis we have both investigated the transitional- and the physical costs. The costs are addressed to the different scenario scopes that we have defined. Estimations contains a high degree of uncertainty and the calculations are meant for illustration purposes only. The data used for cost increase estimation are based on an internal discussion in combination with data from SSP and RCP projections previously mentioned in this analysis. Due to the high uncertainties related to the data, we have decided that it will not be used in our strategical planning. We need to perform accurate calculations with a higher degree of certainty in the future to be able to utilize

this information in our planning. Calculation for feed cost is based on our 2019 costs. The costs related to feed are 44% of our overall costs in 2019 (44% feed * NOK 43.54 per kg = NOK 19.16 per kg).

Procured feed is an important part of our business and even a minor increase in cost have implications for our production. The estimation above shows that the cost increase has a medium to significant risk impact according to our financial risk matrix. Assessing the risks related to raw material cost increases in the future scenarios is important for us. This is a topic we that we will further investigate.

Scenario scope	Estimated cost increase	Feed cost (NOK/kg harvested)	Total cost increase (MNOK)
2020	NA	19.16	NA
2C 2030	10%	21.08	249
2C 2050	25%	23.95	623
4C 2030	35%	25.86	872
4C 2050	100%	38.3	2 491

FURTHER WORK

Continuing our efforts when we started assessing the risks of financial disclosures (TCFD) in 2019, we have for the first time performed a climate scenario analysis of Grieg Seafoods operations. The work related to climate scenario analysis is in its early days which is shown by the lack of available and comparable analysis's. Due to the lack of experience and competence on this area, performing this analysis has given us some challenges in tailoring the analysis to our operations. This type of analysis is clearly a field with many pitfalls and different angles to address. We have recently discovered many environmental aspects that we need to research further to fully understand how our business can withstand the challenges that we will face in the future. We will continue our efforts on climate scenario analysis, which will supply our strategical management with stronger and more accurate insight in how to steer our business into the future.

FUTURE POLICY AND REGULATION

We will monitor the ongoing developments related to future policy and regulation:

- Norwegian traffic light regulation and its implications for further growth. There is currently ongoing a trial which opposes this regulation.
- Canada's commitment to ban open pen farming in 2025.
- The decommissioning of salmon farming at the Discovery Islands, affecting one of our farms.
- The European Union roll out of the financial taxonomy. The technical screening criteria for salmon aquaculture has not yet been developed and has a wide range of possible implications for our future business.

This analysis is performed by an internal task force established in the second half of 2020, throughout several workshops and collaborative efforts.





REFERENCE LIST

van Vuuren, D.P., Edmonds, J., Kainuma, M. et al. The representative concentration pathways: an overview. *Climatic Change* 109, 5 (2011). <https://doi.org/10.1007/s10584-011-0148-z>. <https://link.springer.com/article/10.1007/s10584-011-0148-z#citeas>

Keywan Riahi, Detlef P. van Vuuren, Elmar Kriegler, Jae Edmonds, Brian C. O'Neill, Shinichiro Fujimori, Nico Bauer, Katherine Calvin, Rob Dellink, Oliver Fricko, Wolfgang Lutz, Alexander Popp, Jesus Crespo Cuaresma, Samir KC, Marian Leimbach, Leiwen Jiang, Tom Kram, Shilpa Rao, Johannes Emmerling, Kristie Ebi, Tomoko Hasegawa, Petr Havlik, Florian Humpenöder, Lara Aleluia Da Silva, Steve Smith, Elke Stehfest, Valentina Bosetti, Jiyong Eom, David Gernaat, Toshihiko Masui, Joeri Rogelj, Jessica Strefler, Laurent Drouet, Volker Krey, Gunnar Luderer, Mathijs Harmsen, Kiyoshi Takahashi, Lavinia Baumstark, Jonathan C. Doelman, Mikiko Kainuma, Zbigniew Klimont, Giacomo Marangoni, Hermann Lotze-Campen, Michael Obersteiner, Andrzej Tabeau, Massimo Tavoni, The Shared Socioeconomic Pathways and their energy, land use, and greenhouse gas emissions implications: An overview, *Global Environmental Change*, Volume 42, 2017, Pages 153-168, <https://doi.org/10.1016/j.gloenvcha.2016.05.009>. (<https://www.sciencedirect.com/science/article/pii/S0959378016300681>)

Lynne Falconer, Solfrid Sætre Hjøllo, Trevor C. Telfer, Bruce J. McAdam, Øystein Hermansen, Elisabeth Ytteborg. (2020) The importance of calibrating climate change projections to local conditions at aquaculture sites. *Aquaculture*, Volume 514. <https://www.sciencedirect.com/science/article/pii/S0044848619316199>

PwCs Seafood barometer (2021). <https://www.pwc.no/en/publications/seafood-barometer.html>