Ethical Aspects of Norwegian Aquaculture

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Master thesis
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*Ethical aspects of Norwegian aquaculture*

Abstract:
The Norwegian government has submitted a report to the Norwegian parliament, concluding that raw oil export can no longer sustain economic growth. Norway is therefore seeking other industries to minimize the economic loss this is causing. Norway is already the largest exporter of salmon and trout in the world. The report states that the government’s goal is to increase production to five times today’s production by 2050. The ability and desire to grow has its backing from a handful of large companies dominating the aquaculture business and a newly recognized right-wing government eager to make the playroom larger for the aquaculture industry. This paper analyzes the report, using an ethical matrix, looking for ethical arguments from the government as well as defining the stakeholders affected by the government’s goal. This thesis’ aim is to analyze and discuss the broad range of ethical concerns, based on an ethical matrix, so that a variety of ethical perspectives can be included in an evaluative discussion.
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1. Introduction

Global warming, uneven food distribution and increasing pressure on arable land are just a handful of concerns the world’s scientists and politicians are facing when addressing food politics. The FAO states that in 2050 the world will have to feed an additional 2.3 billion people.\(^1\) Since the beginning of the 1980’s, Norway has grown to become one of the most important aquaculture nations in the world producing over 14 million meals of fish a day.

In 2015 the Norwegian government submitted a report Parliament (Report nr. 16 to the “Storting”), proposing changes to the aquaculture sector. The report’s main objective is to make a predictable and sustainable scheme for aquaculture to increase biomass production. The report further states that the ecological footprint of the industry has to be taken into consideration. For the productivity of Norwegian aquaculture to continue, nature has to be safeguarded so that generations to come can prosper from it to the same extent we do now.\(^2\)

The aquaculture industry has seen immense development in technology, which has led to positive social and economic effects. At the same time, scientists, media and organizations claim increased negative environmental and animal welfare impact.\(^3\)\(^4\)

This thesis will draw its focus to an ethical evaluation of the governmental report, stating the following problem: Are the ethical guidelines in the governmental report compatible with the standards of environmental and animal ethics?

As a tool for analyzing these questions I will combine Mathias Kaiser’s Ethical Matrix with the original Matrix developed by Ben Mepham in 1996.

In addition to the Matrices developed by Mepham and Kaiser, I will add the concept of sustainable development and the precautionary principle as principles for a broader discussion. My Matrix will be used as a basis for an ethical discussion where I will assess the findings of the Matrix and eventually answer the above-mentioned problematic issue.

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\(^2\) Meld. St.16. 2015, p. 18


2. Norwegian Aquaculture

2.1 Historical development

Since the Viking Age, Norway has been an exporter of fish, but in the last decades Norway has turned from export of wild fish to becoming one of the largest exporters of farmed fish, e.g. salmon and rainbow trout export. Measured in wealth creation, fish farming has been one of the largest contributors to Norwegian industrial development. Together with the petroleum industry, aquaculture is where Norway possesses international leading competence. This makes the Norwegian aquaculture one of the most modern and innovative aquaculture industries in the world. This development is referred to as the Norwegian aquaculture “fairy tale”. Since the Norwegians first started producing salmon in the late 1960's, Norway has now become the world's leading producer. Norway held 54 percent of the 2014 international market share, with a production of 2 219 000 tons of salmon. In the past decade, the Norwegian salmon industry has grown 108 percent.

Global production of Atlantic salmon (numbers shown in tons).

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2006</th>
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<td>36</td>
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<td>39</td>
</tr>
</tbody>
</table>

7 Meld. St. 16. 2015, p. 5
8 Meld. St. 16. 2015, p. 2
### Production numbers in 1000 tons, wfe, (whole fish equivalent). From 2005–2014E (E indicates estimate).  

<table>
<thead>
<tr>
<th></th>
<th>10</th>
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<th>16</th>
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<tr>
<td>Ireland</td>
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<td>5</td>
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<td>1398</td>
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<td>2000</td>
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<td>2219</td>
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2.2 General Ethical Dilemmas in Norwegian Aquaculture

There has been a constant criticism of the aquaculture industry since its very beginning, though it has taken different forms and has been highlighted by various groups, e.g. environmental NGOs, scientists and the public. The critics against aquaculture industry are concerned with a wide range of internal effects, as well as external effects on the environment. Lately, concerns have been addressing the impact on wild fish and coastal areas, which are being largely affected by the production.  

The internal effects of fish farming are related to the welfare of the fish. Recent studies show that most scientific work done in the aquaculture industry is based on technology development, infection fighting, etc., which in turn is based on the functional well-being (“foraging behavior, ventilator activity, aggression, individual and group swimming behavior and stereotypic and abnormal behavior”) of operating the fish farms. The scientific and practical development devoted to feeling-based welfare, which prioritize welfare of the fish, is more or less nonexistent. At the same time, the feeling-based welfare is what concerns the critics the most. According to Donald Broom, a scientist in animal welfare, fish have the same perception of pain as birds and mammals.  

Norwegian aquaculture is characterized by open-cage systems placed in the sea along the shore, which results in organic and inorganic matter that causes pollution. Un-devoured fodder, planktonic biota and chemicals used in the operations of the fish farms piles up under the

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9 Meld St. 16. 2015, p. 25  
10 Olesen, I. Myhr, A. I. Rosendal, G. K. 2011, p. 382  
11 Martins, S. 2012, p. 3  
cages, thus causing great stress on the physical and biological environment and seabed. This is an issue that in some cases is aggravated by the positioning of farms in waters with little or limited natural currents.\textsuperscript{13} Norwegian fish farms are often placed in fjords and along the shores with shelter from hazardous natural factors such as wind and strong currents or streams.

Another issue is the feed, which was previously and to some extent still is deriving from fishmeal and oil, a nonrenewable resource.\textsuperscript{14} Nowadays, Norwegian aquaculture is changing towards an imported plant-based feed, which again has given blossom to a debate concerning transportation and ecological footprint. Another strongly-debated issue concerns the escape of farmed fish and the influence this has on the wild salmon and trout in terms of interbreeding and the spreading of disease. The Norwegian coastline is long and sparsely populated compared to its size. The coastline is strongly regulated in terms of building development and new settlements. Due to an increase in fish farm facilities, there is growing criticism due to esthetical damage. Fish farms are often located in shallow fjords near existing communities. Thus, the debate concerning the area and esthetic “pollution” caused by the fish farms is increasing.\textsuperscript{15}

3. Theoretical background – The Ethical Matrix

3.1 The Ethical Matrix

In this thesis I will build upon the frameworks presented by both Mepham and Kaiser, but I wish to emphasize that the definition of the principles are Mepham and Kaiser’s own and not mine. This will be explained further under the paragraph defining the Matrix. The ethical Matrix (from now on referred to as: The Matrix) was presented by Professor Ben Mepham in 1996 at University of Nottingham as one of the first decision-support framework models to be developed in the field of ethics.\textsuperscript{16,17} Since its development, is has gained significant attention from various fields of ethics and organizations, such as bioethics, animal ethics, the FAO and WHO. Mepham

\textsuperscript{14} Grigorakis, K. 2009, p. 354 http://philpapers.org/rec/GRIEII
\textsuperscript{16} Mepham, B. 1996, p. 106
proposes a framework of twelve individual cells, encompassing three ethical principles and four kinds of stakeholders. Below is a reproduction of the matrix from Mepham, published in 1996.\(^{18}\)

<table>
<thead>
<tr>
<th></th>
<th>Well-being</th>
<th>Autonomy</th>
<th>Justice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treated Organism</td>
<td>e.g. Animal welfare</td>
<td>e.g. Behavioral freedom</td>
<td>Respect for telos</td>
</tr>
<tr>
<td>Producers (e.g. farmers)</td>
<td>Adequate income and working condition</td>
<td>Freedom to adopt or not to adopt</td>
<td>Fair treatment in trade law</td>
</tr>
<tr>
<td>Consumers</td>
<td>Availability of safe food, acceptability</td>
<td>Respect for consumer choice (labeling)</td>
<td>Universal affordability of food</td>
</tr>
<tr>
<td>Biota</td>
<td>Conservation of the biota</td>
<td>Maintenance of biodiversity</td>
<td>Sustainability of biotic populations</td>
</tr>
</tbody>
</table>

The first principle in the Mepham's Matrix is the principle of welfare. Unlike Mepham, Kaiser, who further developed the Matrix, divided this principle into two. The first one interprets welfare as eliminating negative utilities; the second describes welfare as promoting positive utilities. The intended difference is connected to non-maleficence and beneficence in terms of welfare. These columns are representing the utilitarian ethical view.\(^{19}\)

The next principle is autonomy, although since Kaiser’s stakeholders are not only human beings, other terms are used for autonomy, such as integrity and dignity. Mepham and Kaiser base these principles in deontological ethics. Third, the principle of Justice as Fairness represents John Rawls’ theory of justice and is linked to the norms of fair distribution of costs, benefits and risks.\(^{20}\) In Kaiser’s example of an Ethical Matrix on GM fish, he uses the following stakeholders: Small producers, Consumers, Treated Fish and Biota.

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\(^{18}\) Mepham, B. 1996, p. 106

\(^{19}\)Mepham, B. Kaiser, M. Millar, K. Thorstensen, E. Tomkins, S. 2007, p. 14


Accessed 20 October 2015

\(^{20}\) Mepham, B. 1996, p. 106
<table>
<thead>
<tr>
<th>Ethical Matrix for gm fish</th>
<th>Welfare as eliminating negative utilities</th>
<th>Welfare as promoting positive utilities</th>
<th>Integrity /Autonomy</th>
<th>Justice as Fairness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small producers</td>
<td>Dependence on nature and corporations</td>
<td>Adequate income and work security</td>
<td>Freedom to adopt or not adopt</td>
<td>Fair treatment in trade</td>
</tr>
<tr>
<td>Consumers</td>
<td>Safe food</td>
<td>Nutritional quality</td>
<td>Respect for consumer choice (labeling)</td>
<td>General affordability of product</td>
</tr>
<tr>
<td>Treated Fish</td>
<td>Proper animal welfare</td>
<td>Improved disease resistance</td>
<td>Behavioral freedom</td>
<td>Respect for natural capacities (telos)</td>
</tr>
<tr>
<td>Biota</td>
<td>Pollution and strain on natural resources</td>
<td>Increasing sustainability</td>
<td>Maintenance of biodiversity</td>
<td>No additional strain on regional natural resources</td>
</tr>
</tbody>
</table>

3.2 A Critical Overview of the Matrix

In the case of animal welfare and biotechnology, the Matrix has gained respect as an ethical tool. The Matrix is to be used by decision-makers to identify consequences of biotechnology on animal welfare. Interestingly the Matrix gives a voice to animals, which is particularly appealing for my paper since it is discussing fish. The different ethical principles in Kaiser’s Matrix provide considerations for animals’ integrity and autonomy together with justice and fairness. However, there is an existing debate criticizing the general framework of the Matrix and how its structure links the different principles to each other. In a critical light, it is important to see the correlation between the different principles and whether or not they are built up hierarchically. Because the

different principles mirror different ethical theories, evaluating one by another will lead to severely different outcomes. Who decides if the harm done towards humans is more serious than the harm inflicted on animals? On the other hand, if one decides that the value of autonomy is more important than the maintenance of fairness, it could be claimed that one prefers deontology to Rawls’ rule of fairness. This way of prioritizing one principle over another leads to breach the idea of the matrix, this is to leave room for divergent philosophical thinking. Neither Kaiser nor Mepham explains how one is to weigh the different principles and stakeholders against each other, but at the same time one of the great strengths of the Matrix is its ability to map out a broad spectrum of discussable factors. Thus, not agreeing on a moral judgment based on an ethical theory is neither a problem, nor necessarily wanted. Mepham states that:

“The Matrix does not aim to be prescriptive but only, by analyzing the issues, to describe ethical impacts. The evaluation stage depends on the weighing of these impacts—and it is here that different outcomes will become apparent”.

The framework of the matrix has also been criticized for not including enough stakeholders. Matthew Cotton claims that more stakeholders must be included to undermine the ingrained bias caused by the framework’s structure. Further he claims that the list of stakeholders is too limited and this could lead to a disagreement between included and non-included stakeholders. The easiest solution to this would be to include a large number of stakeholders. On the other hand, too many stakeholder groups could lead to a diluted discussion. Therefore the existing matrix needs to undergo a critical review of the included and excluded stakeholders to be able to optimize the amount people involved in the discussion.

Another problematic aspect of the Matrix, regardless of the case it is applied to, is that some of the potentially-affected stakeholders lack the mechanism of representation via a voice of their own. This is true for fish, the environment, and others. Without representation from a single person or a voice of its own, one can easily end up thinking of a stakeholder group as a

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22 Schroeder, D. Palmer, C. 2003, p. 301  
http://clok.uclan.ac.uk/9696/1/Ethical_Matrix_Schroeder_Palmer.pdf Accessed 28 October 2015  
23 ibid., p. 301  
24 ibid., p. 302  
25 Mepham, B. 1996, p. 112  
26 Cotton, M. 2009, p. 166  
homogeneous entity and fail to express the diversity of values represented within a unity. On the other hand, one can argue that the ability to map out different values, both within a stakeholder group and between stakeholders, leads to an opportunity where different ethical issues are observed. Thus, it allows for further ethical reflection on an issue.

4. Report nr.16 To the Parliament

4.1 Summary

The Norwegian aquaculture has since the beginning been a strongly-regulated industry. The Fishery Department in the Norwegian government has been the regulative authority. The possibility to grow has been regulated by a mandate to attain MTB (Maximum Total Biomass) quotas for production. Further, the report states that the ability to increase production rests on two possibilities: first, granting new quotas to existing or new businesses; second, increase quotas so the net sum of the biomass produced increases. Additionally the report states the difficulty of predictability due to the different goals and policies of the changing governments. This has led to decreasing growth in the industry the last decades. In 2002, permission for new quotas was given based on local cooperation, and female leaders received priority. In 2009, businesses that wanted to develop processing plants for fish were given priority. Most recently, in 2013, businesses focusing on environmentally-friendly production facilities were given priority. The report states that the problematic and chaotic way of regulating the aquaculture industry is inadequate for the value-generative abilities of the industry. Therefore, the report set as its main goal to create a more long-lasting and predictable method in handling the industry. The report concluded that combining sustainable development and environmentally-friendly production is vital for continued growth and would increase Norwegian competitiveness on the global market.

The action guidelines (Handlingsregelen) are the government's new tool for regulation of the aquaculture industry. The purpose of the action guidelines is either to give permission to increase production or map out the conflicting status of a farm or area to indicate obligated

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27 Cotton, M. 2009, p. 166
28 Meld. St. 16. 2015, p. 3
29 Meld. St. 16. 2015, p. 7
improvements. The action guidelines combine local area development and an indicator system for environmental impact.\textsuperscript{30}

To decide if production facilities are allowed to scale up their production, the government has decided to use a street light principle as guidance:

- Green light: Production is sustainable and should therefore increase.
- Yellow light: Sustainable production is at capacity and should therefore freeze.
- Red light: Sustainable production is over capacity and needs to decrease until acceptable conditions are reached.\textsuperscript{31}

The different environmental and sustainable impacts included in the action guidelines are based on four measurable premises that closely correlate with the production facilities. \textit{Lepeophtheirus salmonis}, or the salmon louse, is of great concern to Norwegian aquaculture. It decreases welfare of the farmed fish and is spreading to populations of wild sea trout and salmon, which has led to a decrease in these populations. It is therefore of the government's opinion to include a measuring system of salmon louse in the farms. If infected fish reach a certain limit, there is a need for justification.\textsuperscript{32}

Farmed fish escaping into the wild has also caused genetic strain on wild salmon and trout populations crossbreeding prevents wild fish from adapting to their natural environment. Further, escaping has contributed to the spreading of disease and appear as a competing factor on spawning grounds. For several years, Norway has been measuring escaped fish and employing the principle of “the polluter pays”. This means that the farm from which the fish have escaped pay for catching of the fish. The report states that the practice of catching escaped fish should continue and is more effective than regulating the capacity increase in areas of repeated escaping.\textsuperscript{33}

Pollution from aquaculture is, according to the report, not a pressing issue, and therefore there is not an immediate plan to start a measuring system. Every Norwegian county has its own environmental authority governed by the county governor. This authority sets the emission rate for its area, which leads to a natural limitation of produced biomass. Increased production in an

\textsuperscript{30} Meld. St. 16. 2015, p. 47
\textsuperscript{31} Meld. St. 16. 2015, p. 48
\textsuperscript{32} Meld. St. 16. 2015, p. 55
\textsuperscript{33} Meld. St. 16. 2015, p. 56
area can be granted on grounds of evaluating emissions and pollution rates against socioeconomic benefits.\textsuperscript{34}

Fish fodder is another issue discussed in the report. Fodder ingredients are mostly of international origin. The government holds Norwegian producers of fish fodder responsible for the sustainability of their imported fodder ingredient. Fish and vegetable ingredients have to be harvested sustainably to be used as fodder in Norwegian aquaculture. The report states that there are no direct link between Norwegian aquaculture and the global sustainable harvest of ingredients used as fodder in Norwegian fish farms; therefore a control of fodder ingredients is not included in the action guidelines.

After evaluating the four premises, the report concludes that salmon lice are the only measurable problem that can be treated by an indicator system.\textsuperscript{35}

\section*{5. The Matrix}

\subsection*{5.1 Defining the Matrix}

Kaiser states that the first two ethical principles of the Matrix are rooted in major Western ethical theories, respectively consequentialism and deontology.\textsuperscript{36} Additionally, Rawls' theory of justice is included as the third principle. Kaiser is of the opinion that since the Matrix is an ethical tool, it is important that the framework of the model is rooted in ethical theories. Even more important is that the principles should encompass the common morality shared by the broader spectrum of the population.\textsuperscript{37} I will not base the principles in my Matrix in the forenamed theories, nor will the following discussion solely be of a descriptive manner. Rather, I will use the matrix as a descriptive tool as well as a basis for a concluding assessment based on the findings. This is because with the traditional setup one easily ends up in a discussion where one has to weigh

\textsuperscript{34} Meld. St. 16. 2015, p. 56
\textsuperscript{35} Meld. St. 16. 2015, p. 57
the different ethical theories against each other. The objective of my Matrix is therefore to make a descriptive analysis of the report and add prescriptive judgments on those findings.

The principles of the ethical Matrix presented in this thesis are the following:

- Wellbeing should be understood as the safety, welfare and health of a group of stakeholders.
- Autonomy is used for the industry and consumer while integrity is used for fish and the biosphere. It should be understood as freedom in the sense of choosing how to make their own decisions, or behavioural freedom for fish and the maintenance of biodiversity.
- Justice should be understood as how just or fair a situation is for a group of stakeholders.

These principles are included and explained in this manner due to their ability to make a framework that enables a thorough and coherent debate. Moreover, these principles capture elements of common morality, norms and assumptions that corroborate concerns in a contemporary society. Further, the principles remain open for rational critique.38

My additions to the Matrix are Sustainable Development and the Precautionary Principle. The foundation of increased aquaculture production in Norway is, according to the governmental report, sustainable production. To address the question of sustainable development properly, I find it natural to include sustainable development as a principle in the Matrix. Therefore, sustainable development should be understood as it is in the report, as described by Gro Harlem Brundtland: “Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs.”39

The precautionary principle should be understood as: “When a decision is made without there being sufficient knowledge on the impacts it may have on the natural environment, the aim shall be to avoid possible significant damage to biodiversity. If there is a risk of serious or irreversible damage to biodiversity, lack of knowledge should not be used as a reason for postponing or failing to take administrative actions.”40

The precautionary principle is included in the Matrix due to its ability to broaden and deepen the
debate, mostly because of the principle’s ability to incorporate sustainable measures into a
debate that strongly needs it. Secondly, precautionary measures are mentioned in the report as
a possible remedy to the salmon louse problem. Last, the precautionary principle is already an
integrated principle in Norwegian politics⁴¹, and should therefore also be included in the debate
about aquaculture.

With regard to stakeholders, I propose: Aquaculture industry, Consumers of aquaculture
products, Farmed fish and Biosphere.
The governmental report sets out to make life easier for the aquaculture industry with proposed
action guidelines for a predictable policy that the industry can relate to when increasing their
production. At the same time the essence of an industry that increases its production is the
maintenance of a sustainable production. This makes the aquaculture industry important and it
is therefore included as a stakeholder group in the Matrix.
Although most of the fish produced is exported to a number of foreign countries, I will not
separate consumers into several different stakeholders; rather, consumers will be treated as
one stakeholder.
The growing negative debate in media as well as the aquacultures’ effects on the environment
makes it natural to include the biosphere as a stakeholder.
While fish are a difficult stakeholder as they do not have a voice of its own, they should still be
included in the matrix since they are probably the most affected by the proposals in the
governmental report.

5.2 An ethical Matrix on a predictable and sustainable aquaculture

Building the Matrix on a predictable and sustainable increase of aquaculture production in
Norway:

<table>
<thead>
<tr>
<th>Respect for:</th>
<th>Wellbeing</th>
<th>Integrity/Autonomy</th>
<th>Justice</th>
<th>Sustainable Development</th>
<th>Precautionary principle</th>
</tr>
</thead>
</table>

Aquaculture Industry | Predictable income and work security | Freedom to adopt or not to adopt | Fair trading possibilities | Secure that the future generation can prosper from the industry’s wealth | Risk Analysis
---|---|---|---|---|---
Consumer of aquaculture products | Accessibility of safe and nutritious food | Respect of consumer choice | Universal affordability | No interests threatening future health or living conditions | Critical towards the industry
Farmed fish | Proper animal welfare | Behavioral freedom | Respect for telos | Improved living conditions | Prevent future harm on wild fish
Biosphere | Conservation and protection | Maintenance of biodiversity | Fair treatment of nature | Not over exploiting natural resources | Deep ecology (prohibition)

### 6. Discussion

#### 6.1 Wellbeing

The wellbeing of the aquaculture industry is here defined as the ability to foresee a predictable growth scheme and work security. The governmental report is aiming to let the companies that already have concession of production to be able to increase it. Today the governing principle for production is regulated by MTB of 780 tons living fish per quota. In Troms and Finnmark, the two most northern regions of Norway, the MTB is set to 945 tons.\(^{42}\) The amount of MTB is based upon the ability to control the market and environmental effects. Now, the governmental report is proposing to renew this system by letting the industry increase the MTB on criteria outlined in a new set of action guidelines. From an economic perspective the industry could focus on increasing their given quotas instead of buying quotas from other producers or enlarge

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their investment abroad. As emerging from the report, the action guidelines would lead to safety for the industry regarding increased production, which again would be beneficial for the supply industry, employment along the coast as well as increased tax income for the state.\textsuperscript{43}

If the action guidelines should be implemented, an increased production, as it also is today, would be dependent on the environmental effects the production is causing. On the 9th November 2015 the second biggest producer of Salmon, Læroy Seafood Group ASG (LSG) was warned by the food authority that they would have to half their production on four salmon farms due to a long period of uncontrolled infection of salmon louse.\textsuperscript{44,45} The same warning has been dispatched on thirteen other salmon farms only in the first six months of 2015.\textsuperscript{46}

Therefore, an increase in MTB seems problematic when combating e.g. the salmon louse problem the industry faces. Even though the action guidelines will not grant increased MTB if salmon louse exceeds the maximum permission, the link between larger quantities of salmon in the ocean and increased risk of salmon louse is evident when one looks at overall increase of quotas.\textsuperscript{47}

Another problematic issue is that salmon louse has lately shown to develop resistance to antibiotics\textsuperscript{48}. Increased salmon louse infection equals higher economic strain on production facilities,\textsuperscript{49} which in turn undermines the benefits of higher production. This becomes evident in a NOFIMA research, which shows that in 2015 the industry will spend 5 billion NOK on fighting the salmon louse. That is an increase of fifty percent from 2014 and adds 4 NOK for every kilo of produced salmon.\textsuperscript{50} The aquaculture industry is claiming that the total FTEs of the industry reaches 21.000.\textsuperscript{51} Numbers from the Norwegian Central Statistical bureau shows that in 2015

\textsuperscript{43} Meld. St. 16. 2015, p. 83
\textsuperscript{45} Intrafish. 2015, \url{http://www.intrafish.no/gratis_nyheter/article1424532.ece} Accessed 14 November 2015
\textsuperscript{46} Mattilsynet 2015, \url{http://www.mattilsynet.no/fisk_og_akvakultur/fiskehelse/fiske_og_skjellsykdommer/lakselus/oversikt_over_lokaliteter_som_har_faatt_varsel_om_halvert_produksjon_paa_grunn_av_langvarige_lakselusproblemer.18040} Accessed 15 November 2015
\textsuperscript{47} Regjeringen 2009, \url{https://www.regjeringen.no/no/aktuelt/bekymringsfull-uttviking-av-lakselus-i-norge/d582925/} Accessed 19 November 2015
\textsuperscript{49} Nordland, E. 2015, \url{http://www.ilaks.no/lakselus-gir-kostnadseksplosjon/} Accessed 19 November 2015
\textsuperscript{50} Nrk. 2015, \url{http://www.nrk.no/trondelag/lakselusa-koster-oppdretterne-dyr-1.12682527} Accessed 20 November 2015
\textsuperscript{51} Laksefakta. 2013, \url{http://www.laksefakta.no/Arkiv/N%C3%B8kkelinfo/Norge-verdensledende-p%C3%A5-laks} Accessed 14 November 2015
the total amount of FTEs is 6239.52 The supply of taxes that the government collects from the aquaculture industry amount to 62353 million Norwegian Kroner, which is less than the state receives from taxes on sugar from producers of non-alcoholic beverages per year.54 Most of the companies operating in the aquaculture industry are large national or multinational companies that are located in Bergen, Oslo or abroad. This leads to the tax collected in most cases never reach the area they operate in. As a result, only five percent of the companies operating in the aquaculture sector pay taxes in the communities they operate in.55 The benefits anticipated by the governmental report differs significantly from the actual wellbeing of the industry. The government argues that the new policy is good industrial policy combined with benefits for rural areas.56 At the same time there are indicators showing that economic and regional benefits are not as promising as one might believe.

The accessibility of safe and nutritious food is not explicitly featured in the report, but an implicit background for increased production. The report’s main highlight is the economic benefits of increased production, but this would not be possible if the demand for fish was absent. The market for Norwegian salmon is clearly of a global structure. 80 percent57 of total production is exported. No remarks are made of consumers in the report. Introducing the report the government states the following: ‘since 2005 we have seen a global shortage of salmon that reflect the high prices and extraordinary high profitability in the salmon companies’.58 Further: “Fish from aquaculture is an answer to the basic global demand: We need more food and we need healthy food.”59 These statements grant the idea that we can be sure that the Norwegian aquaculture is able to present the world with safe and nutritious food.

In 2011 dr. Jérôme Ruzzin at the University of Bergen presented a scientific study in which a group of mice ate the standard feed of salmons. The result showed that the mice developed type two diabetes and obesity. The experiment was taken further and the mice were given...
salmon fillets. The result was the same.\textsuperscript{60} When mice ate fillets of salmon with the POP’s (Persistent organic pollutant) reduced by half of the normal fillet sold in supermarkets, they developed fewer symptoms of the same kind. This report did not make any significant impression on the Norwegian population, nor was it exposed through media before long after. Various scientists with Ingvill Graff from NIFES (National Institute for Nutrition and Seafood Science) as a spokesperson concluded; that the society was presented with what was characterized as an extreme experiment leading to confusion.\textsuperscript{61} Whether or not the POP leads to diabetes or obesity, it raises a question of concern. The uncertainty regarding the safety of eating salmon should be of the industry’s main concern. When the research shows such inconclusive results it leaves the consumer with significant doubt upon salmon as a nutritious and safe food source.

Fish are entitled to protection by the Norwegian animal welfare law.\textsuperscript{62} According to the report increased production is only possible as long as the safeguard of fish is controlled and in accordance with the law.\textsuperscript{63} The current situation of the aquaculture industry shows a picture of deteriorating fish welfare. It has been uncovered outbreaks of ISA (infectious salmon anaemia)\textsuperscript{64} in salmon that are being sold in supermarkets, with guaranty from the Norwegian veterinary institute claiming it is not harmful for consumers to eat the infected fish. Nevertheless, the infection is very painful for the salmon, as it is infecting the inner organs.\textsuperscript{65} The problematic issue is, however, that since the infected fish is not considered dangerous for human consumption the fish is not being treated.\textsuperscript{66}\textsuperscript{67}

In 2013 a new virus was detected in Norwegian fish farms. The infection is characterized as a form of tuberculosis. The course of the disease is characterized by symptoms where the fish is not able to ingest feed and therefore suffers from weight loss, which in the worst case leads to

\begin{itemize}
  \item \textsuperscript{60} Ruzzin, J. 2011, \url{http://www.ncbi.nlm.nih.gov PMC3179488/} Accessed 15 November 2015
  \item \textsuperscript{61} ILaks. 2014, \url{http://www.ilaks.no/rykende-uenige/} Accessed 15 November 2015
  \item \textsuperscript{62} Falkanger, T. 2013, \url{https://snl.no/hjemmel} Accessed 16 November 2015
  \item \textsuperscript{63} Meld. St. 16. 2015, p. 35
  \item \textsuperscript{64} Havbruk Wikia 2015, \url{http://havbruk.wikia.com/wiki/ILA - infeksi%C3%B8s lakseanemi}. Accessed 16 November 2015
  \item \textsuperscript{65} Forskning 2012, \url{http://forskning.no/fisk-fiskehelse-fiskesykdommer-oppdrett/2012/08/farlig-utvikling-snilt-virus} Accessed 16 November 2015
  \item \textsuperscript{66} Nrk 2002, \url{http://www.nrk.no/troms/ila-laks-i-butikken-1.211360} Accessed 16 November 2015
  \item \textsuperscript{67} ILaks 2015, \url{http://www.ilaks.no/pavist ila-i-oppdrettsanlegg-i-bo-kommune/} Accessed 16 November 2015
\end{itemize}
These diseases are just a few in the greater picture of infections in the salmon industry. The most stressing issue is however salmon louse, which according to the Norwegian Veterinary Institute is an ever-increasing problem. Comparing the years 2013 and 2014, the Institute found that the occurrence of salmon louse has increased, as well as the outbreak of multi-resistant bacteria. The circle of diseases is causing another circle of different strategies of ways to combat the problems. One of the results of combating diseases is the growing antibiotic resistance of the bacteria infecting the fish, which again results in even greater strain on the fishes in the farms.

In 2009 the European Food Safety Authority concluded that fish feel pain. It is therefore reasonable to say that at the moment the aquaculture does not live up to the welfare law of Norway.

In the county of Hordaland in Western Norway there are 158 protected areas. These areas are worthy of preservation due to their rich flora, fauna or wildlife. The county minister in Hordaland is now willing to start protecting areas under water. Protecting coast and fjord areas is a relatively normal practice in Norway’s other counties. Regardless of preservation status the government has been giving permission for aquaculture practices in protected areas. One example is the protected area of Froan on the coast outside of Trondheim. A fish farm was given approval to operate in this area. The government gave permissions with the precaution that there has to be environmentally friendly production. As the protection of coast areas is growing, the governmental report should discuss what their view on fish farming in protected areas are. It is clear that growing protection of areas combined with increased aquaculture production eventually will turn into a conflict of interests. Norwegian environmental organizations requires intensification of area protection by the government, because of the impact it has on marine life

Lately Norwegian shrimp fisheries have seen a large decline in catches. The last years, the impact of salmon louse and multi-resistant bacteria have been increasing, which has had a negative effect on shrimp catches.

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decade; there are indications that this is related to aquaculture. At the research center IRIS, scientists have found that the chemicals and medicine used in aquaculture cause the shrimps to die.\textsuperscript{74} The indication that there are increasing efforts to protect sea areas, are linked to the idea that the external effects of aquaculture are not compatible with a living biodiversity of the coast.

6.2 Integrity/Autonomy

The salmon industry has the last decades searched for a solution to the use of wild caught fish as fodder for the aquaculture. The industry has largely been criticized for their use of fish to produce salmon fodder due to the strain it causes on already overfished populations. In the search for alternative fodder ingredients the industry has severely changed the nutritional value of the fish.\textsuperscript{75} The solution has been to turn towards a plant-based feed. Thus, the result of this has led to a fish that today contains less than fifty percent of the maritime omega 3 fatty acids it did only two decades ago.\textsuperscript{76} Still the industry is claiming that the salmon should be valued and viewed as an omega 3 “factory”.\textsuperscript{77} Harald Arnesen found the same result in 2011; he calls the farmed salmon a swimming vegetable.\textsuperscript{78} Further he claims that customers are being lured by the industry’s promises of healthy omega 3 rich food and therefore demands that labelling should be statutory to secure consumers rights. In favor of this argument is that most other food sold in supermarket has strong regulations when it comes to labelling nutritional content. In spite of scientists concern of the nutritional value of salmon, Norwegian lifestyle magazines urges people to eat salmon due to its high content of omega 3 fatty acids.\textsuperscript{79} \textsuperscript{80} \textsuperscript{81} These dietary advices

\textsuperscript{74} Abcnyheter 2015, \url{http://www.abcnyheter.no/nyheter/norge/2015/10/04/194876360/rekene-dor-lakselusmedisin-far-skylden} Accessed 03 December 2015
\textsuperscript{75} Regjeringen 2012, \url{https://www.regjeringen.no/no/sub/eos-notatbasen/notatene/2012/auug/uonskede-stoff-i-for/id2433017/} Accessed 19 November 2015
\textsuperscript{76} Grimelid, F. 2015, \url{http://www.vest24.no/nyheter/oppdrett/vestlandet/mindre-sunt-omega-3-i-laksen/5-82-32512} Accessed 15 November 2015
\textsuperscript{77} Laksefakta 2014, \url{http://www.laksefakta.no/Mattrygghet/Laks-p%C3%A5-bordet/Les-mer-om/Marint-omega-3} Accessed 12 December 2015
\textsuperscript{78} Nrk 2011, \url{http://www.nrk.no/livsstil/lite-omega-3-i-oppdrettslaks-1.7487978} Accessed 16 November 2015
\textsuperscript{79} Godfisk 2015, \url{http://www.godfisk.no/Sj%C3%B8mat-skolen/Sj%C3%B8mat-og-helse/Fordeler-med-%C3%A5-spise-sj%C3%B8mat} Accessed 02 December 2015
\textsuperscript{80} Helsenorge 2014, \url{https://helsenorge.no/kosthold-og-ernaring/kostrad/spis-fisk-oftere} Accessed 02 December 2015
\textsuperscript{81} Klikk 2015, \url{http://www.klikk.no/helse/kosthold/mat/article784885.ece} Accessed 02 December 2015
should be depreciated since they are based on outdated facts, and is no longer the reality after the large quanta of vegetable fodder that has been introduced in the salmon fodder.⁸²

According to the standards of living environment for animals in the Norwegian animal welfare law, Norwegian salmons are supposed to enjoy species-specific needs such as stimulating activities, the freedom of movement including a safe and suitable shelter.⁸³ Salmon as a wild species is born in freshwater where it spends the next five years of its life. When it reaches approximately 13 kg it starts a long journey through the ocean to Greenland or the Faroe Islands. Returning after three to four years, sexually mature, to breed in the very same river it was born in. Farmed salmon encounter a very different lifecycle due to technological development; after six months the salmon prowl are released into saltwater.⁸⁴ Research shows that as much as eighty percent of prowl released into saltwater becomes blind shortly after introduction to seawater.⁸⁵ In the cages that are twenty-four times twenty-four meters⁸⁶ there are 200,000 salmons gathered simultaneously. The Institute of Marine Research concludes in a report from 2013 that the welfare in Salmon farms is generally low. Furthermore, it is shown that 20 percent of prowls do not live until slaughter. In certain farms as many as 60 percent die.⁸⁷ There are visibly contradictions with the industry’s practices and the behavioral freedom salmon is granted in the animal welfare law.

It emerges from the report that there is a clear understanding of aquaculture’s impact on the environment.⁸⁸ It is of indisputable importance for the aquaculture industry to increase their focus on sustainability. The FAO (Food and Agriculture Organization of the United Nations) claim that aquaculture impose negative effects on ocean biodiversity. Escaped salmon can

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⁸⁸ Meld. St.16. 2015, p. 18
make up as much as 30 % in many river systems and in some even outnumber its conspecific
the wild Atlantic salmon. This is confirmed by the Norwegian Scientific Council. They claim
that salmon louse is one of two factors that are affecting the seepage of salmon into Norwegian
rivers. Second, the genetic degeneration is affecting the wild salmon so it is lowering its ability
to survive in the ocean in general. The last 8 years the Directory of Fisheries has estimated
that in average 173462 salmons are escaping each year, and an average of 450000 wild
salmon seepage into Norwegian rivers every year. According to the National Authority for
Investigation and Prosecution of Economic and Environmental Crime in Norway, the numbers
presented by the Directory of fisheries cannot not be trusted. The unrecorded numbers are
probably far greater than what is presented. In 2009 salmons were reported escaped from a
salmon farm in Gratangen, later investigation showed that the salmon were released on
purpose. The salmon were infected by ILA and the producer profited economically by releasing
the fish and received refund by its insurance instead of treating the infected fish. Hybridization
between wild and farmed salmon has the possible outcome of genetic change, negative effect
on viability and character, as well as reduced chances of local adaptation. This clearly
shows the lack of respect for the maintenance of biodiversity and could in turn lead to the loss of
species.

6.3 Justice

Norway is the largest exporter of salmon in the world. At the moment there is no other country
that is close to the production seen in Norway. The report states that the constant MTB on
production can lead to artificially low prices. That could even lead to a favorable market for
foreign producers and stimulate them to produce more. Even though one can foresee the

91 Miljødirektoratet 2015, http://www.miljodirektoratet.no/no/Nyheter/Nyheter/2015/Juli-2015/Frykter-
konsekvensene-av-romt-laks/ Accessed 17 November 2015
Accessed 17 November 2015
oppdrettsfisk Accessed 17 November 2015
Accessed 16 November 2015
market, the government sees it as an alternative to increase MTB to be able to uphold the high market share.\(^\text{98}\) As already explained in the section above the consequences of increased MTB could have the opposite effect if external problems continue to threaten the production of the aquaculture industry. Nevertheless, the government states that it is not an official job to regulate the market, but to ensure fair trading possibilities for one of its core industries.

There is an increased demand for salmon at the moment and it is a relatively cheap source of protein compared to pork, beef or sheep meat. At the same time an increase in production could lead to more fish and lower prices making salmon more affordable. But as mentioned above the expenses made by infection of salmon louse could lead to increased prices of salmon, which in turn would affect the prices. The government proposes an increased MTB as a solution to continue to secure the general affordability of salmon. Rasmus Hansson, leader of the Norwegian green party, claims that the affordability of salmon is granted solely to the rich people of the world. As a final comment he states that not a single one of the world’s starving children has ever eaten Norwegian salmon.\(^\text{99}\)

The Norwegian animal welfare law grants the following value to farmed fish: “*Animals have intrinsic value independent from the functionality they may have for the use of human beings. Animals should be treated well and be protected from unnecessary danger, tension and strain.*” \(^\text{100}\) (My translation). Now, when translating the principle of justice into *respect for telos* one have to consider to what extent the aquaculture industry is interfering with the nature of the fish. In a sense we have already turned the farmed salmon into a domesticated fish and therefore one could argue that it has gained a new telos. But as stated in the European Food Safety Council fish can feel pain combined with the animal welfare law the aquaculture is in many ways severely altering the intrinsic nature of salmon.\(^\text{101}\)

As the Matrix includes a discussion on the intrinsic value of salmon, the matrix also incorporates the discussion on nature’s value and its fair treatment. The treatment of nature in philosophical terms links human beings’ moral obligation towards nature, and therefore also

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\(^\text{98}\) Meld. St. 16. 2015: 39
\(^\text{101}\) Mephm, B. 1996. 109
the moral standing of nature itself. This could lead to a long discussion of different moral theories, but the focus of this paragraph is to try to find the government's approach on the just and fair treatment of nature. The report makes an attempt to show this already in its introduction. It states that: "With today's production technology nature will set the agenda for how the aquaculture industry can operate." Further it states: “It must be determined which environmental effects the society as a whole should accept” (my translation). Now, the first sentence seemingly grants nature rights. While the next sentence gives humans the ability to choose what's right for the environment. In that case the two sentences, quotes from the very same paragraph, are contradictory. In defense of the report the Norwegian environmental law states that as long as humans do not harm nature's capacity for self-renewal, it has not done anything wrong in a legal sense. Thereby the first sentence grants the environment higher value than the law does. At the same time the law declares that “based on the technology as the basis of an overall assessment, of current and future use of the environment and economic conditions, gives the best results”. As will be shown further down the report, even though the technology for more sustainable aquaculture plants exists, grants economic conditions the advantage when promoting the future path for the industry. On basis of this knowledge one could argue that the fair treatment of nature's value is not respected.

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102 Meld. St. 16. 2015. 8
103 Meld. St. 16. 2015. 8
105 Ibid. - Lovdata.
6.4 Sustainable development

The governmental report proclaims the importance of a development that will ensure future generations accessibility to the material gains of the aquaculture industry. The method the government needs to fulfil this mission is mentioned in the Summary of Meld. St. 16. To be able to achieve a win/win situation it is, according to Ian Bryceson, important to search for a situation that benefits both the environment and the society. At the moment we have not reached this equilibrium, he stated in 2004.\textsuperscript{106} He referred to the agencies which are supposed to regulate and control that the aquaculture is managed and handled in a sustainable order. An example is how Jens Stoltenberg’s second government tried to secure sustainability in the aquaculture sector.

The government’s strategy report on a sustainable aquaculture industry was submitted in 2009. The main goals are the following: Aquaculture should not lead to lasting changes in the genetics of wild fish, all aquaculture facilities should have an acceptable environmental standard and not pollute more than the recipient withstands, infections and disease do affect wild salmon in a reducing manner, the aquaculture sector have an location distribution that reduces environmental strain and reduces infection risk, the aquaculture industry’s need for fodder resources should not overexploit natural resources.\textsuperscript{107} Office of the Auditor General of Norway (which is monitoring and advising the government of Norway) showed in a report in 2012 several vulnerabilities on every goal stated in the report on sustainable aquaculture industry from 2009.\textsuperscript{108} In other words, the governmental attempts to solve the unsustainability issues are not leading to the desired results. For future generations to be able to use the ocean, as we are today, it is crucial that the ocean remains at least as, if not more, clean and unpolluted.

Norwegian fjords have been a dumping station for industry and human waste for generations, and the industry is trying to become more environmentally friendly and the human waste that is released into the fjords are being cleansed. At the same time aquaculture is releasing tons of excrements and un-devoured fodder along with chemical waste from the production directly into the fjords. According to the Norwegian Climate and Pollution Agency an average sized fish farm corresponds to the sewage release of a city of 50,000 people. Adding all aquaculture farms in

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\textsuperscript{107} Regjeringen.no 2009. \url{https://www.regjeringen.no/no/aktuelt/strategi-for-en-miljomessig-barekraftig-id552992/} Accessed 18 November 2015

\end{footnotesize}
Norway this leads to an enormous quantity of excrements released in the fjords. According to the governmental report, surveillance that is being done on sea bottom quality under aquaculture farms can be classified as good.\textsuperscript{109} The Norwegian Climate and Pollution Agency, on the other hand, suggests stronger regulations. This is based on the conception that the aquaculture industry leads to eutrophication of the sea bottom, combined with increased sea temperatures this could lead to fewer fish and decreasing plant life. Furthermore, this could impair the future value of tourism and fishing.\textsuperscript{110}

The level of contaminants found in salmon is a highly debated topic in Norwegian media. This is a problematic issue that is often associated with health risks for humans, and a concern of the effect caused by intake over time. PCB’s are reported found in Norwegian salmon and the effect on humans is connected with a weakened immune system, damage of the nervous system, liver cancer, negative impact on fetus and infertility on women.\textsuperscript{111} In 2013 Norway’s largest newspaper wrote that doctors and scientists warn children and pregnant females from eating farmed salmon, because of the uncertainty of contaminant levels.\textsuperscript{112} Already in 2004 American scientist warned against eating more than one meal of Norwegian salmon a month, due to the increased possibility of developing cancer.\textsuperscript{113} The Norwegian Food Authority dismissed the funds of the American scientists and encouraged Norwegians to eat even more salmon.\textsuperscript{114} Claudette Bethune was hired by NIFES in 2003 due to her expertise in medical research on seafood effects on humans. She found high levels of cadmium in Norwegian farmed salmon. As a result, combined with claiming that the Norwegian scientists that dismissed the funds of the American research report were lying, she was fired from her position as a senior scientist at NIFES.\textsuperscript{115} The discussion has continued and reaches new heights when Norwegian doctor Anne-Lise Bjørke Monsen published her research, encouraging children and females to

\textsuperscript{109} Meld.St. 16. 2009 57
withhold from eating salmon due to the amount of contaminants.\textsuperscript{116} Scientific research shows that contaminant levels in Norwegian salmon is decreasing, when it comes to mercury, arsenic, dioxins, dioxin-like PCBs and DDT in a period from 1999 to 2011. The same research shows that PCB and a quantifiable level of pesticides have been stable in the same period.\textsuperscript{117} The state of the confusing debate that prevails in science and media concerning the contamination of salmon leads to an uncertainty in how to assess the situation. It appears to be gambling from the authority’s side when the discussion is fronted with such unpredictability. Therefore, it is not only the present generations, but also the future generations that are affected by not knowing the health risks of salmon.

To improve the living conditions for the farmed fish and to secure the future existence of aquaculture industry there is a call for transforming the industry. There are countries that already have large aquaculture operations on land instead of in open cages in the sea such as China, USA, and Denmark. The advocates of land-based aquaculture claim that land-based plants will cause less direct impact on the environment, to a large extent solve the problem of escapes, and lower the frequency of salmon louse and its spreading. This will improve the salmon’s living condition especially due to the elimination of salmon louse, and likely other diseases. At the same time, it will not remedy the other welfare issues in terms of larges space and natural behavior.\textsuperscript{118} In lack of other alternatives land-based operations are at least an improvement in terms of improved living conditions. The industry, on the other hand, is cautious in their attitude towards land-based aquaculture. The governmental report grants land-based aquaculture many of the mentioned benefits. Nevertheless, the report gives no clear answer to when the government will steer the industry in this direction. The reason is that the economic strain will be a too large of burden for the industry.\textsuperscript{119} Frode Mathisen, Director of Biological Performance in Grieg seafood, states that the economic barriers are too challenging and the Norwegian aquaculture will therefore lose their competitive advantage.\textsuperscript{120} Torbjørn Trondsen at the Norwegian College of Fishery Sciences has devoted the past 10 years to study the

\textsuperscript{116} Nrk.no 2013, \url{http://www.nrk.no/hordaland/advarer-mot-oppdrettslaks-1.11071637} Accessed 18 November 2015
\textsuperscript{118} Myrset, O. 2015, \url{http://www.sysla.no/2015/02/12/havbruk/dette-ma-du-vite-om-oppdrettsanlegg-land_39673/} Accessed 07 Decemeber 2015
\textsuperscript{119} Meld. St. 16. 2015, p. 39
\textsuperscript{120} Mathiesen, F in Bakkeli, B. 2011, \url{http://www.sysla.no/2014/09/10/havbruk/ikke-realistisk-med-lukkede-anlegg-pa-land_25695/} Accessed 07 December 2015
economy of land-based aquaculture and states that the cost is largely the problem, but that aquaculture will have to become land-based due to the increasing internal and external issues in sea cage aquaculture. Further, he states that for Norway to continue their leading role in the aquaculture business it needs to develop technology for land-based production.\footnote{Langberg, Ø.K. 2012, \url{http://www.aftenposten.no/okonomi/Laks-i-kjempetanker-kan-true-norsk-eksport-7009058.html} Accessed 07 December 2015}

Strain on natural resources has been a disputed topic in the debate concerning the aquaculture in Norway. Access to cheap fodder is a challenge, as well as a precondition for growth in the aquaculture sector. As claimed by the report, salmon is the animal that utilizes fodder most effectively, compared to breeding of pork, cow, chicken and sheep.\footnote{Meld. St. 16. 2015, p. 20} The fodder factor (how many kilos of fodder the fish need to grow one kilo\footnote{Hallenstvedt, O 2014, \url{https://snl.no/f%C3%B4rfaktor} Accessed 17 November 2015}) is relatively low, still it constitutes for over half of the production cost in the sector.\footnote{Meld. St. 16. 2015, p. 21} The way the aquaculture industry has managed to keep food prices down is by turning from a maritime-based fodder-to-fodder constituting of more vegetable ingredients. But maritime ingredients are still a part of the fodder. Michele Mesmain ascertains that fish oil producers are overbidding Peruvian fishmongers.\footnote{Geelmuyden,N. C. 2013, p. 88} Norwegian companies are large producers of fish oil from the vastly overfished anchovy.\footnote{Brajak, Briceno 2013, \url{http://www.huffingtonpost.com/2013/02/04/peruvian-anchovy-overfishing_n_2618275.html} Accessed 17 November 2015} The same fish oil is a central part in fodder pellets for salmon in Norway.\footnote{Marketnews 2015, \url{http://marketnews.dk/artikel/19/37811/venter_ingen_fiskekvoter_i_peru_pga_el_nino.html} Accessed 17 November 2015} On the other hand, the increased vegetable dominant fodder used in aquaculture is containing soya. Brazil as the second greatest producer of soya in the world, are also the largest exporter of soya for Norwegian feed producers. The effect of increased demand of soya has led to great pressure on the rainforest and large areas that are now being used for producing soya could produce food directly to humans instead.\footnote{Gjengedal, Lygre 2015, \url{http://www.bt.no/meninger/kronikk/Norsk-soyalaks-stjeler-jord-i-Brasil-3331004.html} Accessed 17 November 2015} It is a paradox in itself that the Norwegian fodder producers import large amounts of soya when the government is transferring large amounts of money through different assistance programs to save the rainforest\footnote{Bistandsaktuelt 2015, \url{http://www.bistandsaktuelt.no/nyheter/2015/regnskogen-fikk-dobbelt-sa-myНЕ-i-fjord} Accessed 19 November 2015}. 

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\item \footnote{Langberg, Ø.K. 2012, \url{http://www.aftenposten.no/okonomi/Laks-i-kjempetanker-kan-true-norsk-eksport-7009058.html} Accessed 07 December 2015}
\item \footnote{Meld. St. 16. 2015, p. 20}
\item \footnote{Hallenstvedt, O 2014, \url{https://snl.no/f%C3%B4rfaktor} Accessed 17 November 2015}
\item \footnote{Meld. St. 16. 2015, p. 21}
\item \footnote{Geelmuyden,N. C. 2013, p. 88}
\item \footnote{Brajak, Briceno 2013, \url{http://www.huffingtonpost.com/2013/02/04/peruvian-anchovy-overfishing_n_2618275.html} Accessed 17 November 2015}
\item \footnote{Marketnews 2015, \url{http://marketnews.dk/artikel/19/37811/venter_ingen_fiskekvoter_i_peru_pga_el_nino.html} Accessed 17 November 2015}
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\end{itemize}
6.5 The precautionary Principle

The benefits of risk analysis are large, and the precautionary effect could save one from unnecessary hazards. It emerges from the report that the government is implementing precautionary principles to avoid what happened in Chile 2009. Chile was, in 2007/8, the second largest exporter of salmon and had 20 percent of the global market share. After the collapse businesses experienced severe economic problems and many people lost their jobs. Chile has now regained their position as the second largest producer. At the same time the collapse in Chile helped Norway to become even more dominant in the world production. The great Chilean collapse happened due to infection of ISA.130

Now, we know that ISA exists in Norway as well, but so far it has not spread at the same rate as in Chile. Northern Norway has particularly been spared from the infection of ISA. Recently, in 2015, came reports that ISA were infecting salmon even in northern Norway. The reason for the virus-spreading even in the northern areas is claimed to be an effect of increasing water temperatures. Scientists have claimed that ISA and the increasing problem of salmon louse could lead Norway into a similar situation of the one of Chile in 2009.131 This would have devastating effects for the industry and Norwegian economy. It is likely to believe that the environment would suffer greatly from such a scenario. The remedy for outbreaks of infections is often increased use of toxins and medicine. Therefore, one can argue that it is not compatible with the principle of precaution to increase the production of salmon when the issues of infections and louse are not under control.

The consumers of aquaculture products should have knowledge to the extent that they can make their own choices and preferably precautions if necessary. As mentioned above the debate concerning the safety of salmon as food is a wide and at times strongly confusing debate. There seems to be a constant conflict between the industry and the government, scientists and environmentalists. One example where the precaution of consumers has forced

an industry to change is the Norwegian chicken industry. In December 2014 veterinarians and scientists warned consumers that as much as 50 percent of Norwegian chicken was infected with multi-resistant bacteria that made treatment with antibiotics useless.\textsuperscript{132} The government and the food security authority claimed that Norwegian chicken was safe to eat as long as hygiene precautions were taken in the kitchen.\textsuperscript{133} This assurance however was not good enough for Norwegian consumers, as a result the chicken sale dropped dramatically. Not until recently, after the industry stopped using the antibacterial substance narasin in chicken production, the sale recovered.\textsuperscript{134} Scientists have warned consumers of the health effects of salmon, and the debate has been going far longer than the one of chicken. But in contrast, the salmon industry despite warnings from doctors and scientists, experience growing sales numbers. One can only speculate the reasons why, nevertheless, in the case of chicken production, the power of precautionary consumers have changed the industry. There should be reason to believe that there is enough scientific uncertainty about the health issues, at least the health benefits, of salmon production. If consumers were to adopt precautionary measures they have the potential power to turn the industry in another direction. If one assesses the information provided by Jerome Ruzzin (page 18), Anne Lise Bjørke Monsen (page 27) and Claudette Bethune (page 27) it becomes evident that there exists uncertainty in science. They are also present research that evaluates the potential consequences of inaction. This in turn meets the requirements of implementing the Precautionary Principle.

In 1997 Matthias Kaiser wrote an article presenting different Precautionary Principle methods designed to stop, what he thought was inevitable, the genetic degradation of wild Atlantic salmon.\textsuperscript{135} At the time there was no scientific proof of escaped farmed salmon and wild salmon being able to mate with one another, but it was a likely scenario. Kaiser was right in his anticipation. Scientist Kevin Grover found in 2013, with a newly developed measuring system, that in certain Norwegian rivers as much as 47 percent of wild salmon have been genetically

\textsuperscript{132} Nrk 2014, \url{http://www.nrk.no/rogaland/leger-slar-alarm-om-ny-kyllingbakterie-1.12074412} Accessed 08 December 2015
\textsuperscript{133} Nrk.no 2015, \url{http://www.nrk.no/nyheter/1.12391307} Accessed 08 December 2015
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changed due to cross breeding with farmed salmon. The Norwegian Directorate of Fisheries sent in November 2015 a complaint to the European Free Trade Association Surveillance Authority claiming that the "Norwegian authorities fail to include biological effects of aquaculture industry in the implementation of the Norwegian Water Framework Directive". The reason being that the Norwegian authorities do not measure the biological consequences of escaped salmon, which they are bound to do by the Water Framework Directive. Further, the complaint states that the biological effects of interbreeding between wild and farmed salmon have consequences for the survivability of the wild salmon. One of Kaiser’s solutions to this problem is still valuable today, as it was in 1997. Kaiser claims that one should radically change the technology and production methods and opt for land-based aquaculture. The arguments he uses for this is that the technology is already there. There is a great possibility of getting rid of the escape problem and there is reason to believe that other environmental risks of aquaculture would be reduced as well. Kaiser as well as the governmental report counters this argument with the fact that the economic pressure this will place on the producers is too high. Even though it might be costly to move aquaculture out of the sea and onto the land, Norway is committed to do something about the environmental risk of genetic contamination of the wild fish, at least according to its own directive. The report names land-based aquaculture as a future alternative, but genetic contamination is an urgent problem. One can therefore question the precaution when the ethics of nature is imposed to economic and technological standards, at least when the government is claiming that the industry can only grow on the premises of nature.

Arne Næss argued that by separating humans, and putting ourselves above nature, we are ignorant. By making such a separation we indulge selfishness towards other people, but also

towards nature.\textsuperscript{140} Even though deep ecology is a controversial movement, it poses some interesting aspects in the debate about aquaculture. Searching the governmental report for arguments towards a biospheric egalitarianism where human and nature have equal rights and values, one will end up dissatisfied. Nevertheless, Kaiser uses deep ecology as one of his precautionary strategies in forming a sustainable aquaculture.\textsuperscript{141} Now, deep ecology as Kaiser sees it will not favor aquaculture, but on the contrary, it will actually remove the whole industry. Due to the evidentially unsustainable aspects of aquaculture, we could soon, if not already, find ourselves in a situation where the harm done towards the environment by aquaculture is irreversible. We could continue farming salmon, and by the spreading of louse or genetic contamination lose the wild salmon. If the situation is as pressing as described, we could instead forbid aquaculture. The argument for doing this, in contrast to the measurement methods presented by the government, is that it eliminates the risk of further environmental harm immediately.\textsuperscript{142} This proposal may seem radical, but the fact is that there are parties in the parliament that have proposed similar action.\textsuperscript{143} On the other hand, forbidding the aquaculture will lead to a major economic loss, since the aquaculture industry is the second largest export industry of the country, and supposedly the new economic backbone after the oil has become less profitable for the country. The aquaculture industry however is, if one believes the critics, destroying the livelihood of fishermen living on catching wild fish. There are reasons to believe that shrimp, crab and several other species are being reduced due to external effect from aquaculture.\textsuperscript{144} \textsuperscript{145} \textsuperscript{146} Without aquaculture there is the possibility that the wild fisheries could return to former stable populations and this would in turn lead to more jobs along the coast and a growing economy in rural regions of the country. An interesting aspect about this is that there is currently close to 10.000 FTEs in the wild fishing sector, while as shown above there is 6239

\textsuperscript{143} Sv 2015, https://www.sv.no/atila/oppdrett/ Accessed 09 December 2015
in the aquaculture industry. Kaiser also presents another argument based on the development of a truly ecological society. By forbidding fish farming it could be the start of educating the population towards important ecological goals, where the importance of adjusting our needs towards natural conditions is shown.

7. Concluding Remarks

In this thesis I have evaluated the ethical guidelines in the governmental report on sustainable aquaculture. I have found that the report lacks to clarify how major ethical and environmental dilemmas should be dealt with. My aim has not been to demonize the report or the government’s aim to increase aquaculture production. On the contrary, I see great value in increased aquaculture; therefore, I find it important that the government uses the correct tools to make the industry sustainable.

In chapter 2 I have presented an overview of Norwegian aquaculture by showing the historical development of the industry. Further this chapter points out the general ethical dilemmas that the industry faces.

Chapter 3, this chapter presents the theoretical background of the thesis; the Ethical Matrix. The Ethical Matrix is used as the framework of my discussion in chapter 6. Further, this chapter introduces a critical overview where I present the criticism directed towards the Matrix.

Chapter 4 is a summary of the governmental report.

In chapter 5 I introduce my Ethical Matrix and explain which ethical principles and stakeholders that will be discussed.

Chapter 6 is the main part of the thesis where the Matrix is applied and used to form a prescriptive discussion of the government’s ability to develop a sustainable increase of the aquaculture industry.

I found that the lack of appropriate measures to control the negative effects of the aquaculture industry reveals lack of initiative to make lasting changes by the government. The governmental report presents few measures that will change the unsustainable course of Norwegian aquaculture. Further, the government seems to focus on legitimizing large scale production,


instead of creating a system that will generate a future-oriented and sustainable aquaculture industry. The action guidelines presented in the report is not compatible with the national laws and moral obligation we have towards animals, humans and nature. If these elements are not incorporated in the future design and progress of the industry, it will undermine itself.

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