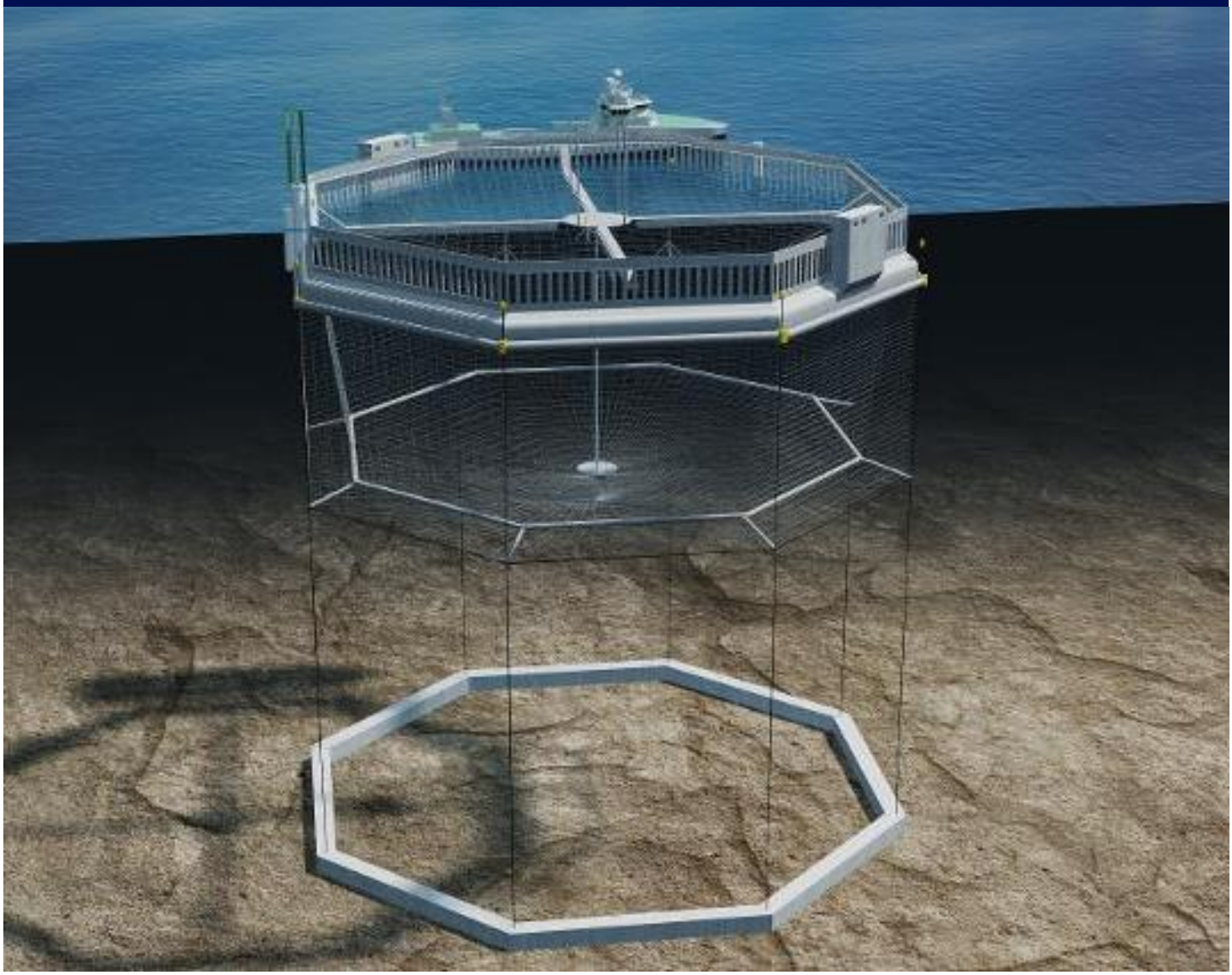
University of Stavanger

**BERIT ASHEIM (9144) & ERIK HALDORSEN (9046)**
SUPERVISOR: YONG HAO TAN

# The Implications of Resource Rent Tax on Innovation in Norwegian Aquaculture

**Master thesis, 2023**
**Master of Science in Business Administration**
**University of Stavanger Business School**
**Specialization: Business Development and Innovation**



# I Acknowledgment

This master's thesis marks the finish line of our five-year-long journey with a specialized master's program in Innovation and Business Development. As students with a genuine interest for Research & Development, we set out to investigate aquaculture and its wide-ranging implications. The primary focus has been on understanding the complexities of innovation in the aquaculture industry and the potential effects of introducing a *Resource Rent Tax.*

Initially, our intention was to employ *Net Present Value* calculations to assess the economic viability of *Blue Farm*, a representative aquaculture enterprise. However, we encountered a significant challenge in the form of multiple modifications to the proposed Resource Rent Tax throughout the course of our research. Recognizing the potential for rendering our calculations obsolete, we made a decision to forgo the *Net Present Value* analysis. Instead, we redirected our efforts toward a more qualitative examination of the policy's impact and significance. This approach unveiled information beyond *Blue Farm's* economic situation following the implementation of the *Resource Rent Tax*, revealing a more holistic view of the tax and its implications.

Furthermore, we would like to extend our thanks to our supervisor, Yong Hao Tan, who has been a crucial part of shaping our thesis. Moreover, we would not have been able to perform our research without the contribution of key figures in *Grieg Seafood*, *Blue Farm*, and the interviewees, who generously shared their time and knowledge on the subject.

Undertaking this thesis has been a challenging yet rewarding experience, allowing us to explore the use of innovation in aquaculture and the complex implications of a Resource Rent Tax in combination with a move toward sustainability. We hope that our findings, analysis, and recommendations presented in this thesis will contribute to the broader research surrounding innovation and policymaking in aquaculture.

Finally, we would like to thank our family, friends, and loved ones who have been a solid foundation, and source of motivation in a stressful and momentous period of our lives.

# II Executive summary

The purpose of the following thesis is to shed light on the implications of the newly proposed *Resource Rent Tax* in Norwegian Aquaculture and explore its potential effects on the realization of future sustainability goals. Through our comprehensive analysis using a range of qualitative data sources, such as case studies, interviews, and previous academic works, we were able to uncover a significant effect between the *Resource Rent Tax* and innovation within the sector.

The aquaculture sector has been heavily reliant on innovation to keep up with the growing demand for farmed fish. In fact, in 2021 the *Norwegian Government* set out plans to increase production by 500% within a 30-year timeframe to meet this growing demand. There is a consensus between scholars and our interviewees from this thesis that innovation is the key to unlocking the capacity potential of 500%. However, the recent introduction of the *Resource Rent Tax* has proven this to become an even greater challenge. The proposal for a 40% *Resource Rent Tax* resulted in the cancellation of 40 billion NOK worth of projects. Subsequently, the *Government* confirmed the implementation of *Resource Rent Tax*, reduced to 25%, leading to an additional five billion NOK of projects canceled. As a result of this decrease in capital leading to project cuts, this, in turn, diminishes the emphasis on innovation and ultimately impedes progress in sustainability. Without further progress in sustainability, there is a risk of an escalation of salmon lice, prompting production reductions and diminishing available capital. This cyclical pattern creates a self-perpetuating loop of decreased production, innovation, and sustainability.

To break this cycle, we propose implementing an incentive program that utilizes a portion of the government's 12.5% share of the *Resource Rent Tax* to reinvest in fish farming. The objective of this incentive program is to encourage aquaculture companies to undertake projects aligned with the sustainability objectives outlined by the *Ocean Panel* and the *Paris Agreement*. Furthermore, by reinvesting in aquaculture, we ensure that the Norwegian fish farmers can continue to meet the growing demand while maintaining their competitiveness on a global scale, particularly as nations like Chile are rapidly catching up.

# Table of Content

# III List of figures



# IV List of Table

# 1. Introduction

The *Norwegian Government* has set a goal of increasing salmon production from one million to five million tons by 2050 (Hersoug et al., 2021). A development permit scheme was created by the *Government* to support innovation that enables the expansion of production. This led to multiple organizations starting to perform research on innovative fish farms. A noteworthy instance of such fish farms is *"Blue Farm"*, a collaborative effort between *Blue Farm AS* and *Grieg Seafood Rogaland AS*. This initiative seeks to extend production to the untapped resource of the high seas, which has remained largely unexplored for a considerable period.

Furthermore, the *Government* chose to commit itself to sustainable farming through the creation of *Ocean Panel*, a corporation of 17 heads of state in pursuit of more environmentally friendly commercial ocean practices. This commitment has steered the *Government* to incorporate sustainable frameworks such as the traffic light system, to identify which areas of Norway are affected by high concentrations of lice and escaping fish. Salmon lice live and breed on their hosts by attaching themselves to the fish which creates a wound and may become infected and potentially result in death (Lusedata, n.d.). Wild salmon are more resistant to lice, escaping fish are therefore heavily controlled to reduce the likelihood of crossbreeding (Costello, 2009).

The introduction of *Resource Rent Tax* (RRT) in aquaculture has been a subject of debate since its introduction in 2018 (Åm, 2021). After multiple alterations to RRT, the final version of taxes of 25% was released by the *Norwegian Storting* in *Skatteloven §4-17 and §19-1 to §19-10* (Lovvedtak 83 (2022-2023)). Today Norway is one of the largest exporters of farmed salmon, the sales value of farmed salmon is projected to quadruple by 2050, under current policy strategies for Norwegian value creation from the ocean (Åm, 2021). In Åm (2021) research, it is pointed out that aquaculture has profited to the extent that a new term *"Salmon Billionaires"* has entered the vocabulary. Accordingly, this thesis establishes the consequences of innovation caused by the introduction of RRT.

## 1.1 Background

A RRT is a result of the *Ricardian Theory*, where a company is granted a special advantage for a specific resource that is limited in availability. The theory states that the industries collecting from public goods should pay an extra tax. As a result of this, the oil sector has a 56% RRT allocated by the *Norwegian Government* (for the 2019 tax year) in addition to its normal tax obligations of 22%, resulting in a gross tax of 76% (Norsk Petroleum, n.d.).

Furthermore, As the hydropower sector utilizes natural resources to generate energy, this sector is also required to pay a RRT of 37%, with an anticipated increase to 45% excluding business tax, with effect from the fiscal year of 2022 (Norwegian Government, 2022). Similarly, the integration of RRT has been debated for land-based wind power with an initial plan of 40%, where the hearing currently is postponed. Thus, it comes as no surprise that the Norwegian government has been debating the application of RRT to the offshore aquaculture sector from 01.01.2023 retroactively (Folkvord & Furuseth, 2018).

The following timeline displays key events which have affected *Blue Farm* and its launch.

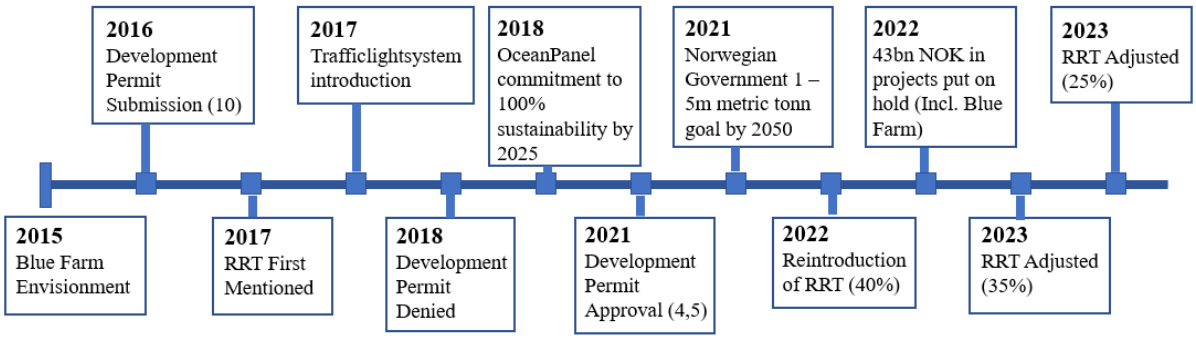



*Figure 1. "Timeline of critical events", 2023, table created by author.*

### 1.1.1 Policy Perspective

Local laws and regulations can dictate a company's operations and its ability to leverage international growth opportunities. Thus, individuals aspiring to become entrepreneurs, business leaders, or strategists in industries that are heavily regulated should make a point of understanding how politics can affect businesses (Boyles, 2022). The increasing globalization has rendered industries more susceptible to shifts in political decision-making and the

requirements of non-governmental organizations, which can exert pressure on governmental policies. High-tech and multinational industries are particularly vulnerable to strategic changes and must be nimble enough to adjust to minimize the cumulative impact of such pressures (Eryürük et al., 2014).

Cumulative effects refer to the overall impact, encompassing both direct and indirect effects, on a particular resource, ecosystem, or human community resulting from all actions taken, regardless of the actor. Thus, to develop effective countermeasures to strategic changes, it is essential to consider the entire system in a holistic scope (DEAT, 2004).

Governments possess significant power to influence industries, but they are also impacted by global discussions and sanctions imposed by international directive mechanisms. This creates a pronounced conflict, particularly for developing countries, as governments must balance economic objectives with social and environmental concerns. Achieving sustainability in the global context, requires navigating conflicts via scenario planning that optimizes economic, environmental, and social outcomes (Eryürük et al., 2014).

Furthermore, the basis for why the RRT is introduced to aquaculture, is because it is utilizing Norwegian fjords and other marine regions that belong to the society. Statistics show that the industry's income is on par with hydropower. Therefore, the resource rent is estimated at NOK 11.8 billion, which suggests that society should share the extraordinary returns generated by the exploitation of natural resources (Norwegian Government, 2021).

The RRT includes the offshore aquaculture industry that produces salmon trout and rainbow trout at a rate of 25% RRT. However, there is a tax-free allowance for operators who produce between 4000-5000 tons or have a yearly profit below 70 million NOK. This will ensure only the largest operators will pay the RRT. The RRT income is estimated to be 3.65-3,8 billion NOK and will be shared 50% by the state and the local municipality based on Prop. 78 LS (2022–2023) (Norwegian Government, 2023).

The last proposal from April 2023 the Prop. 78 LS (2022–2023) suggests implementing a neutral RRT that emulates the role of a silent partner in a company's investments. Under this

approach, the *Government* would contribute funds equivalent to the tax rate to cover investment costs, while also receiving 25% of future profits.

#### 1.1.1.1 Ocean Panel

The *Ocean Panel* was established by the *Norwegian Prime Minister* and her office in 2018, with the purpose of reaching 100% sustainable ocean governance within the Norwegian territorial waters by 2025 (UN, n.d.-a). This goal highlights the importance of sustainability in ensuring the industry's ability to continue to meet demand. The most significant initiative to reach the desired goal is to "develop, adapt, and effectively implement science-based plans to rebuild overexploited fish populations and ensure adaptive fisheries management in response to climate change and uncertainty in a changing marine ecosystem (...) to ensure sustainable small-scale fisheries" (Ocean Panel, n.d.), highlighting the need for new and innovative solutions.

Furthermore, the *Norwegian Government* encouraged all coast- and ocean nations to commit to the same goal by 2030. As of 2023, 17 nations and their respective heads of state have dedicated themselves to ensuring sustainable practices and thereby avoiding potential future crises, to improve public health, and create a more resilient society (Ocean Panel, n.d.).

#### 1.1.1.2 Norwegian Government Production Goal

The *Norwegian Ministry of Trade, Industry and Fisheries* report, *Meld. St. 16 (2014-2015)*, outlines an ambitious goal to increase the production of salmon in Norway from one to five million metric tons by 2050. The report also mentions conditions that need to be fulfilled to accomplish the goal (Meld. St. 16 (2014-2015)).

"*Among the prerequisites for the estimate are that today's environmental and disease challenges have been resolved, that one succeeds with innovation in feed, fish health, breeding and technology, and that one has a predictable regulatory regime*" (Meld. St. 16 (2014-2015)).

The report points towards untapped potentials, such as offshore fish farms, which may make up a large quantity of the production in the future. According to Hersoug et al., (2021), the

production of large smolt, land-based, contained net pens and offshore fish farms are all essential investment areas for future innovation to reach five million metric tons of fish.

### 1.1.2 Aquaculture at Sea

Aquaculture is the act of farming fish in captivity. In the early 1970s, the inaugural floating pen nets were developed for the purpose of fish farming, resulting in the inception of the Norwegian aquaculture sector. Today, the country generates 80 billion NOK in annual sales every year, as the largest farmed salmon producing country worldwide (Misund, 2023). As such, aquaculture represents one of Norway´s essential export industries and facilitates a large portion of the Norwegian workforce (Mäkitie et al., 2020; Norsk Industri, 2017).

There are three main ways to farm fish. "*Extensive*", is where fish are blocked into a designated area such as a lake, stream, or fjord and no further intervention is necessary. "*Semi intensive*", is the same as extensive, although the fish are supplied with feed as needed. "*Intensive*", increases human intervention where a large effort is put into controlling variables that may aid the survival rate and growth of the fish (Misund, 2023). In Norway, the intensive method is extensively employed and can be classified into three subcategories: *"open cages", "closed cages",* and *"land-based"* systems. Among these, open cages in calm fjords are the prevailing choice. Open cages, as seen in Figure 2, separates the fish from its surroundings using nets, whereby water, feed, and droppings may flow freely through the cage. Closed cages, however, as shown in Figure 3, have hard barriers between the fish and the outside environment which necessitates water, feed and waste to be pumped in and out. Land-based facilities function the similarly to closed cages, with the exception that the cage has been moved to land (Misund, 2023).

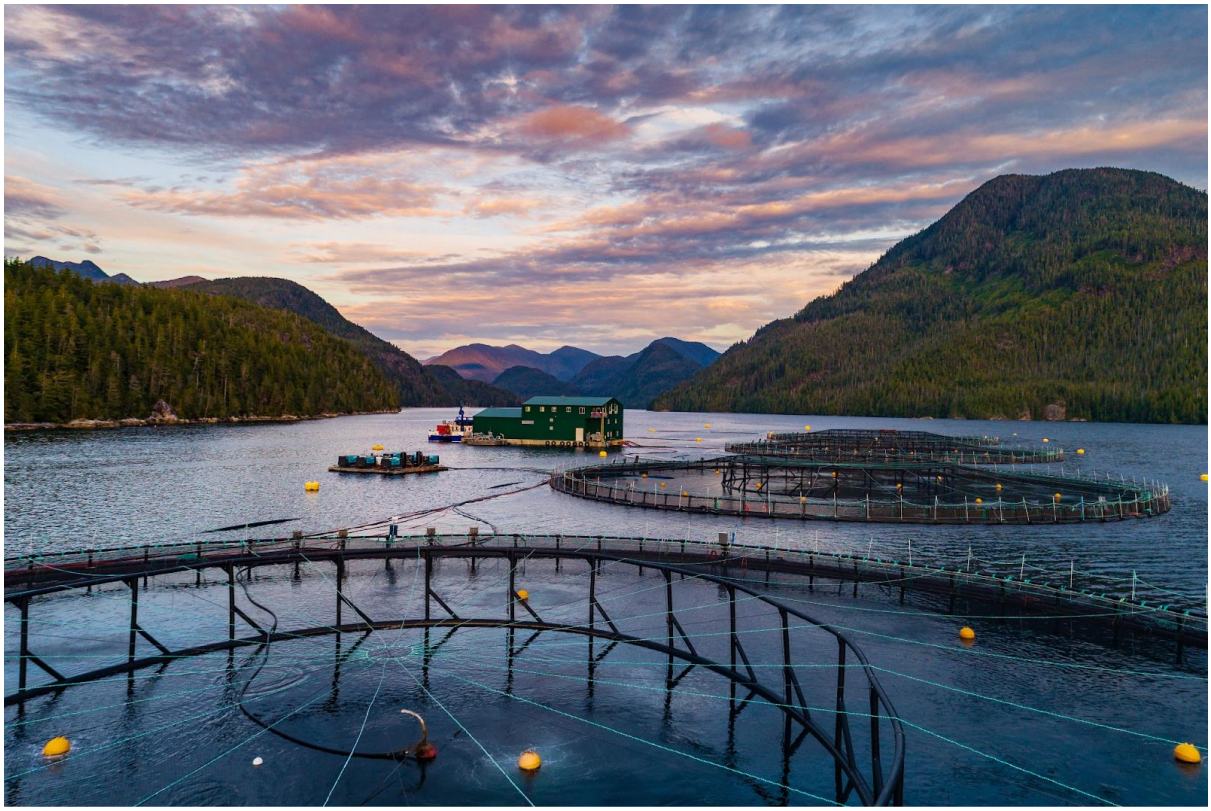


*Figure 2. "Intensive open cages in Finnmark", 2023, (https://griegseafood.com/finnmark), Copyright Grieg Seafood.*


*Figure 3. "Intensive closed cage - The Egg", 2023, (https://haugeaqua.com/technology/egget), Copyright Hauge Aqua.*

### 1.1.3 Blue Farm

As of 2016, there were no operational fish farms located at sea, nor technologies that could enable competitors to initiate production on open seas. The basis for *Blue Farm* was, therefore, to expand farmable waters from the coastline out to sea to realize its untouched potential (Blue Planet, personal communication, 2016).

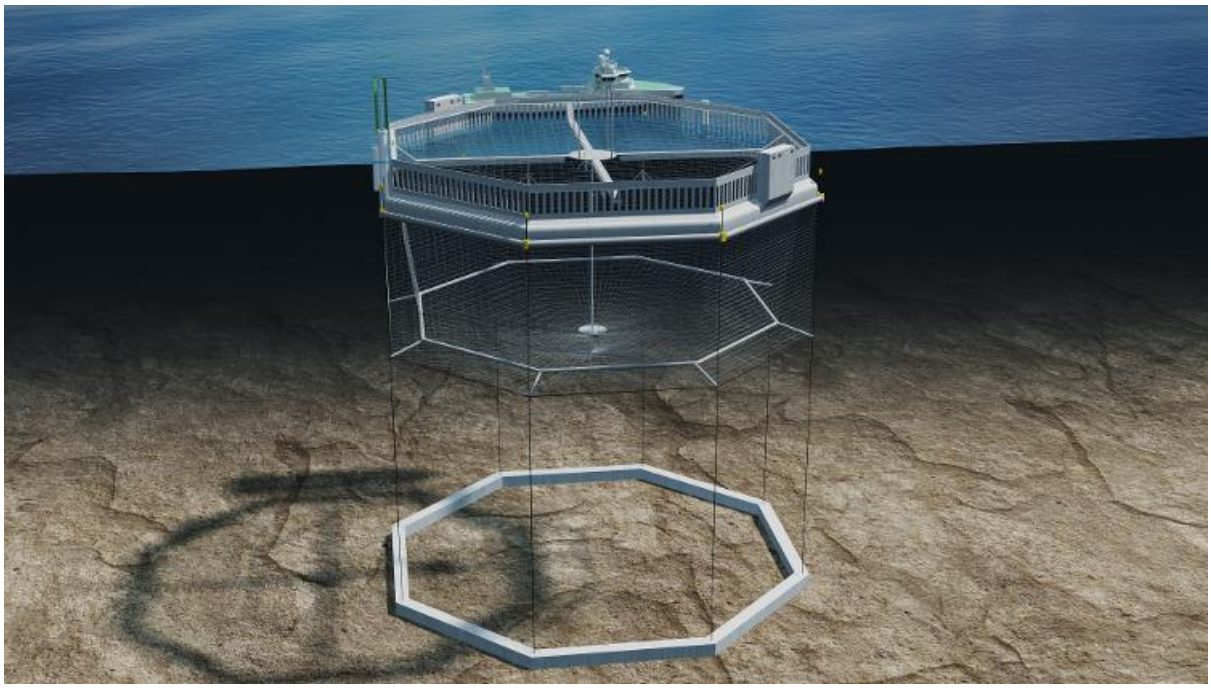


*Figure 4. "The Blue Farm Cage", 2023, (https://www.blue-farm.no/), Copyright Blue-Farm - offshore fish farming.*

In 2013, a notion surfaced regarding the unsuitability of current fish farms to be deployed in the deep sea due to challenging weather and water currents. This prompted *Blue Planet* and an oil sector engineer to collaborate and establish *Blue Farm AS* in 2014. The enterprise partnered with major players in the aquaculture industry, namely *AKVA group AS*, *Egersund Net AS*, *Blue Planet AS*, and *RS X AS*, who collectively became its proprietors (Blue Planet, personal communication, 2016).

Furthermore, in 2016 *Grieg Seafood* partnered up with *Blue Farm AS* as the lead for production on the *Blue Farm* concept cage (Figure 4). The concept enabled production in deeper waters through the incorporation of concrete and wire tether technologies from oil and gas into existing aquaculture components (Blue Planet, personal communication, 2016). Figure 5 shows the initial location around Kvitsøy island, five kilometers North-West of Stavanger, in semi-

sheltered waters. This location will serve as a test before moving the project to its final destination, 20 kilometers offshore.


*Figure 5. "Proposed Blue Farm Test Location", 2018, Blue Farm. (Personal communication).*

## 1.2 Research Question

The purpose of this master's thesis is to answer the following research question:

*To what extent will the implementation of Resource Rent Tax impact innovation in aquaculture and the achievement of future sustainability goals?*

The research question addresses a timely and important issue in aquaculture, namely the potential impact of a RRT introduced in an industry dependent on growth to reach the government's goals of increasing farmed salmon from one million to five million tons by 2050. As a result of the RRT, innovation could decrease due to the reduction in profits, resulting in less investment. Thus, this demonstrates the need to explore the new policy and the implications that may follow.

To answer the research question, we have focused on innovation theories and the sustainable aspect of aquaculture, to allow for a focused depth analysis of the potential effects the RRT has on these key areas. The significance of this research is to help understand the impact of a RRT on R&D and investments in aquaculture, as well as providing practical implications for policymakers, industry stakeholders, and researchers.

## 1.3 Motivation

The introduction of RRT to the aquaculture industry has attracted significant attention, due to its controversy and extensive media coverage. Traditionally, RRT has been primarily associated with the allocation of government-owned resources, such as oil and hydropower production. Our research on the topic was sparked by its integration into aquaculture and limited comparisons with the agricultural sector. Furthermore, we decided to focus our research on aquaculture and concluded the lack of comparison was a result of the profitability in aquaculture versus agriculture. Motivated by curiosity regarding the potential negative impacts on innovation, we decided to investigate the effects of RRT on innovation within the aquaculture industry.

# 2. Theory

## 2.1 Rent and Tax

### 2.1.1 Ricardian Theory

The book *"Principles of Political Economy and Taxation"* by David Ricardo, which was published in 1817, is acknowledged for creating the idea of rent. In the book, Ricardo covered the notion that landowners might generate extra money from their property, which he referred to as *"rent"*. The amount of rent a landowner could collect was based on the fertility and location of the property, he contended, and was a result of the lack of available land. An essential contribution to our knowledge of the economics of land and resource use was made by Ricardo's concept of rent (Ricardo, 1821, ch. 5; Gunton, 2003).

The most productive land is able to produce a surplus of output above the cost of production, which Ricardo referred to as rent. The concept of resource rent refers to the additional money made from the extraction and sale of natural resources over and above their cost of production. Taxing resource rent can raise money for the government or compensate for the exploitation of non-renewable resources by society. Resource rent is frequently used in economic analyses of natural resource management, including hydro energy, oil and gas, and minerals (Gunton, 2003), and will now enter aquaculture.

### 2.1.2 Neutral Tax

The concept of a neutral tax is a well-known phenomenon and refers to the State taking its share of both income and cost, thus resulting in a *"neutral RRT"*. The main goal of having neutral taxation is so that the decision-making of the company will not lead to socioeconomic losses. However, in the oil and hydropower sector, the RRT has developed from neutral taxation to cash flow taxation (Norwegian Ministry of Petroleum and Energy, 2023; NOU 2022:20).

In theoretical terms, a neutral tax aims to have no impact on economic decision-making, allowing agents to base their choices solely on market conditions and profitability. It applies a general income tax without specific industry-related incentives or exemptions (NOU 2022:20).

Conversely, a cash flow tax considers the actual cash flow generated by a business and may provide incentives that differ from a neutral tax. For example, in the aquaculture sector, a neutral tax would be a general income tax, while a cash flow tax in the oil sector could be based on net cash flow from production activities (Norwegian Ministry of Petroleum and Energy, 2023).

## 2.2 Regulations

The regularity system was developed in 1973 and was first established to avoid overproduction and support local communities. Moreover, the regulatory system is an important factor in industries' environmental and sustainable strategies (Afewerki et al., 2022).

### 2.2.1 Special Development Scheme

In 2015 *The Norwegian Directorate of Fisheries* introduced a temporary development permit scheme that provides special permits that entail substantial amounts of innovation and investment. Through the construction of prototypes and testing facilities, industrial design, equipment installation, and full-scale trial production, for instance, the goal is to make it easier for technology transfer to invent solutions that can help solve one or more of the environmental and spatial problems that the aquaculture industry faces (Fiskeridirektoratet, n.d.-a).

Development licenses are special permits that may be granted to projects involving considerable innovation and investment. The program is only applicable to the creation of technical installations and equipment, and it mostly covers significant projects that demand risk sharing from the government (Fiskeridirektoratet, n.d.-a).

*The Norwegian Directorate of Fisheries* might enable the conversion of a development license, at the end of a project phase, converting the special permit to a commercial production license. The conversion requires a payment of ten million NOK which is a fraction of the original price of a production license (Fiskeridirektoratet, n.d.-a), where a total of six billion NOK was spent on production licenses in 2020 (Fiskedirektoratet, 2020). The development licenses are therefore held as substantial value for aquaculture firms and can be sold or utilized as collateral to secure capital for additional projects as of *akvakulturregisterforskriftene § 19* (Fiskeridirektoratet, n.d.-a).

### 2.2.2 Traffic Light System in Aquaculture

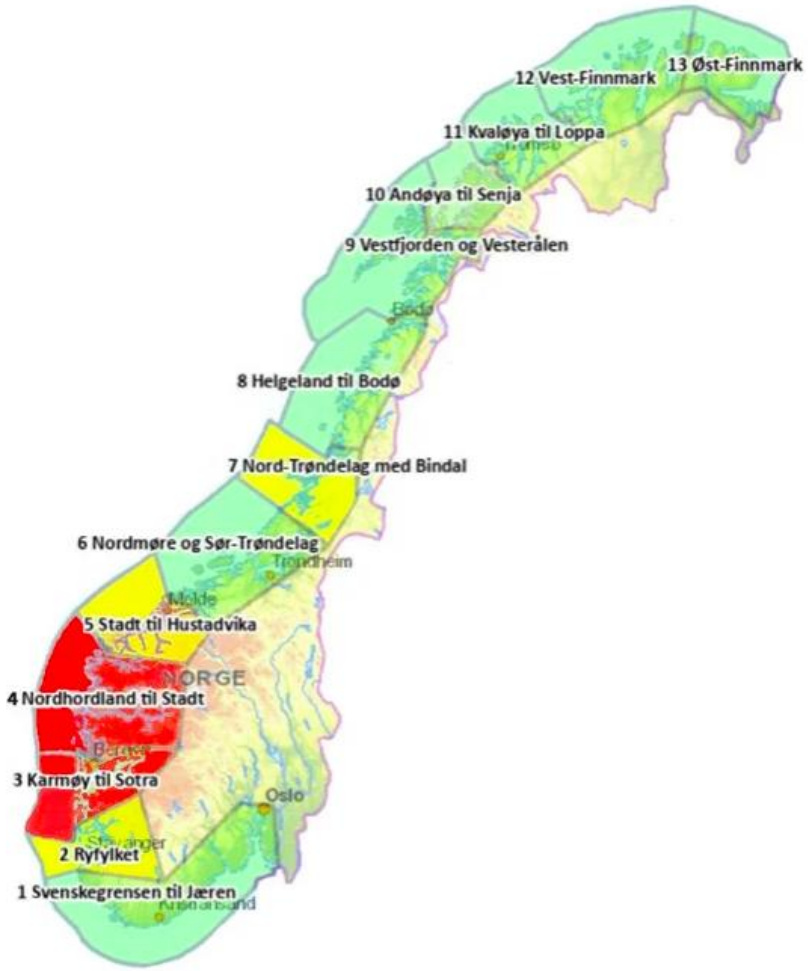



*Figure 6. "Traffic Light System Locations", 2022, (https://www.regjeringen.no)*

*The Norwegian Government* launched the finalized version of its *Traffic Light System* in 2022 as a regulatory framework for managing future growth in the aquaculture industry. This system was implemented with the primary objective of ensuring the adoption of sustainable production methods to address the escalating issue of lice infestation and its detrimental effects on wild salmon populations in affected regions. Notably, areas exhibiting high lice levels are designated as *"red"* zones, indicating that producers must reduce production until lice populations are brought under control (Meld. St. 16 (2014-2015); Stokke & Hauge, 2019). On the other hand, the *"green"* areas allow for a potential cumulative production growth exceeding 21,000 tons of salmon, trout, and rainbow trout.

### 2.2.3 Incentive Program

Fiscal incentive schemes often target specific groups, such as small- and medium-sized enterprises (SMEs), young firms, or firms in specific technological sectors. This can be attributed to their comparatively limited access to financing for research and development, primarily because they have limited collateral (Mohen & Lokshin, 2010).

According to the statistical analysis performed by Wu (2005), the results indicate that the establishment of state R&D incentive programs effectively stimulates greater expenditure on industrial innovation. Additionally, the availability of state services in higher education and the implementation of innovation-focused programs also influence private decisions regarding investments. This policy assessment delivers a positive message to state policymakers, as it demonstrates the significant potential of utilizing innovation policy instruments to promote economic development (Wu, 2005).

The ideal incentive scheme designed to promote innovation demonstrates a significant level of tolerance, and in some cases, even rewards, for both early failures and long-term success. Additionally, a crucial factor in motivating innovation is a steadfast commitment to a long-term compensation plan (Manso, 2011).

## 2.3 Innovation Theories

Innovation may be defined as the creation, acceptance, and execution of services, products, processes, and ideas (Thompson, 1965), together with the corresponding outcome (Dubickis & Gaile-Sarkane, 2015), while economic growth is driven by continuous innovation (Dubickis & Gaile-Sarkane, 2015; Dutta et al., 2014; OECD, 2007; Van de ven, 1986). Increasing competition, due to globalization and the expanding influencing scope that businesses possess, fuels the need for innovation and further development. To establish competitiveness, businesses have to continuously research similar markets for new and leading technologies which may be applicable (Dubickis & Gaile-Sarkane, 2015).

Disruptive innovation is an effective method for expanding and establishing new markets, as well as providing new capabilities, which may disrupt existing market linkages (Dan & Chieh, 2008). In aquaculture, disruptive innovation can revolutionize the way fish farming is conducted, leading to increased efficiency, reduced costs, and improved sustainability. For

example, the development of *Recirculating Aquaculture Systems* (RAS) and automated feeding systems have transformed the industry by minimizing water usage, optimizing fish growth, and mitigating environmental impacts (Ahmed & Turchini, 2021).

Radical innovation entails the introduction of entirely new technologies or approaches that significantly disrupt and transform established practices (Gomber et al., 2018). Traditionally, radical innovations are found at the beginning of an industry's lifespan. However, in the aquaculture sector, there have been several radical innovations that have transformed production methods. Offshore, semi-closed, and land-based containment systems are all examples of types of radical innovations which have occurred within the sector (Afewerki et al., 2022).

Incremental innovation, on the other hand, involves making small, incremental improvements to existing technologies or processes (Tushman & Nadler, 1986). In aquaculture, incremental innovations can lead to gradual enhancements in productivity, disease prevention, feed efficiency, and overall operational efficiency. These continuous improvements contribute to the overall development and evolution of the industry, ensuring its ability to meet the growing demand for seafood in a sustainable manner (Afewerki et al., 2022). In fact, according to Afewerki et al. (2022), research shows that the most innovation in aquaculture is incremental in nature.

Technology and knowledge transfers across industries can also contribute to the advancement of sustainable growth. Most scholars agree that technology transfer encompasses the transmission of technical knowledge and information encapsulated within products, processes, and managerial practices (Wahab et. al., 2012). Firms can strengthen their competitive advantage by implementing and learning from knowledge acquisition and transfer (Khamseh & Jolly, 2008).

The theoretical frameworks of knowledge transfers are based on the assumption that knowledge is a valuable resource that can be transferred from one individual or organization to another. These frameworks aim to identify the factors that facilitate or hinder knowledge transfers, as well as the mechanisms through which knowledge is transferred (Kothari & Wathen, 2017). One of the most widely used frameworks is the knowledge-based view (KBV) in which a firm's knowledge resources and capabilities are critical to its competitive advantage

(Gassmann & Keupp, 2007). According to the KBV, knowledge transfer can occur through either explicit or tacit means and involves the transfer of knowledge from individuals or groups with high levels of expertise to those with lower levels of expertise. Overall, theoretical frameworks of knowledge transfer provide a basis for understanding the processes and mechanisms. Furthearmore where knowledge is transferred and can be used to inform strategies for improving knowledge transfer within and between organizations.

## 2.4 Investment Decision Theory

According to Avram et al. (2009, p. 1905-1906; Virlics, 2013), investment is the act of spending money in the present with the goal of generating profits in the future. To thrive in a competitive market, a company must make investments to facilitate growth and development. Capital is allocated to a specific cause for a medium to long term to recoup the invested capital and receive an additional profit over time (Avram et al., 2009).

Critical determinants for investors encompass their profit expectations, cost considerations, available capital, and previous knowledge (Avram et al., 2009). Moreover, the absence of complete information creates a sense of uncertainty for the investor's ability to recuperate their investments (Avram et al., 2009). Within an organizational context, the decision-making process occurs, guided by a clearly defined strategy, established procedures, and standard operating policies. The organization itself consists of diverse individuals, each driven by their objectives and aspirations, while simultaneously being influenced by external systems at higher levels (Aharoni, 2015).

Understanding how people make decisions in situations of uncertainty and with limited information is substantial. Decision-making can be influenced by factors, such as the availability of information, the decision-maker's level of interest, and the resources (time and energy) they are willing to invest in processing information. However, it is not always feasible to gather information on every possible opportunity. As such, relevant information, awareness of biases, and efficient allocation of resources should be of focus (Aharoni, 2015; Mantel et al., 2006).

In business situations, there are always multiple variables that cannot be precisely determined. Some factors may be subject to mathematical analysis, but many rely on subjective estimates.

Due to the inherent uncertainty in these situations, decisions are often based on subjective perceptions and estimates (Aharoni, 2015). When an organization initiates an investigation for a potential investment it confines resources to the new commitments. Additionally, executives might disagree on where the resources are best exploited. This perspective may make it difficult to view these resources as sunk cost, which can potentially lead to poor decision-making (Johnson, 2003).

Commitments in business can be created through financial investments but also through psychological and social investments. Simply knowing that an investigation is underway can create a sense of commitment to the investment proposal, as rejecting it may be perceived as a failure and negatively impact the investigator's relationships and social standing with relevant parties. These factors may contribute to the investigator's reluctance to reject the proposal even if it may not be a sound business decision (Aharoni, 2015).

When an organization makes a decision, it must consider the potential impact of prior commitments made by the organization and the interrelationships among its members (Mathieu, 1990). These factors can create complex situations that must be carefully navigated to make effective decisions (Aharoni, 2015).

## 2.5 Sustainable Transition

In recent years, climate change has emerged as a significant concern, leading to the establishment of the *Paris Agreement*, a binding international alliance formed in 2015. The agreement aims to limit global warming to well below 2°C and pursue efforts to keep the temperature below 1.5°C. Fostering the adoption of zero-carbon solutions and creating new business opportunities for cities and companies (UN, n.d-b).

As a result of the *Paris Agreement*, the *Circular Business Model* (CBM) gained popularity. CBM became a valuable business strategy with its selling point to combine economic development with the benefits of reducing emissions and waste (Cantzler et al., 2020). The CBM aims to maximize resources and efficiency while minimizing waste, the future desire is to create a closed-loop system that eliminates waste entirely (Cantzler et al., 2020; Stewart, & Niero, 2018). The change to move businesses to more sustainable business practices has resulted in the creation of *Ocean Panel* as mentioned in *1.1.1.1 Ocean Panel.*

One of the reasons why the sustainable transition is significant for the aquaculture industry, is due to its desirability as one of the cheapest animal proteins available. In fact, according to the four pillars of food security; namely availability, access, utilization, and stability, the aquaculture industry plays an important role in ensuring adequate food supplies through its alignment to these pillars. As food security is highly impacted by political decisions, it can be an important determinant to boosting a country's socioeconomic status and combating malnutrition (Guiné, 2021). Thus, aquaculture plays an important role in ensuring adequate food supplies in developing countries through its supply of available animal protein that contains important nutrients at a cheaper price (Pradeepkiran, 2019).

To increase sustainability in aquaculture, the disruptive system "*Integrated Multi-Trophic Aquaculture"* (IMTA) was implemented to offer a more sustainable food process. The IMTA system has the potential to reduce greenhouse-gas emissions and transform aquacultures to low-carbon. Yet, there is a limitation to the process, as it has only been tested in fresh waters and relies on naturally occurring ecosystems of microalgae, bacteria, and duckweed. Although the implementation and research of the IMTA align with the UN Sustainable Developing goals, Mok & Gaziulusoy (2018) concluded that there could be critical issues when implementing systems changes, which could result in unintentional events that. could negatively affect the production and welfare of the fish (O'neill, 2022).

# 3. Methodology

## 3.1 Newspaper Articles

Newspaper articles from *Intrafish* and *Teknisk Ukeblad* (TU) were reviewed for this study. Searches were conducted using terms as *"Resource Rent Tax in Aquaculture"*, *"Aquaculture"* and *"Resource Rent Tax"*. Furthermore, we selected relevant articles based on their publication dates from 2018 to 2023 as well as their focus on the ongoing discussion about the RRT. The information was retrieved from various sections of the newspapers, including the editorial, opinion, and news sections. However, to ensure reliability, an effort was made to minimize reliance on information sourced solely from newspapers by seeking more authoritative sources such as the *Norwegian Government* or scholarly works. Additionally, we used different companies' home pages, to see how various companies operate when it comes to innovative projects in offshore aquaculture.

## 3.2 Store Norske Leksikon (SNL)

In this study, the Norwegian encyclopedia *Store Norske Leksikon* (SNL) has provided us with tangible references for the personal communication we engaged in with the researcher responsible for the article. SNL is an encyclopedia owned by Norwegian Universities and is managed and written by researchers employed at these academic institutions. As a result, the encyclopedia has a high level of credibility due to the expertise of its contributors.

## 3.3 Collaboration

Establishing a partnership proved to be a very time-consuming and challenging process. The initial method was to construct and send well-written emails and thereafter call a central person within the desired company. These emails were sent to a significant number of Norwegian aquaculture firms such as *AKVA group*, *MOWI*, and *Eide Fjordbruk AS*. As this approach did not yield results, the focus shifted to using personal contacts from *BDO* and personal networks, which then led us to a collaboration with *Grieg Seafood* and *Blue Planet*. *Blue Planet* prompted us to use their previous research and development applications, which have given us valuable information in assessing the financial effects of RRT.

## 3.4 Interviews

Various key individuals and firms affected by the new tax were interviewed to gain a deeper understanding of the situation. The process started with sending emails to all parties which were affected by the RRT, including; firms, researchers, and political representatives. Unfortunately, the political representatives we approached were not able to perform interviews. However, executives from fish farm organizations, salmon freight forwarders, and University Professors took their time to discuss the impacts of RRT.

The interviews lasted 30-45 minutes and were conducted over *Teams* or phone. Questions were sent to participants one day in advance to allow for some preparation. The interviews were kept semistructured where digressions were encouraged to receive detailed answers as well as opened for interviewees to include noteworthy information.

While performing interviews, different factors were considered. An important factor for this thesis was to establish interviews with both sides of the political conflict. However, as we did not succeed in establishing a conversation with state or party representatives, we are not able to convey their reasoning other than what is already accessible online. Fortunately, the *Norwegian Government* is transparent and openly shares information about all policy changes. Although we have had access to the information itself, only physically speaking to one side of a conflict introduces a bias and may affect the conclusion and path of the thesis.

| Firm | Role | Date | Where |
|---|---|---|---|
| Seafood Airfreight | Higher executive | 21.03.2023 | Zoom |
| University of Stavanger | Professor, Department of Innovation, Management and Marketing | 22.03.2023 | Teams |
| Seafood Consultant firm | Consultant | 22.03.2023 | Teams |
| Fish Farm | Higher executive | 12.05.2023 | Teams |
| Seafood Technology firm | Petroleum Engineer | 12.05.2023 | Phone |
| University of Stavanger | Professor, Department of Social Economics and Finance | 15.05.2023 | Teams |

*Table 1. "Interviews performed", 2023, table created by author.*

## 3.5 Limitations

We embarked on writing our thesis at a time when the results of the RRT implementation in the aquaculture industry were still being processed. In this regard, comprehensive data on the potential impact of this tax was limited. Nonetheless, numerous studies have explored the potential implications of the RRT, particularly by examining its implementation in other industries such as oil and hydropower. It is crucial to acknowledge the fundamental differences between these industries and especially, considering that aquaculture deals with live fish which entails a unique set of factors to be considered. When we started the thesis the RRT was proposed to be 40%. Despite the absence of a firmly established RRT, we adopted the latest proposal as of April 2023 of 35% in this thesis, as a reference point. However, it is noteworthy that the RRT was ultimately finalized at 25% by the end of May 2023, resulting in significant changes and implications not only for the industry itself but also for the focus and findings of our thesis.

Despite our attempts to engage in a conversation with state or party representatives, the *Norwegian Government* executes a high level of transparency and openly shares information regarding policy changes on its website. While being able to obtain the government's agenda and the process behind the policy, we acknowledge that relying solely on communication with one party may introduce biases that could potentially influence the conclusions and trajectory of the thesis. Regardless, we aim to maintain an objective and balanced approach in our research to accurately portray facts rooted in academia.

Lastly, in line with the previously mentioned acknowledgement, the inclusion of cash flow calculations in our analysis was omitted due to the prevailing uncertainty surrounding the RRT. A crucial factor in this decision was the ambiguity surrounding the nature of the RRT, namely whether it should be designed to achieve neutrality or be contingent upon cash flows. The inability to ascertain the precise framework of the RRT significantly hindered our ability to perform accurate cash flow calculations and, consequently, led to their exclusion from our study. This approach was undertaken to ensure methodological rigor and avoid potential misinterpretations arising from the unresolved nature of the RRT's design principles.

# 4. Analysis

## 4.1 Risk

The fish farming industry faces significant risks, including fish health issues, fish escapes, and environmental impacts. These risks have the potential to undermine the industry's profitability, reputation, and future growth prospects. To ensure sustainable growth and development of the fish farming industry, it is crucial to enhance our comprehension of these risks and effectively manage them (Brewer, n.d.). Price risk is a primary concern in the domains of forecasting and futures market studies, while insurance serves as a valuable tool for mitigating production risks, particularly those associated with diseases, escape, technical failures, and similar factors. These risks undoubtedly hold significance, it remains unclear whether other risk factors, such as regulatory risks, may carry greater importance and therefore merit greater attention in future research endeavors (Bergfjord, 2009).

One of the risks mentioned when interviews were conducted, was the risk of a price increase as a result of the RRT being pushed to the consumers. As we will come to discuss in section *4.3 Innovation Impacts* this will raise a new issue, at a time when inflation is at an all-time high.

### 4.1.1 Political Uncertainty

As previously mentioned in *3.5 Limitations,* RRT has been through several revisions before finally ending at 25% in June 2023. The constant changes to the tax, which can be seen in Figure 1 *Timeline of critical events,* as well as abrupt alterations in tax rates have the potential to generate uncertainty regarding future tax rates (Schreiner et al., 2023). Political decisions should be based on reliable knowledge and facts. The consideration of uncertainty in political decision-making can have contrasting effects, benefiting one interest group while leaving another interest group disadvantaged. This susceptibility to uncertainty often leads to the politicization of knowledge, extending to the research supporting the governance of aquaculture (Bjørkan & Hauge, 2019). Furthermore, political risk should also raise concern for any investor who is evaluating a potential investment (Chermak, 1992).

R&D experienced a notable decline during periods characterized by policy uncertainty, as indicated by national elections. This decline is particularly pronounced for highly impactful

innovations, specifically those with extensive citations, and for exploratory innovations that prioritize exploration over exploitation. Moreover, industries that heavily rely on R&D activities also exhibit a greater reduction in innovation during such times (Bhattacharya et al., 2017). This decline in innovation can be seen by the 40 billion NOK worth of sustainable projects, such as semi-closed and offshore research, which were canceled as a result of the introduction of RRT in 2022 (Horjen & Fretheim, 2023). Furthermore, *MOWI* has also chosen to cancel five billion NOK worth of projects following the finalization of RRT in May 2023 (Gran, 2023).

### 4.1.2 Financial Uncertainty

Firms face daily risks from the external environment in which they operate. The most critical risks affecting corporate performance are financial in nature, as a result of changes in interest rates, exchange rates, inflation, tax, and the operations of associated corporate entities. The development of new and untested technology, coupled with the uncertainty surrounding fish health and welfare, poses a substantial financial risk. Changes and lack of predictability in the industry's regulatory framework, including taxation, can have negative effects on investment levels and consequently hinder aquaculture companies' ability to meet society's demands for sustainable production (Misund et al., 2019). Moreover, as stated in section *2.4 Investment Decision Theory*, Mok and Gaziulusoy (2018) found that the implementation of new technologies can have a detrimental impact on production and lead to increased costs.

## 4.2 Environmental Impacts

The legal commitment through the *UN's Paris Agreement* ensures that all member states including Norway must limit their contribution to global warming. Research shows that an increase in ocean temperatures will raise the number of salmon lice (Sandvik et al., 2021). Therefore, it is in the *Norwegian Government's* interest and obligation to minimize the elevation of ocean temperatures. Minimizing the temperature rise and, consequently, the presence of lice, efforts are being made to support the *Norwegian Government's* objective of reducing lice levels in Norwegian waters.

Interviewees shared a common indifference towards a more environmentally friendly production and seemingly were more motivated to create a production that yields a larger quantity of healthy fish and thereby capital. Instead, sustainability and environmental impact

were viewed as positive side effects of ensuring good quality fish. The *Norwegian government* has a more varied agenda where multiple variables are considered, such as environmental guidelines, healthy competition, and sustainable production, and should therefore be at the forefront to enable sustainable solutions.

### 4.2.1 Fish Farm Impact

The transfer of aquaculture to offshore locations has the potential for reducing environmental impacts, adversely creating more demanding living conditions for the fish. In traditional fish farming, waste accumulation is a concern, as slow currents in fjords limit waste dispersal, resulting in concentrated deposits on the seabed. On the other hand, offshore aquaculture benefits from strong currents that facilitate wider waste dispersion, thereby reducing localized impacts on the seafloor (Havforskningsinstituttet, 2022).

The *Norwegian Nature Conservation Association* advocates for the adoption of closed cages for all farmed salmon, as it would reduce the spread of salmon lice, escape incidents, and ecological contamination of the seabed (Naturvernforbundet, 2020). This mindset aligns with the government's sustainability goals formulated through the *Paris Agreement* and *Ocean Panel*.

### 4.2.2 Sustainable Transformation

Achieving sustainability in fish farming can be feasible through the adoption of practices and technologies that promote a closed-loop system, such as CBM. Incorporating the principles of CBM, fish farming can be rendered to a sustainable transition. These principles emphasize the reduction of waste generation and the conservation of resources, thus contributing to the overall sustainability of the industry.

Another way to achieve sustainable strategies is through the implementation of an IMTA system. IMTA involves cultivating multiple species, such as fish, shellfish, and seaweed, in a single farming operation. The waste products of one species can be utilized as a resource for another, creating a closed-loop system that minimizes waste and maximizes resource efficiency, and a push towards a CBM (Knowler et al., 2020).

Furthermore, the use of the incremental innovation of RAS can help to reduce water usage and waste production. RAS is a technology that filters and recirculates water within the fish farm, reducing the need for water exchange and minimizing the discharge of waste into the surrounding environment (Van Rijn, 2013). Ahmed & Turchini's (2021) research shows that the RAS system is limited to closed/semi-closed cages, RAS is often implemented in onshore farms and is not extensively used due to complex systems and high prices. Consequently, aquaculture is in need of more innovative processes to reduce costs and greenhouse gasses.

The human population is rising and areas for producing food are decreasing. Accordingly, developed countries like Norway play a vital role in food security, where the goal of five million tons of exported salmon may make a difference. Performing R&D has historically been an expensive endeavor and has a large upfront cost which is recouped over time. R&D may also benefit others such as developing nations to secure a more reliable food source (Khan, 2014) through the use of knowledge sharing from projects in the development permit scheme (Fiskeridirektoratet, n.d.-a).

In summary, the adoption of CBM principles and the implementation of technologies like IMTA and RAS can enable fish farming to become more sustainable and circular, in addition, RRT can play a crucial role in facilitating the transition to a CBM by incentivizing businesses to adopt sustainable practices, investing in renewable energy, and supporting the development of new technologies that promote resource efficiency and waste reduction.

## 4.3 Innovation Impacts

Aquaculture is a business sector that has been under constant change and innovation due to the growing demand, increasing lice- and escape problems, and the pressure to move towards a CBM. The R&D has spawned various different fish cage designs in order to raise the number of fish being farmed, reduce the likelihood of escape and minimize the ecological footprint on the seafloor. It is imperative for aquaculture to employ disruptive technologies to expand production. Aquaculture has experienced an increase in disruptive technologies with the use of Internet of Things (IoT), Artificial Intelligence (AI), blockchain, offshore farming, closed systems, and lasers, as seen in Figure 7 (Yue, 2022). Additionally, there is an option to work towards more sustainable farming by implementing the disruptive concept of IMTA.

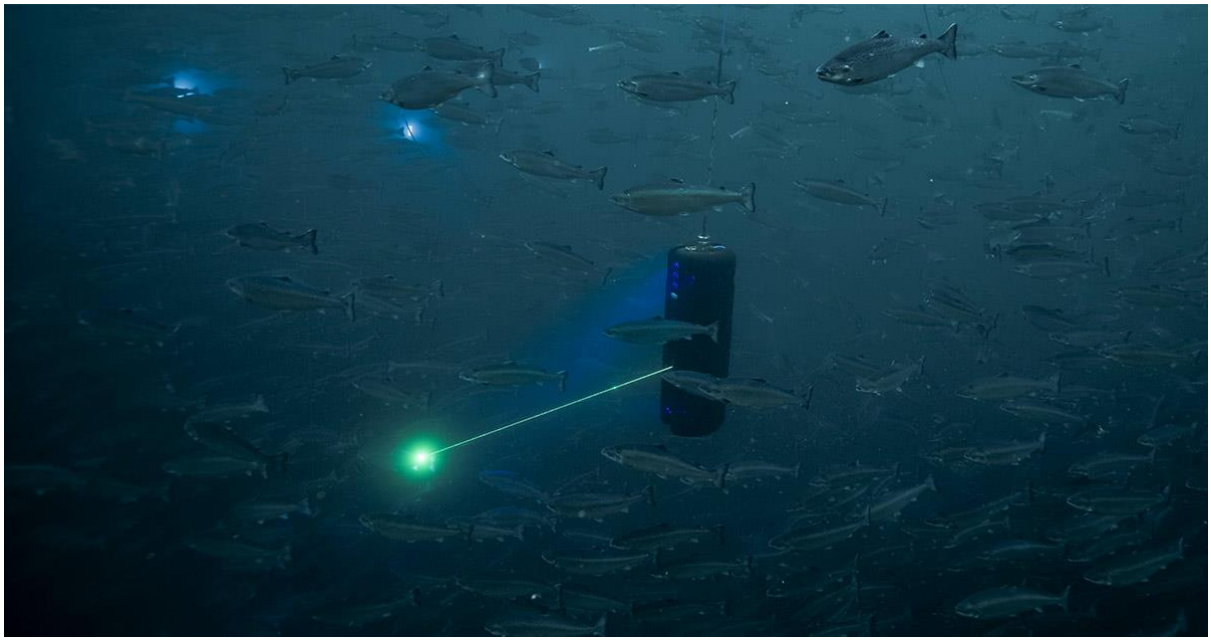


*Figure 7. "The Stingray Laser System - removing salmon lice", 2022, (https://www.fiskerioghavbruk.no/fiskeri-og-havbruk/laser-gir-laksen-et-bedre-liv/)*
*Copyright STINGRAY & MARK CABOT.*

# 5. Results

The interviews provided varied and valuable insights into aquaculture and RRT from the firm perspective. In the interviews, all respondents agreed that the proposed RRT is too high (35% at the time of the interviews), and that the reduction in capital will reduce the willingness to invest, which coincidentally is why the market now experiences a halt in projects worth 45 billion NOK. Words like *"pulling the emergency break"* were used in unison with talks of reduced profitability and the frustration of not being included in the discussion and decision-making in a policy that impacts such a large and vital sector. Furthermore, a common theme throughout all interviews was that the RRT was initially declined, and no further steps were taken to evaluate actions toward it.

According to the *Seafood Consultant* interviewee, the implementation of the RRT has led to a significant decrease in the value of development permits, potentially up to 50% of their initial worth, but realistically decreases with the same value as the RRT. This decline has had repercussions for ongoing projects and can be the reason why developers who obtained permits under the forming of the RRT have chosen to postpone their projects until there is further clarification regarding the regulations (Seafood Consultant, Personal Communication, 22. March 2023). Additionally, interviewees emphasized that the reduced profit margins resulting from the implementation of the RRT would ultimately lead to increased costs for the end consumer. This would occur as the industry seeks to compensate for the loss through higher prices for the final product, potentially impacting the affordability of salmon for consumers and the competitiveness of Norwegian salmon.

While not their primary concern, most interviewees were conscious of fish welfare and genuinely interested in reducing the number of lice and escaping fish. Likewise, the interviewees also shared a common consensus that semi-closed and land-based fish farms would reduce these problems while offshore farms serve as a way of increasing production numbers. Unfortunately, these types of fish farms are the most expensive to make and yield the least amount of fish, which is not in alignment with the *Norwegian Government's* increasing production from one to five million metric tons of fish annually.

# 6. Discussion

The following section delves into previously outlined factors influencing aquacultures, such as lice control, fish escape, sustainability, and animal welfare. These aspects shape the industry's trajectory and offer insights into challenges and opportunities for its further development.

The *Traffic Light System* regulates production based on the prevalence of lice in coastal areas as previously explained in section *2.2.2 Traffic Light System in Aquaculture*. The system works to suppress the ever-growing lice population but has a fundamental flaw. The *Traffic light System* is based on reaction instead of anticipation where lice are controlled as they gain numbers instead of implementing a system that tackles the lice before it becomes a problem. The *Government* is choosing to fight the symptoms instead of addressing the root of the problem which in this case is the accumulation of fish farms in fjords. Spreading the fish farms into offshore and semi-closed or closed farming, the *Government* would provide breathing room between open cages and reduce the likelihood of lice spreading (Professor UiS, Personal communication, 15. May 2023).

In this case, *Blue Farm* and its offshore concept offer a solution by moving away from areas with high lice concentration, as their production takes place in the deep sea. This concept enables production beyond the traditional scope of fish farming and introduces a completely new part of Norwegian waters for farming. While addressing the *Government's* need to expand production, *Blue Farm* remains exposed to external factors and primarily operates as an open cage system in open waters.

Several factors need to be considered, including lice control, fish escape, sustainability, and animal welfare. According to the *Professor of Social Economics and Finance at the University of Stavanger*, spreading production over a larger area will lead to a decrease in the lice population (Professor UiS, Personal communication, May 15, 2023). However, fish escape remains a challenge for *Blue Farm*, as they have not employed any new technologies to prevent this phenomenon. The sustainability of open cage farms has been extensively debated. While open cages in calm waters have potential of concentrating waste on the seabed beneath the farms, offshore currents help disperse the waste, reducing its negative impact. Offshore currents have a positive effect on sustainability, they may have a negative impact on fish welfare, as the constant swimming against the currents over time can potentially tire the fish.

*Blue Farm* has performed an analysis on the subject and found that there should be no reason for concern (Petroleum Engineer, Seafood Technology Firm, Personal communication, 12. May 2023).

Furthermore, sustainability is one of the key requirements to receive a development permit from the *Norwegian Directorate of Fisheries,* a specific requirement connected to sustainability is to employ knowledge sharing to build on previous research (Fiskeridirektoratet. n.d. -b). This consequently opens for faster developments and moves towards the goal of an increased production rate as well as more sustainable production.

Traditionally the industry mainly depends on incremental innovation. However, the move towards sustainable production has pushed the industry to be radical in its innovative processes through the use of IoT, AI, and other technology to reduce the impact of lice and escapes (Yue, 2022). This push has had significant consequences for the industry and will continue to evolve as long as the right conditions for further development in aquaculture are fulfilled.

The introduction of RRT and the uncertainty connected to it, has halted R&D in the sector and has been the root of a 45 billion NOK potential decrease in innovation investments. Interviewees highlighted that sustainable projects typically are expensive, which is the main reason why multiple innovative projects were scrapped (Professor UiS, Personal communication, May 15, 2023).

Furthermore, the future of aquaculture, and innovation theories; disruptive, incremental, and radical will play a crucial role. Implementing these innovation theories may enhance the growth, productivity, and sustainability of the aquaculture industry by fostering technological advancements, improving efficiency, and implementing sustainable practices. Thus, meeting global seafood demand by increasing the production five times by 2050, while minimizing environmental impact.

The results from the finalized RRT revealed a mixed response among companies in the aquaculture industry. While some firms were considering restarting projects, others decided to halt further development. *MOWI*, for instance, announced a significant cut in investments worth five billion NOK, affecting 1,400 jobs, after the reduction announcement to 25% RRT (Gran, 2023). These developments align with *PwC's* findings, which indicate that companies

are seeking better business conditions abroad due to the absence of expensive production permits and excessive taxes in aquaculture in most countries. The introduction of an additional tax alongside existing industry fees in Norway raises concerns about its international competitiveness. This move could hinder Norway's position, allowing competitors like Chile to overtake it and gain a larger share of the market (Higher Executive Seafood Airfreight, Personal communication, 21. March, 2023).

Additionally, *PwC's* survey highlights the resistance among aquaculture firms toward using open cages in the deep sea for the next decade. Reports also indicate challenges in achieving the *Norwegian Government's* goal of exporting five million tons of salmon, as regulatory systems like the Traffic Light System and the recently implemented RRT contribute to a slower process (Furuset, 2023).

While RRT may have many negative sides connected to the fish farmers and innovation at large, arguments have been made that the RRT will make it more attractive for small municipalities to welcome aquaculture, as they will receive half of the tax income from the RRT (Prop. 78 LS (2022-2023)).

# 7. Conclusion

## 7.1 Findings

This thesis has given valuable insight into aquaculture and how consequential innovation is in the sector to facilitate future growth. Interviewing executives as well as researchers linked to aquaculture has provided us with information that otherwise would not be attainable.

To answer our research question, "*To what extent will the implementation of Resource Rent Tax impact innovation in aquaculture and the achievement of future sustainability goals?"* We have concluded that Norwegian aquaculture has experienced consistent growth over numerous years and has firmly established itself as a profitable industry. The *Norwegian Government* has made a commitment to sustainability in production through initiatives such as the Paris Agreement and the establishment of the *Ocean Panel*. The *Government* implemented measures like the *Traffic Light System* and the *Development Permit Scheme* to achieve these goals. While these systems were working to promote investment in sustainable R&D before the integration of RRT, the industry has now chosen to cancel a large portion of investments that were aimed towards sustainability and development as these projects generally cost more and earn less in the beginning. This applies to offshore projects at sea, such as *Blue Farm,* and semi-closed projects which both favor the state's interests in expanding production and reducing the environmental impact. Innovation will continue to be one of the most important aspects of aquaculture to secure a 500% increase in production by 2050, but the integration of RRT has become a hindrance for investors to reach this goal.

Therefore, to enhance sustainability in aquaculture production, we propose that the *Norwegian Government* implement a subsidy policy targeting semi-closed and offshore fish farms. This policy would allocate a portion of the funds collected from the RRT to farmers who prioritize these technologies, thereby incentivizing the transition towards more environmentally friendly practices.

Supporting the adoption of innovative approaches, this policy strengthens Norwegian farmers to compete internationally and contributes to enhancing food security by promoting responsible and efficient fish production. The implementation of a larger number of semi-closed fish farms and fish farms at sea, encouraged by the policy, would effectively increase the distance between open cages, mitigating the spread of lice and the risk of fish escape.

This comprehensive approach further safeguards food security and the sustainability of the industry. Additionally, if deemed necessary, we propose the implementation of an incentive scheme exclusively for radical innovation, acknowledging its higher cost compared to incremental innovation. By emphasizing the mutual benefits for both the industry and the State, this approach aligns with the government's sustainability goals and promotes the most comprehensive development, particularly when transitioning towards a CBM.

## 7.2 Future Research

The research conducted has been afflicted by constant changes to the Norwegian RRT and has thus resulted in a qualitative rather than quantitative method. To further advance research on this topic, it would be advantageous to conduct a quantitative examination of the impacts of RRT. This could involve carrying out a case study in which the firm's profits are calculated both with and without the tax. Additionally, it would be valuable to conduct a quantitative assessment to determine the monetary gains for the *Norwegian Government* and evaluate whether the economic benefits for the government outweigh the consequences for the industry.

# 8. References


Aharoni, Y. (2015). The foreign investment decision process. In *International Business Strategy* (pp. 10-20). Routledge.

Ahmed, N., & Turchini, G. M. (2021). Recirculating aquaculture systems (RAS): Environmentalsolution and climate change adaptation. *Journal of Cleaner production*, *297*, 126604. https://doi.org/10.1016/j.jclepro.2021.126604

Afewerki, S., Asche, F., Misund, B., Thorvaldsen, T., & Tveteras, R. (2022). Innovation in the Norwegian aquaculture industry. Reviews in Aquaculture, 15(2), 759-771. https://doi.org/10.1111/raq.12755

Avram, C., Avram, E. L., Horja, M. I., Ignat, A. B., Savu, L., Vancea, S., (2009). INVESTMENT DECISION AND ITS APPRAISAL, (20th ed.). (pp. 1905-1906). Annals of DAAAM & Proceedings.

Bergfjord, O. J. (2009). Risk perception and risk management in Norwegian aquaculture. *Journal of Risk Research*, *12*(1), 91-104. https://doi.org/10.1080/13669870802488941

Bhattacharya, U., Hsu, P. H., Tian, X., & Xu, Y. (2017). What affects innovation more: policy or policy uncertainty?. *Journal of Financial and Quantitative Analysis*, *52*(5), 1869-1901. https://doi.org/10.1017/S0022109017000540

Bjørkan, M., & Hauge, K. H. (2019). Kunnskapsbasert forvaltning og dilemmaer knyttet til usikkerhet. *Interessekonflikter i Forskning; Ingierd, H., Bay-Larsen, I., Hauge, KH, Eds*. https://doi.org/10.23865/noasp.63

Boyles, M. (2022, July 19) Understanding how politics can affect your business. Harvard Business School Online. https://online.hbs.edu/blog/post/politics-and-business

Brewer, S. (n.d.) Understanding and managing aquaculture risk. DNV. https://www.dnv.com/feature/understanding-managing-aquaculture-risk.html

Cantzler, J., Creutzig, F., Ayargarnchanakul, E., Javaid, A., Wong, L., & Haas, W. (2020). Saving resources and the climate? A systematic review of the circular economy and its mitigation potential. *Environmental Research Letters*, *15*(12), 123001. https://doi.org/10.1088/1748-9326/abbeb7

Chermak, J. M. (1992). Political risk analysis: Past and present. *Resources Policy*, *18*(3), 167-178. https://doi.org/10.1016/0301-4207(92)90002-Q

Costello, M. J. (2009). How sea lice from salmon farms may cause wild salmonid declines in Europe and North America and be a threat to fishes elsewhere. *Proceedings of the Royal Society B: Biological Sciences*, *276*(1672), 3385-3394. https://doi.org/10.1098/rspb.2009.0771

Dan, Y., & Chieh, H. C. (2008, July). A reflective review of disruptive innovation theory. In *PICMET'08-2008 Portland International Conference on Management of Engineering & Technology* (pp. 402-414). IEEE. doi: 10.1109/PICMET.2008.4599648 https://doi.org/10.1109/PICMET.2008.4599648

Department of Environmental Affairs and Tourism (DEAT) (2004) Cumulative Effects Assessment, Integrated Environmental Management, Information Series 7, Pretoria https://www.environment.gov.za/sites/default/files/docs/series7_cumulative_effects_Assessment.pdf

*Dubickis, M., Gaile-Sarkane, E. (2015). Perspectives on Innovation and Technology Transfer. Procedia - Social and Behavioural Science, 238, 965-970. https://doi.org/10.1016/j.sbspro.2015.11.512*

Dutta, S., Lanvin, B., & Wunsch-Vincent, S. (2014). The Global Innovation Index 2014: The Human Factor in Innovation. Geneva: World Intellectual Property Organization. Retrieved from http://www.globalinnovationindex.org/userfiles/file/reportpdf/GII-2014-v5.pdf

Eryürük, Ş., Koshijima, I., & Kato, T. (2014). Impact analysis of political decisions on business sustainability. *Asian Journal of Management Science and Applications*, *1*(4), 355-373. https://doi.org/10.1504/AJMSA.2014.070664

Gran, S. (2023). Mowi kutter investeringer for 5 mrd. *Finansavisen* https://www.finansavisen.no/sjomat/2023/06/02/8013014/mowi-kutter-investeringer-for-5-mrd.

Fiskeridirektoratet. (2020). Auksjon august 2020. https://www.fiskeridir.no/Akvakultur/Tildeling-og-tillatelser/Auksjon-av-produksjonskapasitet/Auksjon-august-2020

Fiskeridirektoratet. (n.d.-a). Utviklingstillatelser. Retrieved April 14, 2023, from https://www.fiskeridir.no/Akvakultur/Tildeling-og-tillatelser/Saertillatelser/Utviklingstillatelser

Fiskeridirektoratet. (n.d.-b). Kunnskap fra utviklingsprosjektene. Retrieved June 9, 2023 from: https://www.fiskeridir.no/Akvakultur/Tildeling-og-tillatelser/Saertillatelser/Utviklingstillatelser/Kunnskap-fra-utviklingsprosjektene

Folkvord, B., & Furuseth, E. (2018). Høyaktuell grunnrenteskatt. *Skatterett*, *37*(3-4), 207-208.https://doi.org/10.18261/issn.1504-310X-2018-03-04-01

Gassmann, O., & Keupp, M. M. (2007). The competitive advantage of early and rapidly internationalising SMEs in the biotechnology industry: A knowledge-based view. Journal of World Business, 42(3), 350-366. https://doi.org/10.1016/j.jwb.2007.04.006

Guiné, R. D. P. F., Pato, M. L. D. J., Costa, C. A. D., Costa, D. D. V. T. A. D., Silva, P. B. C. D., & Martinho, V. J. P. D. (2021). Food Security and Sustainability: Discussing the Four Pillars to Encompass Other Dimensions. *Foods*, *10*(11), 2732. https://doi.org/10.3390/foods10112732

Gunton, T. (2003). Natural resources and regional development: An assessment of dependency and comparative advantage paradigms. Economic geography, 79(1), 67-94. https://www.tandfonline.com/doi/epdf/10.1111/j.1944-8287.2003.tb00202.x?needAccess=true&role=button

Gomber, P., Kauffman, R. J., Parker, C., & Weber, B. W. (2018). On the fintech revolution: Interpreting the forces of innovation, disruption, and transformation in financial services. Journal of management information systems, 35(1), 220-265. https://doi.org/10.1080/07421222.2018.1440766

Havforskningsinstituttet. (2022). Havbruk til havs. https://www.hi.no/hi/temasider/akvakultur/havbruk-til-havs

Furuset, A (2021, 28. January). PwC tror ikke på visjonen om 5 millioner tonn nås. *IntraFish.* https://www.intrafish.no/nyheter/pwc-tror-ikke-visjonen-om-5-millioner-tonn-nas/2-1-952208

Johnson, D. R., & Hoopes, D. G. (2003). Managerial cognition, sunk costs, and the evolution of industry structure. *Strategic management journal*, *24*(10), 1057-1068. https://doi.org/10.1002/smj.320

Khamseh H.M., Jolly D.R. (2008). Knowledge transfer in alliances: determinant factors. *Journal of knowledge management*, 12(1), 37–50 https://doi.org/10.1108/13673270810852377

Khan, Z. R., Midega, C. A., Pittchar, J. O., Murage, A. W., Birkett, M. A., Bruce, T. J., & Pickett, J. A. (2014). Achieving food security for one million sub-Saharan African poor through push–pull innovation by 2020. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *369*(1639), 20120284. https://doi.org/10.1098/rstb.2012.0284

Kothari, A., & Wathen, C. N. (2017). Integrated knowledge translation: digging deeper, moving forward. J Epidemiol Community Health, 71(6), 619-623. http://dx.doi.org/10.1136/jech-2016-208490

Lovvedtak 83 (2022-2023). Første gangs behandling av lovvedtaket. https://www.stortinget.no/globalassets/pdf/lovvedtak/2022-2023/vedtak-202223-083.pdf

Lusedata. (n.d.) Lakselus. Sjømat Norge. https://lusedata.no/lakselus#:~:text=Hvorfor%20er%20lakselus%20et%20problem,infeksjoner%20og%20problemer%20med%20Saltbalansen.

Manso, G. (2011). Motivating innovation. *The journal of finance*, *66*(5), 1823-1860. https://doi.org/10.1111/j.1540-6261.2011.01688.x

Mantel, S. P., Tatikonda, M. V., & Liao, Y. (2006). A behavioral study of supply manager decision-making: Factors influencing make versus buy evaluation. *Journal of operations management*, *24*(6), 822-838. https://doi.org/10.1016/j.jom.2005.09.007

Mathieu, J. E., & Zajac, D. M. (1990). A review and meta-analysis of the antecedents, correlates, and consequences of organizational commitment. *Psychological bulletin*, *108*(2), 171. https://doi.org/10.1037/0033-2909.108.2.171

Meld. St. 16 (2014-2015). Forutsigbar og miljømessig bærekraftig vekst i norsk lakse- og ørretoppdrett. https://www.regjeringen.no/no/dokumenter/meld.-st.-16-2014-2015/id2401865/?ch=2

Misund, B. (2023, 21. Januar) Fiskeoppdrett. Store Norske Leksikon. https://snl.no/fiskeoppdrett

Misund, B., Osmundsen, P., Tveterås, R., Folkvord, B., Nystøyl, R., & Rolland, K. H. (2019). Grunnrenteskatt i havbruk–Et kunnskapsgrunnlag Faglig sluttrapport. https://www.researchgate.net/profile/Bard-Misund/publication/340047371_Grunnrenteskatt_i_havbruk_-_Faglig_sluttrapport/links/5feb7f27a6fdccdcb816822a/Grundrente Skatt-i-havbruk-Faglig-sluttrapport.pdf

Mohnen, P., & Lokshin, B. (2010). What does it take for an R&D tax incentive policy to be effective?. *Reforming rules and regulations*, 33-58.

Mok, L., & Gaziulusoy, İ. (2018). Designing for sustainability transitions of aquaculture in Finland. *Journal of Cleaner Production*, *194*, 127-137. https://doi.org/10.1016/j.jclepro.2018.05.013

Mäkitie, T., Steen, M., Thune, T. M., Lund, H. B., Kenzhegaliyeva, A., Ullern, E. F., ... & Hydle, K. M. (2020). Greener and smarter? Transformations in five Norwegian industrial Sectors. https://www.sv.uio.no/tik/english/research/centre/intransit/publications/intransit-rs1-report_final.pdf

Naturvernforbundet. (2020, February 24) Oppdrett. https://naturvernforbundet.no/laer-mer/hav-og-strand/oppdrett/

NOU 2022:20. (2022). Et helhetlig skattesystem. https://www.regjeringen.no/no/dokumenter/nou-2022-20/id2951826/?ch=14

NORSK INDUSTRI 2017. Veikart for havbruksnæringen. Oslo: NHO

Norwegian Government. (2021, January 15). Overskuddene fra naturressursene skal fordeles Bedre. https://www.regjeringen.no/no/aktuelt/overskuddene-fra-naturressursene-skal-fordeles-bedre/id2929123/

Norwegian Government. (2022, April 7). The government wants to distribute profits from natural resources more fairly. https://www.regjeringen.no/en/aktuelt/the-government-wants-to-distribute-profits-from-natural-resources-more-fairly/id2887506/

Norwegian Government. (2023). The Norwegian Government's proposed Resource Rent Tax on aquaculture: https://www.regjeringen.no/no/aktuelt/regjeringens-forslag-om-grunnrentesk att-pa-havbruk/id2968430/

Norwegian Ministery of Petroleum and Energy. (2023, 11. May). The Petroleum Tax System. Norwegian Petroleum. https://www.norskpetroleum.no/en/economy/petroleum-tax/

O'Neill, E. A., Morse, A. P., & Rowan, N. J. (2022). Effects of climate and environmental variance on the performance of a novel peatland-based integrated multi-trophic aquaculture (IMTA) system: Implications and opportunities for advancing research and disruptive innovation post COVID-19 era. *Science of the Total Environment*, *819*, 153073. https://doi.org/10.1016/j.scitotenv.2022.153073

OceanPanel. (n.d.). Omstilling til en bærekraftig havøkonomi en visjon for bevaring, produksjon og velstand. https://oceanpanel.org/wp-content/uploads/2022/06/transformations-sustainable-ocean-economy-nor.pdf

OECD. (2007). Innovation and Growth: Rationale for an Innovative Strategy. s.l.: OECD Publishing. Retrieved from http://www.oecd.org/science/inno/39374789.pdf

Pradeepkiran, J. A. (2019). Aquaculture role in global food security with nutritional value: a review. *Translational Animal Science*, *3*(2), 903-910. https://doi.org/10.1093/tas/txz012

Prop. 78 LS (2022–2023) Resource Rent Tax on Aquaculture https://www.regjeringen.no/no/dokumenter/prop.-78-ls-20222023/id2968438/?ch=5

Regjeringen. (2023, 28. March). The Norwegian Government's proposed resource rent tax on Aquaculture. Regjeringen. https://www.regjeringen.no/en/aktuelt/the-norwegian-governments-proposed-resource-rent-tax-on-aquaculture/id2968430/

Ricardo, D. (1821). On the principles of political economy. London: J. Murray.

Sandvik, A. D., Dalvin, S., Skern-Mauritzen, R., & Skogen, M. D. (2021). The effect of a warmer climate on the salmon lice infection pressure from Norwegian aquaculture. *ICES Journal of Marine Science*, *78*(5), 1849-1859. https://doi.org/10.1093/icesjms/fsab069

Schreiner, H. O., Holtsmark, K., & Schreiner, R. (2023) Skattlegging av grunnrente. *SAMFUNNSØKONOMEN*, 19. https://www.samfunnsokonomen.no/asset/Utgaver/2023/02/Samf-2023-02.pdf#page=19

Stewart, R., & Niero, M. (2018). Circular economy in corporate sustainability strategies: A review of corporate sustainability reports in the fast-moving consumer goods sector. *Business Strategy and the Environment*, *27*(7), 1005-1022. https://doi.org/10.1002/bse.2048

Stokke, K. B., & Hauge, K. B. (2019). Mellom kommunal planlegging og sektorstyring for akvakultur. *Plan*, *51*(3), 24-29. https://doi.org/10.18261/ISSN1504-3045-2019-03-06

Thompson, V. A. (1965). Bureaucracy and innovation. Administrative Science Quarterly, 10, 1–20. https://doi.org/10.2307/2391646

Horjen, H. W., Fretheim, O. (2023, 20. february). Investeringer for 40 milliarder i grønn miljøteknologi legges på is. *Teknisk Ukeblad.* https://www.tu.no/artikler/investeringer-for-40-milliarder-i-gronn-miljoteknologi-legges-pa-is/526602

Tushman, M., & Nadler, D. (1986). Organizing for innovation. California management review, 28(3), 74-92. http://dx.doi.org/10.2307/41165203

UN. (n.d.-a). Norway to continue leading the Ocean Panel and transformation to sustainable ocean economy. https://sdgs.un.org/partnerships/norway-continue-leading-ocean-panel-and-Transformation-sustainable-ocean-economy

UN. (n.d.-b). The Paris Agreement. UNFCCC. https://unfccc.int/process-and-meetings/the-paris-agreement)

Van de Ven, A. H. (1986). Central Problems in the Management of Innovation. Management Science, 32, 590–607. https://doi.org/10.1287/mnsc.32.5.590

Virlics, A. (2013). Investment Decision Making and Risk. Procedia Economics and Finance, 6 169-177. https://doi.org/10.1016/S2212-5671(13)00129-9

Wahab, S. A., Rose, R. C., & Osman, S. I. W. (2012). Defining the concepts of technology and technology transfer: A literature analysis. *International business research*, *5*(1), 61-71. http://dx.doi.org/10.5539/ibr.v5n1p61

Wu, Y. (2005). The effects of state R&D tax credits in stimulating private R&D expenditure: A cross-state empirical analysis. *Journal of Policy Analysis and Management: The Journal of the Association for Public Policy Analysis and Management*, *24*(4), 785-802. https://doi.org/10.1002/pam.20138

Yue, K., & Shen, Y. (2022). An overview of disruptive technologies for aquaculture. *Aquaculture and Fisheries, 7*(2), 111-120. https://doi.org/10.1016/j.aaf.2021.04.009

Åm, H. (2021). A critical policy study on why introducing resource rent taxation in Norwegian salmon aquaculture failed. *Marine Policy, 131*, 104692. https://doi.org/10.1016/j.marpol.2021.104692

# 9. Appendix

## 9.1 Interview questions

### University Professors

1. How is RRT structured today?
2. How should the economic resources collected through the RRT be utilized?
3. RRT is imposed on businesses as a cost for utilizing resources that belong to the state (the people). Is this the case in the aquaculture industry, or are other factors such as the environment and profit emphasized?
4. What is your stance on the industry being equated with the oil and energy sector, as opposed to being compared to agriculture?
5. What experiences have you had with the impact of the resource rent tax on innovation?
6. The government has expressed a desire to increase salmon production from one MT/year to five MT/year. How will this be achieved when profit and thus reinvestment are now limited?
7. What are the development permit values after implementing the RRT?

### Petroleum Engineer

1. How are development permits structured?
2. RRT was first mentioned in 2018 when you were applying for development permits for the Blue Farm project. Did you consider at that time that this would become relevant?
3. Since then, how have you assessed the risk of the tax occurring and its size?
4. Are there tax breaks/financial advantages for switching to more sustainable solutions, possibly towards circular operation?
5. Do you see any possible measures to reduce the loss arising from RRT?
6. Are there any other independent factors that have contributed to putting the project on hold?
7. Are there other risk factors, other than political factors, that have been important to look at when planning the project?

8. How important is the consideration of sustainable solutions in the planning of new facilities and the improvement of existing ones?
9. How do you view the potential for further technology transfer between the oil and gas and the aquaculture industry?

## Fish Farm Higher Executive

1. RRT was first mentioned in 2018, when you were applying for development permits for the Blue Farm project, did you consider it as a potential threat then?
2. Since then, have you assessed the risk of the tax occurring and its magnitude?
3. Are you aware of any tax reliefs for switching to more sustainable solutions, possibly towards circular operation?
4. Now we have looked at RRT and how it can potentially affect Blue Farm financially. What measures can be taken to reduce the "loss"?
5. How did you work towards the clarification of RRT?
6. Is all further development put on hold, are you looking at opportunities in countries that do not have RRT?
7. Are there other independent factors that cause the project to be put on hold?
8. How important are sustainable solutions in planning new facilities and improving existing facilities?
9. Can you describe how the Blue Farm project utilizes technology from the oil and gas industry?
10. Do you see the potential for further transfer of technology between oil and gas and aquaculture?
11. Now that the RRT is almost clarified, are you planning to proceed with Blue Farm?

## Seafood Air Freight Higher Executive

1. Do you see any difference in the import/export of salmon/trout after the news about the salmon tax?

2. How adaptable is the fish market to unforeseen events? (new taxes, a flare-up of lice, …)?
3. Do you see a development in terms of which farms are mostly used, and how do you think this will evolve for the next 20 years?
4. In the event of a downturn, development and innovation become all the more important, do you see a trend in the market?
5. Has the RRT affected your turnover, and possibly how?
6. Do you know if operators are moving their operations out of Norway or if they are planning to do so?
7. How does the company think that RRT will affect the logistics industry in general, and what kind of measures can be taken to meet these challenges?
8. What opportunities does your company see for collaborating with competitors in the industry to tackle common challenges related to RRT and technology transfer?
9. Do you see a difference in the import/export of salmon/trout after the news about RRT?