



# Mapping actors and arguments in the Norwegian aquaculture debate<sup>☆</sup>

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## ABSTRACT

Norway is the world's leader in the production and export of farmed Atlantic salmon, and authorities there recently established a new management regime for the industry with a view to promoting substantial long-term growth in the industry. The decision by the government suggests broad acceptance for the industry in Norway, but there have been some danger signs with respect to the industry's social acceptance. This paper examines the comments submitted by a wide variety of key stakeholders on the 2014 management proposal to extract the major concerns of Norwegian stakeholders, map how wide-spread these are and evaluate whether they suggest a problem for the social acceptance of the industry at the general and local levels. Findings are analyzed using Wüstenhagen et al.'s three-fold classification of social acceptance: socio-political, community and market acceptance. In addition, findings are compared to six factors commonly suggested to affect community acceptance for innovations such as aquaculture sites. Results suggest that there are widespread environmental and socio-economic concerns with respect to the salmon aquaculture industry. Stakeholder concerns regarding issues of distributional justice may be addressed while stakeholders with strong concerns about the environmental impact of the industry are unlikely to be appeased, especially if environmental concerns are related to issues of identity or aesthetics. Submissions from Northern Norway, likely to be a major area for industry expansion indicate, a strong division on the social acceptability of the industry.

## 1. Introduction

Norway is the world's leader in the production and export of farmed Atlantic salmon ([1] p. 44), and authorities have recently established a new management regime for the industry with a view to promoting long-term growth in the industry [2,3]. There seems to be broad social acceptance for salmon aquaculture [4,5] – what Wüstenhagen et al. [6] call socio-political acceptance – at the level of the general public in Norway. Such an assumption is reasonable: Norway has several decades of experience with the industry, a strong research community and a capable state with a strong tradition of monitoring and oversight.

In 2014, however, the government, proposed a very ambitious plan: to put the country on the track towards a five-fold increase in national production by the year 2050. That is, it proposed to expand production from the over 1 million tons of farmed salmon Norway then produced to over 5 million tons ([7] p. 42; [8]). An industry expansion of this size requires broad general social acceptance in the country. Because it will also require new aquaculture sites and the expansion of capacity in

established locations, it will also require acceptance at the level of the local communities that will have to host these sites. Significant expansion could activate latent conflict or intensify existing conflict both generally or at the community levels. Should resistance become widespread, this could limit the growth of the industry by resulting in a change in government policy or the through the denial of needed sites. Research conducted before the new plan was proposed already suggested the existence of “simmering” conflicts in local communities [9–12] and there were reports of the increasing reluctance on the part of communities to host aquaculture sites ([13] p. 2). Print and television media publicized stories of environmental damage and lack of oversight [14–16].

With these considerations in mind, this article analyzes comments submitted by 57 stakeholders on the 2014 draft white paper (DWP) to map the concerns that stakeholders have about aquaculture. It asks what concerns stakeholders at the national and local level expressed and whether these stakeholders supported growth in the industry. It analyses these responses from the perspective of Wüstenhagen et al.'s [6]

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formulation of socio-political, community and market social acceptance and in light of six factors that are often identified in the social acceptance literature as affecting social acceptance at the community level.

Two studies on Norwegian views about aquaculture, one done since the new management regime was adopted [17,18], suggest that opposition to the industry is rooted at the ideological level; Chu et al. [15] report the statistical relationship between positive and negative perceptions of aquaculture and regulation and support for expansion of the industry in the US and Norway. These analyses, however do not address the substance of the criticisms of the industry and neither surveys stakeholder views with specific reference to the planned change of management regime in 2014 and the context of sustained growth. A study by Hynes et al. [5], carried out in 2016 found that most Norwegians do not find the industry to be a significant environmental threat, but this survey did not break down the responses by stakeholder group or location.

The hearing responses reveal some threats to broad, socio-political social acceptance. Because the premise upon which the government based its policy was that of environmental sustainability of the industry, this dimension of sustainability may be considered the foundational condition for acceptance of the industry. Some stakeholder groups held that condition was not and could not be met. As might be expected from a previous study of several rounds of license allocations [2] and other stakeholder analyses ([5] p. 69; 10 p. 83; [17,18]), groups and agencies (including government agencies) concerned with wild salmon for scientific, environmental, business or recreational reasons voiced strong environmental concerns related to the impacts of salmon aquaculture on wild salmon. The marine capture fishing industry and the *Troms County Council* were also strongly concerned about the impacts of salmon lice treatments on other wild marine stocks. Others, especially but not limited to industry actors, were far more optimistic and strongly supported growth: they acknowledged the need for environmental sustainability but projected confidence that the industry would meet this criterion. In the middle were those who acknowledged potentially important environmental problems; half of these cautiously embraced growth and half cautiously advised against growth. In short, the most economically dynamic actors and organizations related in some way to these supported growth and, as discussed below, others hoped to share in the value the aquaculture industry would create. In short, social acceptance over the long-term will require that industry meet expectations that it will overcome environmental problems and that the government act to restrain the industry should it fail to do so. In connection with this implied social contract, the management concerns identified in some submissions and concerns expressed by others that the government's plan neglected the need for technology development and improved management capacity that expansion will require are salient.

Beyond environmental issues, one potential threat with respect to broad, socio-political social acceptance and also community social acceptance lies in the fundamental approach taken by the government. In the DWP, the government explicitly excluded socio-economic sustainability from the policy. However, social acceptance literature suggests that community acceptance and ultimately socio-political acceptance requires attention to factors related to socio-economic and other issues. Among those that proved most relevant in this case are perceptions of distributional justice (how costs and benefits are distributed), the provision of adequate and honest information about costs and benefits of the intervention, the degree of disruption of traditional rights and access and the connection of local people to their land- or seascape. Interwoven among these are issues of trust. Specific issues raised included the effect the new management plan would have on industry structure (the distribution of production among small, medium and large firms) and how benefits of the industry were to be shared (such as area use fees, requirements relating to employment, and impacts on processing firms). These issues of distributional justice are enduring ones in Norway [13] but may take on added significance as the industry grows. Several stakeholders brought up another issue of

fairness related somewhat to distributional fairness. A popular desire to develop tagging for farmed fish and objections to the proposal that growth decisions be taken at the level of production areas were a part of the broader concern that individual operators not bear the burden of the poor performance on the part of other producers or be penalized because cumulative conditions were poor. Examination of the submissions also turned up one concern that did not fit easily into the commonly identified factors that affect community acceptance, but which may affect broad socio-political acceptance: Non-industry actors with the greatest expertise on fish welfare expressed strong ethical concerns about current production practices.

Northern Norway, which is expected to host new salmon aquaculture sites, calls for special comment. The submissions create a picture of a region split on the issue of industry growth, with a salmon-fishing organization, a fishing union, a municipality, a county governor and a local ENGO opposed to growth but other municipalities, elected county councils and business interests supporting it. Greater attention to distributive justice may alleviate this difference of opinion. However, the submissions give little insight to issues of identity or connectedness to land- and seascapes. If the divide rests at that level, as the opposition of the iconic coastal fishing industry and the Sami Parliament suggests, socio-economic measures may not bridge the divide.

A final point is that there is also a market component to social acceptance. Here the question is less whether the industry wants to grow (it clearly does) but under what conditions. Industry and its representatives took on the whole a fairly aggressive stance, taking issue with some of the core features of the government's proposed scheme for growth.

## 2. Social acceptance

Marine usage policies such as the promotion of aquaculture and offshore renewable energy and the establishment of Marine Protected Areas (MPAs) are often framed as in the national interest or for the general good but specific communities must provide the sites required for putting these policies into effect. Achieving policy goals accordingly requires not just broad public acceptance of policy goals, but also acceptance among key stakeholders and host-to-be communities. Some studies of these issues indicate that lack of social acceptance at the community level has in the past impeded the achievement of national policy goals [6,19–22].

Social acceptance refers to the support within a public or community for a particular initiative or innovation, often on the part of the government. Thomissen et al. ([23] p. 170) provide one popular definition: "a measure of support towards a set of regulations, arrangements, tools or towards an organization by an individual or a group of individuals based on geographic, social, economic and/or cultural criteria". Thomissen et al. [23] and Wüstenhagen et al. [6] recognize that social acceptance has several dimensions and exists at different levels. Writing from the perspective of renewable energy innovation, Wüstenhagen et al. ([6] pp. 2684–2685) provide a useful combination of these dimensions and levels into a single scheme: socio-political acceptance is "social acceptance on the broadest, most general level" by key stakeholders, often at the societal level; 2) community acceptance is "specific acceptance of siting decisions .... by local stakeholders, particularly residents and local authorities"; 3) market acceptance refers to the willingness of consumers and investors to accept the innovation.

In this paper we examine in particular social-political and community acceptance with respect to two "innovations": a proposal for growth in the salmon aquaculture industry and, to a lesser degree, the proposed management plan itself. The responses did not offer comprehensive material on market assessments, although some points can be extracted with respect to investors (the aquaculture firms).

Broad social disagreement with the government's goals can be resolved at the level of national politics, perhaps via the ballot box or through the negotiations among parties in a parliamentary coalition

government. But if the policy goal remains fixed, at least as an aspirational goal, achieving national aquaculture production targets will depend on the willingness of communities to accept new aquaculture sites or increases in production at established ones [14]. We accordingly compare our findings to the factors frequently identified in the social acceptance research as likely to affect that willingness.

Social acceptance at the community level is increasingly discussed with respect to areas such as wind power, marine protected areas (MPAs) and aquaculture [6,19,23–28]. These are obviously very different topics and affect local communities differently. However, they do share some characteristics. Wind power and aquaculture are often presented as in the national and global interest (national energy security and lowering CO<sub>2</sub> emissions on the one hand and contributing to national competitiveness and global food security on the other). Both are, however, usually carried out by private firms and require sites that affect specific local communities, frequently in rural areas. Aquaculture and MPAs entail the disruption of access to specific marine areas, as can wind farms in marine areas. Despite their different foci, such studies of social acceptance tend to suggest the salience of several similar factors that affect community acceptance of sites. Although they are often formulated in slightly different ways, leading factors can be broadly categorized as: 1) whether stakeholders are involved in decision-making in a meaningful way [6,20,21,27–30]; 2) the provision of adequate and honest information about costs and benefits of the intervention [6,29,31], 3) perceptions of distributional justice (how costs and benefits are distributed) ([6] p. 2685; [20,26,27,32]), 4) the degree of disruption of traditional rights and access [21,25,32] and, 5) the connection of local people to their land- or seascape [19,27,28,30]. Interwoven among these are issues of 6) trust, which manifests itself in a variety of forms [6].

### 3. Background

In 2012, a frequently cited (in Norway) study by a working group created by the Royal Norwegian Science Society (Kongelige Norske Videnskabers Selskab, DKNVS) and the Norwegian Technical Science Academy (Norges Tekniske Vitenskapsakademi, NTVA) suggested that the salmon and salmonid farming industry would likely expand five-fold by 2050. This study “Value Creation Based on Productive Seas in 2050” (*Verdiskaping basert på produktive hav i 2050*, VBPH) [7] had a big impact in the country [33]. The conservative-right coalition government of Norway (elected 2013, and still in power after minor adjustments in the governing coalition and ministers) explicitly embraced this report and adopted its findings as a goal [2,34].

In 2014 the Norwegian government circulated a “høringsnotat” (here translated as “draft white paper” or DWP) for comment. The “Draft white paper for the Storting [Parliament] on growth in salmon and sea trout aquaculture” (*Høringsnotat – melding til Stortinget om vekst i norsk lakse-og ørretoppdrett*) [8] proposed three alternative frameworks for the expansion of the industry: 1) continuing the current system of allocation rounds with objective criteria to be determined at each round, 2) a fixed annual growth rate, or 3) a system based on “action rules” that would determine whether growth would be permitted in each of several “production areas” ([8] p. 5). While the DWP initially introduced the three options as equally viable paths, the language used, and the space given in the document to each alternative suggested that the government favored the third option. Alternative three is accordingly referred to here as “the proposed plan”.

The third alternative, “production areas with action rules”, (*produksjonsområder with handlingsregler*) would divide the Norwegian coast into 11<sup>1</sup> production areas (PAs), with the specification of the areas based on models of how particles (organic matter or pathogens) spread along the coast. Environmental indicators would establish whether the

industry in a given area would be allowed to grow, using a traffic light system: PAs would be evaluated as green (acceptable conditions for growth), yellow (no expansion allowed) or red (production should be reduced). In addition, new concessions would be distributed by auction.

The government stressed the need for environmental sustainability:

“... nature will always set the premise for how the aquaculture industry can operate and the extent to which it can operate. Growth in the Norwegian aquaculture industry must be sustainable. This means that the further development of the industry will also take place so that the structure, function and productivity of nature are preserved, among other things, as a basis for safeguarding future generations’ opportunities to meet their needs” ([8] p. 10) (*our translation*).

The indicators of environmental sustainability chosen would be very important. While the DWP discussed a series of possible indicators (the presence of salmon lice on wild salmon, escapes of farmed salmon, diseases and the use of medications; pollution and emissions, among others), it settled on only one specific indicator and one general category: the presence of salmon lice on wild salmon and pollution/effluents. Of these two, only one could be immediately implemented: that for salmon lice. Indicators related to pollution and effluents would have to be developed over time, once the management system was in place. The problem of escaped farmed fish was to be dealt with separately (most likely by fishing escaped farmed salmon out of rivers) and would not be a part of this decision process.

The DWP marked a major departure in Norwegian policy. Although Norwegian aquaculture has been governed by many regulations and environmental indicators, these have been pitched at the level of the concession or farm site. The creation of large production areas and area-wide indicators was new although not entirely unexpected: in this the proposal largely followed the recommendations of an earlier governmental study [35]. Another striking change had to do with the concept of sustainability employed by the government. The government presented the traditional view of sustainability as composed of environmental, social and economic dimensions but chose to base its management plan on only the environmental dimension. In the past, Norwegian governments had included socio-economic objectives when issuing permits for new sites [2]. Although the DWP asserted that sustainable growth in the industry would “create secure jobs along the coasts ... [and] create new jobs in rural areas» and would therefore constitute good “districts policy”<sup>2,3</sup> ([8] p. 8), no goals or indicators relating to this were to be included in the management plan. The DWP explicitly eschewed such goals and characterized such past considerations as “creative” ([8] p. 3). Economic issues would be left to the industry itself; no specific social objectives were included.

The proposal to encourage the expansion of the industry to such a significant degree and the decision to focus on environmental sustainability brought the environmental impacts of the industry into sharp focus. Much scientific work suggests that the industry does affect the environment in various ways, although these impacts vary in significance, intensity and scope over time, space and level of production. The standard, widely-recognized list of potential impacts includes the following: salmon lice, other parasites and disease, pollution and effluents (such as organic material and nutrients from feed and feces), genetic interaction between escaped farmed fish and wild fish, medications and antibiotics, and at a different level of analysis, the resources required to produce feed [36–38]. The Norwegian Institute for Marine Research (IMR) has issued a yearly risk assessment of many of these risks since 2010 [39,40]. The 2015 assessment, which drew upon

<sup>2</sup> It would: «skape trygge arbeidsplasser langs kysten. En bærekraftig vekst vil sikre og skape nye arbeidsplasser i distriktene, og derfor vil en god næringspolitikk være en god distriktspolitikk». Districts policy in Norway is government policy designed to promote economic growth in areas outside of major urban areas.

<sup>1</sup> As implemented, there were 13 production areas.

information dating to around the time of the hearing round, found that the principal environmental threats were salmon lice, which increased mortality of anadromous fish such as salmon and trout, and escaped farmed fish, which presented a moderate to great risk of producing genetic changes in wild salmon ([40] pp. 1014–1015). The national Scientific Advisory Council for Salmon Research identified both as “non-established” threats to those species (factors that affect stocks so greatly that they can contribute to the critical damage or loss of the wild stock and, because measures to control them are inadequate, have a high risk of further impact) ([41] pp. 95, 108).

While escaped farmed fish and salmon lice were then recognized as the most significant environmental threats, it is possible that a significant increase in production could increase the risks associated with other environmental impacts. Norwegian management has been good but has also had its limitations. The Office of the Auditor General of Norway (*Riksrevisjonen*) assessed the salmon aquaculture industry in 2011, finding several shortfalls in management of the industry, including the lack of a way to assess the industry’s cumulative environmental impacts. It concluded that the industry could not be classified as environmentally sustainable [42]. The DWP management proposal (with its production areas) was in part a response to this finding.

While Norway is generally recognized to have greater public acceptance for the salmon aquaculture industry than is the case in other producing countries [4,5,18] there has been public controversy and discontent [9–12] and signs that the industry in Norway is somewhat concerned about maintaining social acceptance [14,43]. The quality of the frequently-cited VBPH report has been explicitly called into question [33]. Stories about diseased fish, escapes of farmed salmon and the death of caged salmon are easy to find in the media, as are letters to the editor and opinion pieces against aquaculture [9,14,18,44]. A later public debate brought out long-standing unease with respect to the industry on the part of some experts. In the second half of 2017, the national newspaper *Morgenbladet* published a series of prize-winning, critical articles about the industry and its relationship with the state and the research community that threw doubt on the sustainability of the industry [15,45,46] and suggested that critical voices were smothered;<sup>3</sup> echoing similar charges made in 2016 by the state-financed TV channel NRK [47]. While the *Morgenbladet* work was controversial and its findings contested by industry and researchers [48] it did expose an underlying rift in the research community and pose questions about the industry.

#### 4. Key stakeholders with respect to Norwegian aquaculture

Given the question at hand, it is important to understand the position of the farmed salmon industry in Norway. Since its modest origins in the 1970s, the Atlantic salmon aquaculture industry has become an important, dynamic and lucrative industry with a mixture of global companies, and medium and small enterprises [49]. In 2016, Norwegian exports of farmed Atlantic salmon were worth 61.3 billion Norwegian kroner (NOK) (about 7 billion US dollars, USD) and reached 90 countries [50]. The industry achieved an average rate of growth of 15.4% per year in the period 1995–2012 [50,51]. In 2014, the total value creation of the aquaculture industry (dominated by farmed Atlantic salmon) to Norway’s GDP was estimated to be about 42,6 billion NOK (about 4.7 billion USD) ([52] p. 24); it grew to 62 billion NOK (about 6 billion USD) by 2017 [53]. While the industry is spread along the Norwegian coast, it is concentrated in Mid Norway, and is gradually moving North to cooler waters [51]. In 2014 – and today – the industry as a whole generates more profit than any Norwegian land-based industry ([54] p. 7; [52] pp.

<sup>3</sup> A series of seven articles and 25 associated pieces. Journalists Simen Sætre and Kjetil Østli were awarded the VIS Prize for excellence in investigative journalism by the Stavanger Science Academy (Vitenskapsakademiet i Stavanger) in 2018 [45].

27–28).

The two economic sectors that are most directly affected by the aquaculture industry are the fishing industry, which shares dependence on the ecosystem and competes for space in marine areas, and the riverbank owners and commercial fishers of wild salmon and trout who depend on resources affected by the industry. The marine capture fishery is large, diverse and economically important. The total value of all marine wild-caught fish in 2017 (including the famous cod fishery) was valued at 18.1 billion NOK (about 2 billion USD) [55,56]. The research organization SINTEF estimated the total value creation of the fishing industry in 2014 to be about 3 billion USD) ([52] p. 21).

There has long been both commercial and recreational/tourism fishing on wild salmon (and trout) in the fjords and in the rivers. Commercial (*næringsfiske*) fishing has declined significantly and The Norwegian Environmental Agency estimates its sales value at about 20 million NOK or just over two million USD [57] and describes its economic significance as “modest” “*beskjeden*” [58]. Most remaining commercial fishing takes place at sea in mid Norway (Trøndelag) and in the northern-most county (Finnmark) where it has special significance for the indigenous Sea Sami population [57]. Recreational and tourist fishing for Atlantic salmon takes place in the rivers and in fjords and draws fishers from all around the country and from abroad. River-based recreational fishing has a strong tourist business component, run by the riverbank owners who control access. The foundation Redd Villaksen (Save the Wild Salmon), which works with fishing and environmental organizations, estimates the revenues from the recreational wild salmon business to be 1.3 billion NOK (about 149 million USD) spread among many stakeholders, and benefitting 100 000 anglers [59]. The rivers of Trøndelag and Northern Norway (especially Finnmark) produce the most catches [60].

#### 5. Method and data

To investigate the social acceptance of the salmon aquaculture industry and its expansion in Norway, we looked at stakeholder comments to the DWP submitted in late 2014 or early 2015. The comments on the DWP constitute a rich source of information about the views of key stakeholders with respect to the industry. It is standard procedure to invite stakeholders to comment proposed policy changes. Because this proposed plan was a substantial change in management and would set the stage for the significant expansion of aquaculture, this policy proposal was a critical juncture for Norway and the hearing marked an important, public occasion for concerned stakeholders to go on the record and state their concerns.

The advantage to using these submissions as “data” is that they were produced by a wide range of actors with expertise in an array of different fields on the same significant occasion and in response to the same document. In addition to an array of civil society actors, the pool of submissions includes significant industry actors and representatives and a variety of sectors and levels (national, county and local) of government, where important management decisions about the industry are made [12]. Putting the DWP out for comment amounted to polling key, knowledgeable actors. While many of these have published studies, statements and other documents over many years, the collection of responses to the 2014 DWP captures the arguments that these stakeholders felt to be most important to put forward at that moment. The authors recognize that more marginalized individuals or groups are unlikely to participate directly in a formal process such as this, but since local governments (municipalities) can participate in these processes, their voices may find expression through that channel. The wide array of civil society groups that did respond enhanced the chance that marginalized views would be represented. Finally, the submissions stand alone: researchers did not consult other documents produced by the organization, firm or government agency.

With respect to socio-political acceptance we looked first for comments pitched at the national level or phrased in general terms, that is,

not touching upon themes related to specific localities or specific actors. This tends to be the provenance of governmental agencies and national organizations. Issues potentially affecting community acceptance are identified by examining the comments made by municipalities and local stakeholders. Such actors include municipal governments and local chapters of organizations such as environmental non-governmental organizations (ENGOs). The responses also include some county councils, which play a role in regional planning, and county governors who have the mission of ensuring that local and county decisions are in accordance with national laws and directions of the Storting (Parliament). Other actors are more difficult to place but raise issues that may relate to both national and specifically local concerns.

As noted, the government sought to focus the discussion on environmental sustainability. The DWP largely shaped the discussion on environmental issues and discussion on these appear in almost every submission. For this reason, while researchers identified both socio-economic and environmental concerns expressed in the submissions, the former are more extensively mapped. Social and economic concerns were combined because in practice these are closely related. Both sets of concerns are captured in the coding of support for growth.

There are drawbacks to using the hearing responses in this way. These are just one set of comments in a long policy process. In this hearing round, those invited to comment were not asked their evaluation of the aquaculture industry as such, or whether they supported the growth of the industry – they were asked to comment on the plan under which that growth would take place. Again, socio-economic issues were excluded from the discussion. Still, commenters could write what they wished, and because the new plan represented a major shift in policy, many did make broader comments.

At the same time, the framing of the government's request for comments and the specifics of the proposal clearly shaped the comments that were made: Many discussed specific aspects of the plan rather than larger issues. In addition, because the government had clearly decided to expand aquaculture, both supporters and opponents may have shaped their comments in the service of larger strategic goals, for example, to make the best of a decision already taken or to push the boundaries of the government's proposal. Finally, many of the respondents have worked on this issue for years and, in not-so-large Norway, frequently know each other: Submissions may include a subtext that is not accessible to the outside researcher. In short: these comments are just one set of indicators for the industry's social acceptance.

### 5.1. The submissions

The invitation to comment on a DWP is general and anyone may respond although submissions from important actors may be actively solicited. This time the Ministry specifically invited 57 relevant stakeholders to comment on the DWP. It received 58 responses, including one submission of “no comment” (the Ministry of Justice and Public Safety); 57 responses are accordingly analyzed here. Despite the similar numbers, the pool of responders differed slightly from the list of those invited. [Table 1 below indicates the actors and organizations that commented in this round of hearings.]

All the responses are available on the website of the Norwegian government.<sup>4,5</sup> Examination of a selection of key hearings about farmed and wild salmon between 2003 and up to and including the 2014 hearing round (10 hearings, including both invited and responding

<sup>4</sup> Regjeringen.no, at: <https://www.regjeringen.no/no/dokumenter/horin-g-melding-til-stortinget-om-vekst-i-norsk-lakse-og-orretoppdrett/id2076332/>, Last accessed on 4 April 2019.

<sup>5</sup> All county and municipality names used here are those used at the time of the DWP. Since then several counties and municipalities have been combined and names have changed. The number of coast municipalities given here applies to the 2014–2015 period when the DWP was circulated for comment.

**Table 1**  
Stakeholders submitting comments<sup>a</sup>.

| Governmental Bodies  | Category total |
|--|----------------|
| State Level: ministries and agencies   | 7 [6]          |
| The Norwegian Environmental Agency (Miljødirektoratet)   |                |
| Norwegian Food Safety Authority (Mattilsynet)  |                |
| Ministry of Justice and Public Security (Justis- og beredskapsdepartementet) (statement of no comment)             |                |
| The Government Pension Fund (Folketrygdfondet)   |                |
| Directorate of Fisheries (Fiskeridirektoratet)   |                |
| Institute for Marine Research (Havforskningsinstituttet)   |                |
| Norwegian Veterinary Institute (Veterinærinstituttet)  |                |
| County Councils (Fylkeskommune, elected locally)   | 5              |
| Finnmark   |                |
| Møre og Romsdal  |                |
| Nordland   |                |
| Sogn og Fjordane   |                |
| Troms  |                |
| County Governors (Fylkesmannen, appointed by the government)   | 4              |
| Hordaland  |                |
| Nordland   |                |
| Rogaland   |                |
| Sør-Trøndelag  |                |
| Municipalities (City or Local Governments)   | 2              |
| Alta   |                |
| Hammerfest   |                |
| Association of Municipalities  | 1              |
| Network of Fjord and Coastal Municipalities (Nettverk fjord- og kystkommuner)                                      |                |
| Sami Parliament of Norway (Sametinget, ST)   | 1              |
| Aquaculture companies and seafood companies  | 7              |
| Alsaker Fjordbruk A/S  |                |
| Bremnes Seashore A/S   |                |
| Cermaq   |                |
| Coast Seafood A/S  |                |
| Grieg Seafood ASA  |                |
| Marine Harvest (now known as MOWI)   |                |
| Salmar   |                |
| Industry associations (aquaculture or with strong aquaculture components)  | 6              |
| The National Association of Fishery and Aquaculture Businesses (FHL - Fiskeri- og Havbruksnæringens landsforening) |                |
| Hardanger Fjord Association (Hardangerfjordlauget)   |                |
| Norwegian Seafood Association (NSL - Norske Sjømatbedrifters Landsforening)  |                |
| Salmon Group (locally owned aquaculture businesses)  |                |
| Confederation of Norwegian Enterprise - Nordland (NHO NORDLAND)  |                |
| Norwegian Industry (Norsk Industri)  |                |
| Producers of closed facilities, and equipment and services providers   | 5              |
| Akva Design  |                |
| Brilliant Buildings (Byggutengrenser)  |                |
| Fishfarming Innovation A/S   |                |
| Pharmaceutical Industry (Legemiddelindustrien)   |                |
| NORCEM AS (Cement)   |                |
| Fishing Industry   | 3              |
| Norwegian Coastal Fishers' Union – Service Office (Norges Kystfiskarlag - Kystfiskarlagets servicekontor A/S)      |                |
| Norwegian Fishers' Union (Norges Fiskarlag)  |                |
| Nordland Fishers' Union (Nordland Fylkes Fiskarlag)  |                |
| Labor organizations  | 5              |
| The Norwegian Veterinary Association (Den Norske Veterinærforening)  |                |
| Norwegian Union of Municipal and General Employees (Fagforbundet)  |                |
| Norwegian Union of Food, Beverage and Allied Workers (Norsk Nærings- og Nytelsesmiddelarbeiderforbund)             |                |
| Norwegian Confederation of Trade Unions -National Organization (LO, Landsorganisasjon Norge)                       |                |
| The Norwegian Society of Graduate Technical and Scientific Professionals (Tekna)                                   |                |

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(continued on next page)

Table 1 (continued)

| Governmental Bodies   | Category total |
|---|----------------|
| Riverbank owners, salmon focused groups, and hunting and fishing interests                      |                |
| Alta Salmon Fishing Interest Association (Alta Laksefiskeri Interessentselskap)                 |                |
| Norwegian Federation of Hunters and Anglers (Norges Jeger- og Fiskeriforbund)                   |                |
| Norwegian Salmon Rivers (Norske Lakseelver)   |                |
| SalmonCamera (wild salmon and trout interest organization)                                      |                |
| Sogn Council for Wild Salmon (Sogn Villaksråd)  |                |
| Environmental NGOS (ENGOS)  | 5              |
| Bellona   |                |
| Nature & Youth and Friends of the Earth, Norway (Natur og Ungdom og Naturvernforbundet)         |                |
| Friends of the Earth, Norway, Hitra-Frøya Chapter (Naturvernforbundet Hitra-Frøya)              |                |
| Friends of the Earth, Norway, West Finnmark Chapter (Naturvernforbundet Vest-Finnmark Lokallag) |                |
| World Wildlife Fund (WWF)-Norway  |                |
| Research  | 2              |
| Norwegian Institute for Nature Research (Norsk Institutt for Naturforskning)                    |                |
| NOFIMA (Applied research in fields of fisheries, aquaculture and food research)                 |                |
| Total Reponses (Total with Ministry of Justice and Public Security)                             | 57 [58]        |

<sup>a</sup> Note that all names of municipalities and counties are those that were in effect at the time the DWP was circulated. Several counties and municipalities have since been merged with others.

stakeholders) indicates that most of the usual suspects (those who were invited to comment or who did comment 5 times or more in the 2003-14 period) made up the majority of the 57 who commented on the DWP. Fewer municipalities (2 of 276 coastal communities and of the 160 communities that then hosted aquaculture sites), county councils (5 of 17 coastal counties) and county governors (4 of 17 coastal counties)<sup>6</sup> responded than might be expected given the importance of the industry and its presence along most of the coast (11 p. 2). No universities were invited to comment or did so; the same is true of individual researchers. Table 1 indicates that the business community is strongly represented among the respondents, with the aquaculture and associated industries particularly well represented. Compared to the hearings reviewed for this study, the large number of responses by individual aquaculture firms is unprecedented.

## 5.2. Coding the responses

Each submission was read closely by both researchers (one a native speaker of Norwegian). The views expressed were evaluated holistically and coded with respect to two sets of questions. First, what concerns about the industry does the submission express? Second, does the respondent support the growth of the industry at the level the government envisioned, or at some lesser level?

Coding for concerns and for attitudes about growth involved two different methods. In both cases, however, the documents were approached in a holistic manner, with emphasis on interpretation and researcher judgement. Qualitative Comparative Analysis tools (NVIVO), which also call for judgement calls by the researcher, were explored, but

<sup>6</sup> The category is wide-ranging; encompassing instances where the issue was clearly deemed important, but did not stand out enough to be classified as a “main concern”, as well as instances (in lengthy submissions) where the issue was not presented as urgent, yet filled too much space to be reasonably categorized as “broached”.

the added informational value from this work was assessed to be minimal: the submissions varied greatly in format and length. How explicitly or subtly they invoked previous policy documents or other relevant context also varied greatly, making word counts/document size a very poor indicator of strength of concern or issue salience. The analysis must also accommodate the fact that the primary intended audience for these documents is the ministry: it is an advantage to have the submissions be written for the same intended audience, in that it makes them comparable on a “tonal” level.

The process of identifying the concerns expressed in the submissions proceeded in two stages. The first stage was inductive: all submissions were read and the concerns of each stakeholder noted. This process yielded seven general categories of closely related concerns and led to the development of a set of search terms for each category. All responses were then scanned for each set of key words to ensure that all stakeholders sharing that concern were identified. The submissions mentioning each issue were then reviewed and categorized for the degree of emphasis placed on the issue. An issue was a “main concern” if it was the most central message of the submission. An issue was “broached” by a submission if it was mentioned in passing, or otherwise given very little weight. Between the two, a category of “intermediary concern” comprises those submissions that emphasized the issue, but where it was not given priority placement.<sup>5,7</sup> The seven resulting (environmental and/or socio-economic) “concern clusters” were: Management (general), control/oversight, small producers’ interests, fish welfare/mortality, technology development/inland facilities, id-tagging/genetic traceability, and non-salmonid wild species. Discussion of these topics is indicated by the use of bold text in the discussion that followed. [Table 2 lists the key words used to identify stakeholders expressing a concern that fell into one of the seven categories; further information is found in Table A.1.1–A.1.7 in Appendix 1.]

Coding the views of the responses with respect to the writers’ views on the growth of the industry was more difficult. As noted, the government did not ask this question. Accordingly, only some submissions contained direct statements as to whether the respondent supported growth and to what degree. Other respondents were more reticent, and their positions were derived from a holistic reading of the submission and by using Wittgenstein’s concept of family resemblances. As Barrenchea and Castillo [61] explain, such an approach is useful in creating sets when boundaries among them are not clear. The family resemblance approach permits membership in a set “based on the underlying attributes that shape their boundaries” ([61] p. 108). Barrenchea and Castillo further refine the family resemblance concept into four types: here we employ what they term “family resemblance-individually sufficient structure” in which there “no necessary attributes” and “individual attributes are sufficient for concept membership” ([61] p. 111). The attributes in question here are positions taken in the submissions with respect to a series of issues.

Again, researchers proceeded in a two-stage process. In the first, inductive phase, researchers read all submissions and identified positions and topics that tended to cluster together creating group profiles or groups with family resemblances. Submissions were then re-read from the perspective of six proposed family profiles; a process by which the family profiles were refined, and submissions were assigned to a specific family. A complete description of the family profiles is listed in Table A2, in Appendix 2. In brief, the six families are:

1. Hard Yes: These submissions include those with an explicit statement of support for growth, especially at the pace or to the degree

<sup>7</sup> The DWP “especially asked” for (“ber spesielt om”) comments regarding the suggested models (including whether commenters agreed that salmon lice and “effluents” were suitable indicators), and comments regarding the organization (including distribution method for new permits), size and location of the new PAs.

**Table 2**  
Concern clusters and search terms.

| Concern                                      | Exact search terms  | Search term translations  |
|--|---|---|
| Technology development/<br>inland facilities | lukkede anlegg, lukket merd, teknologi, konkurranse, landbasert, utvikling, innovasjon  | Closed facilities, closed cages, technology, competition, land based, development, innovation   |
| ID-tagging                                   | ID-merking, merking, chip, fettfinne, individ, sporing  | ID-tagging, tagging, chip, adipose fin, individual, tracking  |
| Attention to smaller producers               | Små og mellomstore, mindre produsenter, selskap, eierskap, struktur.  | Small and medium size, smaller producers, company, ownership, structure   |
| Management                                   | Forvaltning, samarbeid, kontroll, autoritet, fragmentering, myndigheter, fylkesmann, fylkeskommune, direktorat, tilsyn, departement, kommune, kommunal. | Management, cooperation, control, authorities, fragmentation, government, county governor, county government, directorate, audit, department, municipality, municipal |
| Control/oversight                            | Konsekvens, håndheving, kontroll, tilsyn, ettersyn, myndigheter   | Consequence, enforcement, control, audit, oversight, authorities  |
| Wild non-salmonids                           | Ville bestander, villfisk, fiskere, reker, rekefelt, torsk, hyse, sei, kveite.  | Wild stocks, wild fish, fishers, shrimp, shrimp fields, cod, haddock, saithe, halibut   |
| Fish health/welfare                          | Fiskehelse, velferd, sykdom, svin, etikk/etisk, dødelighet  | Fish health, welfare, disease, loss, ethics/ethical, mortality  |

suggested by the government. The industry organization National Association of Fishery and Aquaculture Businesses (FHL) wrote the strongest statement in support of industry growth. Other submissions in this category shared different mixtures of positions similar to those of the FHL.

2. Optimist: These submissions include those with an explicit statement in favor of growth, although not necessarily at the government's pace or amount and often acknowledging challenges that need to be and can be addressed. These submissions and other submissions in this category shared different mixtures of the positions similar to those that made explicit statements.
3. Lean yes ("hedgers"): These submissions include those with general statements in support of growth, but in a clearly more cautious form, such as suggesting a slower pace of growth or to a lesser degree. They recognize important challenges the industry needs to overcome.
4. Lean no ("skeptics"): These submissions include those expressing conditioned disagreement with the goal of the growth of the industry. These submissions, and those without explicit statements, share different mixtures of similar concerns and positions.
5. Pessimist: This category includes submissions that clearly express doubt that sustainable growth can be achieved under any of the alternative plans outlined in the DWP. They stop short, however, of an explicit, flat statement against allowing growth. These submissions and others in the family shared different mixtures of similar concerns and positions.
6. Hard No: This category encompasses the few submissions that make explicit statements that the industry should not be allowed to expand at all. The submissions otherwise shared many characteristics of the "pessimist" family.

For some submissions, it was not possible to detect the attitude towards growth. The lack of clear statements was, however, also interpreted as the lack of a clear message to the government for or against the proposed policy and therefore unlikely to significantly affect policy.

## 6. Results

### 6.1. The spread of concerns

The following is an overview of the concerns with aquaculture that were voiced in the hearing round. The "concern clusters" are not a list of what the various actors are most concerned about. Rather, these are concerns that several commenters felt needed to be addressed *other than* those that the DWP asked them to address.<sup>7</sup> Since the government excluded most socio-economic concerns, those issues dominate the summary table below [Table 3]. Two sets of issues, area usage (not in the table) and wild salmon concerns (represented in the table) require further explanation and are dealt with below.

#### 6.1.1. Environmental concerns

Most respondents accepted the government's emphasis on salmon lice, escapes and pollution and effluents. Their views on these issues, however, varied. Those actors most concerned for wild salmon (river-bank and salmon fishers' associations, *Norwegian Institute for Nature Research*, the *Norwegian Environmental Agency* and ENGOS) were very concerned about the impact of escapes on wild salmon stocks. Several submissions raising such concerns cited the Scientific Advisory Council for Salmon Research's characterization of escapes and genetic interaction and salmon lice as "non-stabilized and existential threats"<sup>8</sup>; the use of the term "non-stabilized" in the submissions, was here taken to indicate doubt that the proposed plan presented a suitable solution to these problems. The *County Governor of Sør-Trøndelag*, where aquaculture is plentiful, stated unusually clearly that he "could not see that it was right to allow further growth in the aquaculture industry before problems including escaped fish and salmon lice are solved."<sup>9</sup>

Many (but not all) in this set of stakeholders were not satisfied with the government's solution to the problem of escaped fish (fishing out the escaped fish); many who did not think escapes of farmed fish could be made into a useful indicator in the new system still considered the problem to be significant and corrective action of some sort necessary, even if it meant deviating from the premises of the management plan. Those who doubted that escapes or salmon lice were enough under control to allow for the steady, substantial expansion of the industry, were joined by the state agency with responsibility for wild salmon (the *Norwegian Environmental Agency*).

Some of the difficulties presented by the escape of farmed fish might be tackled through the use of **ID-tagging and/or ensuring the genetic traceability** of farmed fish. Such tagging was mentioned in nine submissions. Tagging or traceability of individual fish, for example, would help answer questions about where these fish go when they escape, a matter of some debate. It would also make it possible to accurately place blame for escapes, an answer to the "collective punishment" dilemma (discussed below). Developing and/or requiring the ability to trace escaped farmed fish was advocated by all five ENGOS, two wild-salmon organizations (*Norwegian Salmon Rivers* and *Salmon Camera*), the wild-salmon focused research institution *NINA* – and by one aquaculture company *Cermaq*, which stated that the fish "must be traceable in the future". A third (sizable) category of wild-salmon concerns was the risk of other infections – for instance, *The Norwegian Environmental Agency*, *The Norwegian Veterinary Institute*, *The County Governor of Sør-Trøndelag* and *Salmon Camera* were all concerned about the risk of disease spreading to wild salmonids, an issue not reflected in the government's

<sup>8</sup> e.g. *The Norwegian Federation of Hunters and Anglers*, the research institution *NINA*, *The Norwegian Environmental Agency*. *NINA* was particularly focused on wild salmon and the status of knowledge regarding the impact from aquaculture, and unequivocally identified salmon lice from aquaculture and escaped salmon as the two biggest population threats to wild salmonids.

<sup>9</sup> Fylkesmannen kan ikke se at det er riktig å tillate videre vekst i oppdrettsnæringa for problemene med blant annet rømt fisk og lakselus er løst.

**Table 3**  
Breakdown of 7 “concern clusters” by actor category and priority.

**Red field: main concern. Yellow field: intermediary concern. Grey field: issue broached. Green: there was a submission in this category but no mention of the relevant concern.**

Blank spaces indicate that after all submissions in the actor category were assigned a level of concern, no submissions remained to fill the box.

Numbers indicate the number of submissions in each category at each level of concern.

Environmental issues (or related) are set apart to the right of the table, separated by a double line.

| ACTORS  |                                     | Small/medium producers' interests |   |   | Management |    |   | Control/ oversight |   |    | Fish welfare/ mortality |   |                 | Technology/ inland facilities |   |                 | tagging/ genetic tracing |   |   | Wild non-salmonids |   |    |
|---|-------------------------------------|-----------------------------------|---|---|------------|----|---|--------------------|---|----|-------------------------|---|-----------------|-------------------------------|---|-----------------|--------------------------|---|---|--------------------|---|----|
|   |                                     | 1                                 | 2 | 1 | 1          | 8  | 1 | 4                  | 2 | 2  | 4                       | 2 | 3               |                               |   |                 |                          |   |   |                    |   |    |
| <b>Government (total) (19)</b>                                      |                                     | 1                                 | 2 | 1 | 1          | 8  | 1 | 4                  | 2 | 2  | 4                       | 2 | 3               |                               |   |                 |                          |   |   |                    |   | 2  |
| Governmental actors, subcategories                                  | National (ministries, agencies) (6) |                                   |   |   | 1          | 2  | 1 | 2                  | 1 | 2  | 3                       |   | 1               |                               |   |                 |                          |   |   |                    |   | 1  |
|   | County councils (5)                 | 1                                 | 2 |   |            | 3  |   | 1                  |   |    | 1                       |   |                 |                               |   |                 |                          |   |   |                    |   |    |
|   | County governors (4)                |                                   |   |   |            | 2  |   |                    | 1 |    |                         |   | 1               |                               |   |                 |                          |   |   |                    |   | 1  |
|   | Municipalities (2)                  |                                   |   |   |            |    |   |                    |   |    |                         |   | 1               |                               |   |                 |                          |   |   |                    |   |    |
|   | Association of municipalities       |                                   |   | 1 |            |    |   |                    |   |    |                         |   |                 |                               |   |                 |                          |   |   |                    |   |    |
|   | Sami Parliament                     |                                   |   |   |            | 1  |   |                    | 1 |    |                         |   |                 | 1                             |   |                 |                          |   |   |                    |   |    |
| Aquaculture companies (7)   |                                     | 1                                 |   |   | 2          | 2  |   | 1                  | 1 | 2  |                         | 1 |                 |                               | 3 |                 |                          | 1 |   |                    |   |    |
| Aquaculture industry associations (6)                               |                                     | 2                                 |   |   | 2          | 1  | 1 |                    | 2 |    | 1                       | 1 | 2               | 1                             | 1 | 2               |                          |   |   |                    |   |    |
| Producers of closed facilities, equipment and service providers (5) |                                     |                                   |   |   |            |    |   |                    |   |    |                         |   | 4               |                               |   |                 |                          |   |   |                    |   |    |
| Fishing industry (3)  |                                     |                                   |   |   |            | 1  |   |                    |   |    |                         | 1 |                 |                               |   |                 |                          |   |   |                    | 3 |    |
| Labor (5)   |                                     |                                   |   | 1 |            |    |   | 1                  | 1 | 1  | 1                       |   |                 |                               | 2 |                 |                          |   |   |                    |   | 1  |
| Riverbank owners, hunting and fishing groups (5)                    |                                     |                                   |   | 3 |            | 1  | 2 |                    | 2 |    | 2                       |   |                 | 1                             | 2 |                 | 1                        | 1 |   |                    |   | 2  |
| Environmental NGOs (5)  |                                     |                                   |   |   |            | 3  | 1 | 1                  | 2 |    | 1                       | 3 | 1               | 1                             | 2 |                 | 2                        | 2 | 1 |                    |   | 3  |
| Research Institutions (2)   |                                     |                                   |   |   |            |    | 1 |                    |   |    | 1                       | 1 |                 | 1                             |   |                 |                          | 1 |   |                    | 1 | 1  |
| <b>Totals</b>   |                                     | 4                                 | 2 | 5 | 5          | 16 | 6 | 2                  | 6 | 11 | 1                       | 9 | 10 <sup>1</sup> | 7                             | 5 | 14 <sup>2</sup> | 3                        | 3 | 3 | 3                  | 1 | 9‡ |

<sup>1</sup>Some of these submissions “broached” the health/welfare of cleaner fish only.  
<sup>2</sup> Some submissions that “broached” this issue did so particularly briefly.  
<sup>‡</sup> It is unclear whether *The Norwegian Veterinary Association*, which has been classified here as “broaching” the issue, meant to include non-salmonid fish when it expressed concern about aquaculture impact on “wild fish”.

indicator scheme.

Some organizations did not agree that other issues could be set aside or delayed. The ENGO *Nature and Youth & Friends of the Earth Norway*, and the riverbank/salmon fishers’ group *Norwegian Salmon Rivers*, argued for inclusion of the issue of fish feed, more focus on disease and parasite (other than sea lice) and a greater focus on area use. They supported their position with reference to the 2009 “strategy for an environmentally sustainable aquaculture industry”, written by the Ministry for Fisheries and the Coast. That document identified five areas of concern: 1) genetic interaction and escapes, 2) pollution and effluents,

3) disease, including parasites, 4) area use, and 5) fish feed resources [62].

The strength of stakeholder concern about pollution and effluents (*utslipp*) is especially difficult to characterize because the DWP recognized that monitoring these was important, and it deemed relevant indicators to be suitable to the management scheme ([8] p. 43). However, pollution and effluents were described as a *future* challenge for which an indicator “should be developed” ([8] p. 46). In response to this mixed message, some submissions (e.g. *Alta Salmon Fishing Interest Association, Sogn og Fjordane County Council, Nordland County Council, Nature and*



Youth & Friends of the Earth Norway) expressed their support for the development of an effluents-indicator without much urgency – as if that matter were settled. With one partial exception<sup>10</sup>, the County Governors were notably skeptical of this: *The County Governor of Nordland* made it clear that the effluents-indicator was needed “from the start”, *The County Governor of Rogaland* said that the vagueness of the DWP made comments difficult, and *The County Governor of Hordaland* said that the DWP “trivializes” [“*bagatelliserer*”] pollution from the aquaculture industry. The Hordaland governor was concerned, specifically, about hydrogen peroxide and other delousing chemicals/medication – and about copper, which is used to clean the nets, but is poisonous to other fauna, and does not break down. They (and others, e.g. *Troms County Council*) pointed out that use of these agents has grown dramatically in recent years, and that there is very little knowledge about their impact. The fishing industry organizations were also very clearly (and unanimously) worried about this pollution – most urgently, about delousing chemicals (e.g. hydrogen peroxide) that also kill other crustaceans. The *Norwegian Fishers’ Union* wanted future delousing strategies to have to consider the risks to marine species.

Some commenters expressed concern for **wild non-salmonid species** – but only the three fishing industry organizations held this as a main concern, and the others pointed in different directions. The fishing industry warned that there was a severe lack of knowledge about effects of aquaculture<sup>11</sup> and of delousing agents on marine species such as shrimp, redbait (“*raudåte*”), saithe and cod. *Nordland Fishers’ Union* wanted Norwegian authorities to monitor diseases among wild fish like they monitor salmon lice and escaped fish. *Norwegian Fishers’ Union* wanted wild non-salmonids and crustaceans to be discussed and considered in the White Paper, and *Norwegian Coastal Fishers’ Union* wanted feeding- and spawning areas to be considered when the production areas were made. There were disparate concerns for other species. *NINA*, *The Directorate of Fisheries* and *Tekna* were mainly concerned with the fate of “cleaner fish” (these are often captured in the wild and have very high mortality rates in the pens), and *Nature and Youth* and *Salmon Camera* referred only to crustaceans. The World Wildlife Fund (*WWF*) problematized using wild fish for fish feed as a resource issue.

### 6.1.2. Socio-economic concerns

Socio-economic concerns voiced in the submissions tended to relate directly to the proposed plan (as opposed to the industry in general), often, with an eye towards maximizing beneficial “ripple effects” of aquaculture for local communities. The *Norwegian Environmental Agency* – whose legal responsibility it is to ensure that wild salmonid stocks produce a harvestable surplus – was not at all confident that the government’s plan would achieve that goal, raising concerns about the tourism industry. *The Norwegian Union of Municipal and General Employees* wanted the government to focus more explicitly on “social sustainability” and referred to “aquaculture municipalities’ unhappiness with the lack of ripple effects”. The *Norwegian Confederation of Trade Unions (LO)* wanted more attention paid to aquaculture-related education and more apprenticeships from the industry, and *The Sami Parliament of Norway* pointed out that there was no assessment of the possible impact aquaculture might have on their indigenous culture.

Area usage concerns were difficult to distinguish from production area issues but were also closely linked to several other issues, making them difficult to disentangle and summarize. First, they linked to ripple effects concerns. How would local communities (which make decisions about aquaculture sites) benefit from the planned growth? For many, the answer was from “consideration” (financial compensation) paid to local communities (and the state). *Troms County Council*, *Hammerfest*

*municipality* and the *Network for Fjord and Coastal Municipalities (NFKK)* wanted host municipalities to receive payments for use of the area on a yearly basis. *NFKK* is one organization, but it had 55 member municipalities in 2012 (*NFKK* submission).

Area usage and ripple effects also linked to the questions of area use conflicts and the transfer of what have been considered common areas to private use. This was manifested in the concrete concern expressed by the three fishing industry organizations that aquaculture already took up too much space – and that with the planned growth, “area conflicts will be far more comprehensive in the future” (*Norwegian Coastal Fishers’ Union*). The issues raised by the fishers also show that they feared the area use by aquaculture industries would transcend the specific locality, since the operation of cages in marine waters would affect wild stocks (behavior, health and quality) beyond the boundaries of those cages. The fear that the aquaculture industry would take too much space was countered by the strong statement of concern on the part of some important representatives of the aquaculture industry<sup>12</sup> (and the environmental foundation *Bellona*) that they would not gain access to enough new areas for the anticipated growth. The area issue also linked back to the issue of fees or revenue from the aquaculture industry: if commons areas were to be transferred, the community would have to clearly benefit – and user fees were a clear way of insuring this.

Many (and a variety of) respondents<sup>13</sup> contested the justness of making decisions at the production area level that would affect all operators in the PA, regardless of how conscientious any given operator was. This was sometimes styled as “collective punishment” – especially (but not exclusively) by aquaculture industry actors.

Eleven submissions voiced concerns about **consolidation/corporate structure**, suggesting that the proposal advantaged larger firms over medium and small firms and might drive further consolidation of the industry. This was a main topic for industry organizations that represent many smaller producers (*Norwegian Seafood Association* and *Salmon Group*), as well as for the aquaculture company *Coast Seafood AS*. *Sogn and Fjordane County Council*’s submission was very similar to that of *Salmon Group*, and even referred to that organization. Two other county councils raised concerns along the same lines, and the topic was briefly broached by another five submissions – three of which were riverbank/salmon fishers’ organizations. *Salmon Group*, an association of small business owners, made a plea that the government be more considerate of the needs of the pioneers of the industry in Norway.

Twenty-seven submissions brought up current and prospective **management** issues with respect to the new regime. Three producers and two producer organizations<sup>14</sup> in particular voiced their unhappiness with the current management, which they saw as overwrought – *The Hardanger Fjord Association* took a particularly hostile position towards current management. Conversely, the ENGO *WWF* (and others) argued that there had not been a thorough enough assessment of the consequences of such a radical change to the management framework. The governmental agency that would play a major role in the implementation of the management plan, the *Directorate of Fisheries*, warned that the new regime might require new management structures and more resources.

<sup>12</sup> *National Association of Fishery and Aquaculture Businesses, Salmon Group, Alsaker Fjordbruk A/S, NHO.*

<sup>13</sup> This group was composed of 5 aquaculture firms (Alsaker, Bremnes, Cermaq, Grieg and Salmar), 3 industry associations (National Association of Fishery and Aquaculture Businesses, Hardanger Fjord Association, and Norwegian Seafood Association), 2 ENGOs (Bellona, Nature and Youth and Friends of the Earth, Norway), 2 county councils (Nordland and Sogn og Fjordane), 1 municipality (Alta), 1 labor organization (Tekna) and 1 riverbank/salmon fishers’ association (Norwegian Salmon Rivers).

<sup>14</sup> e.g. the aquaculture firms *Alsaker Fjordbruk A/S, Salmar, Marine Harvest/MOWI, and the business associations The National Association of Fishery and Aquaculture Businesses, Salmon Group.*

<sup>10</sup> *The County Governor of Sør-Trøndelag* provided advice on how the presumed indicator should be developed.

<sup>11</sup> Including effects of behavioral change in wild fish.

Relatedly, WWF, Troms County Council and the labor organization Tekna were among 19 commenters that argued that more government **control/oversight** of the industry was needed. The major aquaculture firm *Marine Harvest* (now known as MOWI) emphasized the need for “independent [lice] counting teams”, though they did not address possible sanctions for being over the limit. *The Directorate of Fisheries* raised the oversight issue by pointing out that the data obtained from fish farmers’ self-reporting would be a critical factor in the new system. *The Norwegian Veterinary Association* wanted to double the frequency of mandatory controls of fish health.

The professional association *Norwegian Veterinary Association (DNVF)* was the only commenter to raise **farmed-salmon health and welfare**<sup>15</sup> as a main concern although the riverbank/salmon fishers’ organization *Norwegian Salmon Rivers* also voiced its concern for the well-being of farmed salmon. Both DNVF and the government agency *The Norwegian Veterinary Institute* argued that fish health and -welfare or fish loss should be included as a part of the action rules for future growth, with DNVF stating that allowing producers with repeated high losses to grow was “ethically difficult to defend.” The research organization NINA was concerned with the welfare of the “cleaner fish” that are set out to eat lice off farmed salmon.

The lack of attention in the plan to **technology development** – mainly concerning **inland/closed facilities** technology – came up frequently, in both socio-economic- and environmental contexts. A total of 26 submissions registered their interest in technology development in one way or another. Beyond the four companies specializing in aquaculture facilities, many others argued that closed facilities (on land or in the water) were the best solution for mitigating the industry’s future environmental impact – as they would eliminate the threat to wild fish. This was one of the main concerns for both *Norwegian Salmon Rivers* and WWF. Others who were notably concerned with technology included *The County Governor of Hordaland*, *Nordland County Council*, *Friends of the Earth Norway Hitra-Frøya chapter* (fish-tagging technology), *Salmon Group* (closed facilities for smolt production), and the research organization *Nofima*. Technology development in general was a main concern for the industry organization *Norwegian Industry* which argued that the government’s plan did not account for the technology that would be needed to reach production goals in a sustainable way.

## 6.2. Growth

Categorizing submissions with respect to whether and to what degree the responding agencies and organizations supported large-scale growth was, as noted, complex. Our coding produced 54 submissions that could be categorized and yielded a breakdown that gave a slight edge to the supporters; 28-25 (including “in-between” submissions). Four submissions took no discernible position on the issue.

Twenty-two submissions seemed **supportive** of the growth of the industry given current technology and conditions. Explicit embrace of the five-fold expansion was less frequent. *The National Association of Fishery and Aquaculture Businesses (FHL)*, however, described the goal as “moderate”– and several submissions from the aquaculture sector expressed broad agreement with the FHL submission (*Cermaq*, *Grieg Seafood*,<sup>16</sup> *Salmar*, *Norwegian Industry*, *NHO Nordland*). Seven of the supporters were very ardent [“hard yes” in Table 4, above] – all were aquaculture companies and industry associations. The other 15 supporters (the “optimists”) were somewhat tempered by the

circumstances. They comprised the remaining aquaculture industry submissions, the *Government Pension Fund*, *The National Confederation of Trade Unions*, 1 (of 2) municipalities (*Hammerfest*), the *Organization of Coastal Municipalities*, and 4 (of 5) county councils. Foremost among the latter was the *Sogn og Fjordane County Council*, who suggested that the local fjord designated as a “national salmon fjord” (where aquaculture is currently restricted) be opened to aquaculture.

Nineteen submissions clearly **opposed** the growth – but only two expressed this with no discernible hint of compromise (“hard no”). Another 17 “pessimists” opposed industry growth under current circumstances and (broadly) in the foreseeable future; taking the position that the existing problems of the industry precluded any talk of expansion at present. Except for *Bellona*, environmental- and salmon fishing organizations were either a “hard no” [1] or “pessimists” [8]. The fishing industry was also unequivocally opposed to growth – 1 “hard no” and 2 “pessimists”. The remaining “pessimists” were the research institution NINA, *The Norwegian Environmental Agency*, *Finnmark County Council*, The Governors of *Sør-Trøndelag* and *Hordaland*, and *The Norwegian Veterinary Association*.

Twelve submissions were (even) subtler and more convoluted – but nevertheless gravitated discernibly toward support or opposition. The “in-between”-space was evenly balanced: 6 “skeptics” leaned “no” – they appeared to agree that industry growth was possible, at least in principle – but suggested conditions for allowing growth that they indicated it would be very difficult to meet at present. Six “hedgers” leaned “yes” and were very cautiously *supportive* of industry growth at present. The governmental sector comprised more than half of the “in-betweeners”: 5 “skeptics” (*The County Governors of Nordland* and *Rogaland*, *Alta Municipality*, *The Sami Parliament of Norway* and the *Norwegian Food Safety Authority*), and 2 “hedgers” (*The IMR* and the *Directorate of Fisheries*). Other in-betweeners were the “skeptical” *Norwegian Union of Food, Beverage and Allied Workers* and the “hedgers” firm *AkvaDesign A/S*, *The Norwegian Union of Municipal and General Employees*, the labor organization *Tekna* – and ENGO *Bellona*, the only environmental organization to not clearly oppose growth.<sup>17</sup>

## 7. Discussion

This section discusses the above findings with respect to Wüstenhagen et al.’s [6] typology of social acceptance (socio-political, community and market acceptance) and with respect to the factors often identified in the literature as affecting social acceptance at the community level: 1) whether stakeholders are involved in decision-making in a meaningful way; 2) the provision of adequate and honest information about costs and benefits of the intervention, 3) perceptions of distributional justice (how costs and benefits are distributed), 4) the degree of disruption of traditional rights and access and, 5) the connection of local people to their land- or seascape. Interwoven among these are issues of 6) trust [6] which manifest themselves in a variety of forms. This section also comments specifically on these issues with respect to submissions that can be directly linked to Northern Norway.

Examination of the submissions did not yield comments directly related to participation issues [1]. The few relevant instances that are indirectly related are discussed here together with trust issues. Issues relating to distributional justice did surface in the submissions and are discussed together with issues of fairness other than those related to distribution per se. In practice, it was difficult to separate discussion of

<sup>15</sup> This issue was briefly mentioned in the DWP, as a “competitive advantage and (...) precondition for access to the markets of other countries” (p. 23) – but deemed a “production problem”, not suitable for determining production capacity growth (p. 44).

<sup>16</sup> *Grieg Seafood ASA*, while clearly supportive of growth (“hard yes”), added that the growth should be kept within “the growth capacity given by the market over time”.

<sup>17</sup> *Bellona* was concerned that the government have a clear strategy for reducing environmental impacts, but it was unclear whether the organization thought that the current proposal would provide these assurances. They (even) appeared to at least somewhat accept the five-fold target; arguing that the “challenge” was “to reduce the total environmental footprint further, so that a fivefold production increase does not lead to a fivefold increase in the total environmental footprint and resource use.” (p. 5).

**Table 4**  
Position taken on industry growth. (\* = one categorization is implied/tenuous).

| Actors<br>Category   | Actors                         |                                   | Oppose       |             | In-between               |                        | Support    |               | No Discernible<br>Position |
|--|--------------------------------|-----------------------------------|--------------|-------------|--------------------------|------------------------|------------|---------------|----------------------------|
|  | Total submissions,<br>category | Total submissions,<br>subcategory | “Hard<br>no” | “Pessimist” | Lean no<br>(“skeptical”) | Lean Yes<br>(“hedger”) | “Optimist” | “Hard<br>yes” |                            |
| Government   |                                | 19                                |              | 5           | 5                        | 2                      | 7          |               |                            |
| National   | 6                              |                                   |              | 2*          | 1                        | 2                      | 1          |               |                            |
| County councils  | 5                              |                                   |              | 1           |                          |                        | 4          |               |                            |
| County governors   | 4                              |                                   |              | 2           | 2                        |                        |            |               |                            |
| Municipalities   | 2                              |                                   |              |             | 1                        |                        | 1          |               |                            |
| Association of<br>Municipalities                                   | 1                              |                                   |              |             |                          |                        | 1          |               |                            |
| Sami Parliament  | 1                              |                                   |              |             | 1                        |                        |            |               |                            |
| Aquaculture companies  |                                | 7                                 |              |             |                          | 4                      | 3          |               |                            |
| Aquaculture industry associations                                  |                                | 6                                 |              |             |                          | 2                      | 4          |               |                            |
| Producers of closed facilities, equipment and<br>Service Providers |                                | 5                                 |              |             | 1*                       |                        |            |               | 3                          |
| Fishing industry   |                                | 3                                 | 1            | 2*          |                          |                        |            |               |                            |
| Labor  |                                | 5                                 |              | 1*          | 1*                       | 2                      | 1          |               |                            |
| Riverbank owners, hunting and fishing<br>groups                    |                                | 5                                 |              | 5           |                          |                        |            |               |                            |
| Environmental NGOs   |                                | 5                                 | 1            | 3*          |                          | 1                      |            |               |                            |
| Research Institutions  |                                | 2                                 |              | 1           |                          |                        |            |               | 1                          |
| Totals   |                                | 57                                | 2            | 17          | 6                        | 6                      | 15         | 7             | 4                          |

the disruption of traditional rights and access [4] from that of the connection of local people to their land and seascape [5] and these are discussed together under the heading of “area” issues.

### 7.1. Environmental issues

The government’s premise that the industry should be environmentally sustainable constitutes an implied social contract with the Norwegian public and the localities that would host aquaculture sites. All the submissions implicitly accepted this premise, by either explicitly agreeing with it or by not disputing it. Environmental sustainability is therefore treated here as the foundational condition for social acceptance. Divisions among the submissions had to do with whether or not the industry was or could be made environmentally sustainable. Many respondents explicitly or implicitly accepted the government’s framing of the environmental issues. However, a variety of organizations in several stakeholder groups were not satisfied with the government’s characterizations or solutions. The strongest concerns related to the fate of wild salmonids and marine life populations and these were pitched at the general level and in some cases, with respect to specific locations. Other submissions revealed widespread general concern in the form of broad if sometimes diffuse concerns about a variety of standard issues (salmon lice, diseases and other parasites, escapes, various kinds of pollution and effluents, and feed) that they felt the government’s proposal would not adequately address. The concern on the part of four county governors who suggested, that the DWP downplayed the significance of pollution and effluents or other issues, is especially interesting since county governors are political appointees who represent the national government at the county level and who monitor compliance with the various laws that govern the farmed salmon industry [12]. It is perhaps worth recalling in this context that *Norwegian Industry* complained that the government was paying no attention to the investments that would be required in technology and research in order to realize its growth goals. The submissions arguing that closed net technology was the way forward if the industry was to grow in an environmentally responsible manner at least implicitly supported this position.

Two groups of submissions, however, challenged the government’s assessment of the environmental risks from the opposite perspective: Aquaculture firms and associations and associations of related business

interests were impatient with the proposed plan’s approach to salmon lice, challenged the idea that salmon lice from farm sites and escaped farmed fish represented a major threat to wild anadromous fish and frequently expressed confidence that whatever environmental problems there were would be dealt with by the industry.

The responses from the agencies most directly involved with the management of wild salmon and salmon aquaculture indicate some differences of opinion among experts regarding the government’s proposal. The Ministry of Industry, Trade and Fisheries launched the plan but the *Norwegian Environmental Agency* (in the Ministry of the Environment<sup>18</sup>) made strong and clear statements in opposition to the proposed plan. More interestingly, the *Directorate of Fisheries* (housed in the Ministry of Industry, Trade and Fisheries) and the largely government-funded research institution *IMR*, expressed caveated and unenthusiastic support for growth. In addition, *Nordland County Council* (among others) pointed out<sup>19</sup> that the proposed management plan did not explicitly address how the new plan would incorporate the standards of The European Union Water Framework Directive (WFD) [63] which relates to watershed basin management and to which Norway is a party. The submission by the research organization *Nofima* was extremely limited given the occasion, but the significance of this is debatable; the *Norwegian Institute for Nature Research (NINA)* submitted a substantial (pessimistic) comment.

Those who raised concerns about the industry supported their position with reference to scientific research and previous governmental policies. Their fears may well reflect a predisposition to be suspicious of technology and for reverence for nature [17,18] or they may arise out of a desire to protect their businesses, but their arguments in these documents are anchored in science and policy; they are neither particularly emotional, nor particularly reliant on anecdotal, local knowledge. That

<sup>18</sup> Now named the Ministry of Climate and Environment.

<sup>19</sup> The Norwegian Environmental Agency, the Government Pension Fund, County Governor in Hordaland, Friends of the Earth, Norway -West-Finnmark; others mention need to be in conformity with the EU Water Directive: the Governor of South Trøndelag, The Norwegian Federation of Hunters and Angler and Norwegian Fisher’s Union. The Institute for Marine Research noted that Norway lacked the monitoring reference stations required to apply the Water Directive to this management plan.

said, while the largest environmental organizations in Norway are represented in the submissions, the most critical civil society organizations (animal-oriented and environmental), such as the Green Warriors of Norway [64], the Animal Protection Alliance [65] and NOAH (an animal rights organization) [66] did not submit comments and were not analyzed. Judging exclusively by the responses submitted, it was the position of the aquaculture industry's representative that stands out as at odds with generally accepted scientific knowledge (discussed further below).

### 7.2. Socio-economic concerns: Distributional justice and area issues

All those submitting responses seemed to assume that the industry would generate value. *Hammerfest municipality* acknowledged aquaculture as one of the most important value-creating industries along the coast. There was, however, little discussion in the DWP of the concrete socio-economic effects the industry would generate along the coast, such as the number and quality of jobs created either directly or by associated (service and supply) industries. The *Finnmark County Council* pointed out that there had been no study of the socio-economic impacts of the plan. Questions raised in submission about who would benefit from the growth of the industry are here discussed as aspects of distributional justice, a factor often important for community acceptance [6,20,26,27,32]

Issues relating to value creation were frequently discussed in the submissions in connection with other issues. First, many respondents, including three county councils and smaller firms (including their representatives), expressed the fear that three components of the plan (i.e. how new concessions would be allocated, specific rules about whether companies could move their production quotas among production zones and using the production area as the basis for decision-making) would advantage large companies over smaller firms. Several made the point that innovation and local value creation comes disproportionately from smaller companies, including industries that supply and service the aquaculture industry. This was sometimes explicitly linked to a notion of fairness. It is noteworthy that the *Norwegian Union of Food, Beverage and Allied Workers* protested that the processing industry was overlooked by the plan. It is also interesting in this connection to note that the increased immigrant presence in coastal communities that fish processing and related coastal industries have brought with them [9,67] was not mentioned.

The potential value creation of aquaculture also linked to two other tightly-connected issues that more directly relate to distributional justice: the privatization of the commons and the payment of fees to municipalities (and sometimes County Councils). Aquaculture companies' use of what have been common areas was only in a few cases treated as a matter of principle (*Nordland County Council* for example, considered this a question of rights with respect to coastal area): instead municipalities and some county councils made a strong case that such privatization of common areas could only be justified if the locality directly benefited from it. *The Network of Fjord and Coastal Municipalities (NFKK)* is a strong case in point. It argued that it would be hard for municipalities to prioritize area use for aquaculture if the municipality did not get something in return. Interestingly, the fishing industry was opposed to these fees, apparently fearing that it would be out bid.

The potential damage to the tourism industry that an increase in aquaculture production might bring was seldom discussed: only a few submissions directly brought up the tourism industry and impacts on riverbank/salmon fishers' interests explicitly. However, this is an old debate in Norway and the connection between potential harm to anadromous stocks and the interests of these groups is widely understood in the country. The confidence of the government and the industry that harm to wild anadromous stocks could be successfully managed by

a larger industry was, however, not shared by the economic group that saw its interests threatened: the riverbank/salmon fishers' organization.

One intersection between environmental and issues of fairness and justice does not quite fit the distributional justice concept, but it is potentially highly problematic and worth noting. The production area approach at least potentially requires making decisions about growth in the industry based on the industry's cumulative impact on the area. While the measures of such impact are very circumscribed in the management scheme, the wide-spread opposition to making all operators in the area subject to area-wide decisions is striking. This is an attitude that can stand in the way of making any carrying capacity measurement an indicator for management decisions.

Issues relating to connection to land- and sea-scapes were infrequent and seldom explicit. None of the submissions discussed aquaculture from the perspective of what Hanes [22] calls amenity migrants, or those who move to an area, either as permanent residents or cabin or vacation-home owners, for aesthetic or similar reasons. There were no complaints that aquaculture sites would disfigure the landscape, or that aesthetically displeasing facilities would inhibit tourism.

Three groups, however, did make points that seem related to identity if not aesthetics. First, and most importantly, the Sami Parliament expressed concern for potential interference with the traditional ways of life of this indigenous people and that their uncatalogued heritage sites might be disturbed as the industry expanded. Second, the iconic, and culturally significant coastal fishing industry was clearly concerned that its operations would be disrupted by a larger aquaculture industry. Finally, riverbank owners and salmon fishers were very much concerned for the fate of wild salmon (and sea trout). While the concerns of riverbank owners may relate to business, recreational fishing has a strong aesthetic and emotive aspect [68]. The concerns of ENGOs might also be related to aesthetics, as suggested by those who find the opposition of ENGOs to be ideological [17]. The concerns expressed by local chapters (*Friends of the Earth Hitra-Frøya* and *Friends of the Earth West-Finnmark*), who are among the strongest opponents of industry expansion, may originate in strong connections to place and land- and sea-scape. The *Hitra-Frøya* chapter is located in an area with a substantial aquaculture presence, and the *West-Finnmark* chapter is located in an area into which the industry seeks to expand production. However, none of these organizations explicitly addresses aquaculture issues in identity or aesthetic terms. The relative lack of identity and aesthetic issues in these submissions does not necessarily mean these are unimportant in Norway; it may mean that responding to the management plan was not the occasion on which to make such arguments.

### 7.3. Reliable information

Previous research has suggested that general acceptance for the industry also rests upon acceptance at the local and national levels (including among the general public) that information about the industry, including scientific information, is reliable and trustworthy [6,29,31,69]. That there has been some question in Norway about the reliability of available information is suggested by the *Morgenbladet* articles. Many of the submissions, however, built on reports provided by Norwegian research agencies such as the National Scientific Advisory Council for Salmon Research and the Institute for Marine Research, suggesting general acceptance of available scientific work.

There was an important exception, however. The scientific work upon which the government and many others relied had two important functions. It provided the basis of assessments of the environmental impact of the industry and also underlay the models that would be used to monitor lice. A strong attack on the relevant science came from the industry. The submission by the *National Association of Fishery and Aquaculture Businesses (FHL)* argued that

“[S]molt on their way to the sea are picking up salmon lice that come from wild stocks of sea trout and salmon. ... this means that counting salmon lice on wild salmon and sea trout cannot be used as an indicator for environmental impact of lice from aquaculture facilities. In clear text, this means that there is no scientific basis for the use of the model that the Institute for Marine Research believes that it can develop to measure the potential environmental impact of salmon lice from aquaculture. It is anyway entirely clear that the basis of the ministry’s proposal – that there is a strong connection between the amount of farmed fish and the effect of salmon lice on stocks of wild anadromous fish, especially sea trout, is not correct. It is therefore also scientifically wrong that « salmon lice (from aquaculture) is a suitable indicator (our translation).”<sup>20</sup>

This leading industry representative (supported here explicitly by the large companies Salmar and Marine Harvest/MOWI and in a general way by others) accordingly opposed not just the specific proposed number of permissible lice on wild anadromous fish, but the idea that the lice are an industry problem and the IMR approach to researching the issue.

Two other issues relate to the availability of reliable and trustworthy information. First, some submissions included statements that information was lacking in key areas and some suggested that existing monitoring capacity was inadequate to the task, inhibiting an adequate analysis of the potential impacts of an expanded industry. Second, some submissions expressed a lack of confidence in industry reporting on escaped fish. This is discussed as an issue of trust, below.

#### 7.4. Trust issues

Much social acceptance literature touches directly or indirectly upon the need for trust with respect to social acceptance [6]. Trust issues did emerge in the submissions, although these were usually fairly subdued and raised with respect to a variety of issues. Perhaps the clearest expression of basic lack of trust in the unfolding process of policy development came from the fishing industry: its three submissions suggested that the government was deliberately avoiding the issue of impact of lice treatments on non-salmon wild stocks). However, the industry attack on the scientific research can be interpreted as a lack of trust in the government and researchers.

There are some hints that issues relating to trust and legitimacy might extend beyond the fishing and aquaculture industries: Because the Norwegian regulatory system has become steadily more indicator-based ([70] p. 283) and depends partially on internal controls and self-reporting by aquaculture firm, the trustworthiness of the industry is also important for social acceptance. Some environmental NGOs pointed out that the aquaculture industry was responsible for reporting escapes, and that these were systematically and significantly underreported, perhaps by a factor of five (*Nature and Youth & Friends of the Earth Norway*; WWF; *Alta Salmon Fishing Interest Association*) – basing this statement on the 2013 *Risk Analysis* by the Institute for Marine Research ([36] p. 83). Even so, this theme was not taken up in most submissions. In this context, it is can be speculated that the *FHL*-led attack on the science underlying the government’s proposal would erode the trust that ENGOS

<sup>20</sup> At man ikke har dokumentert at lakselus fra oppdrettsanlegg betyr noe, antyder at utvandrende smolt pådrar seg lakselus som kommer fra ville bestander av sjøørret og laks. Dette betyr igjen at å telle lakselus på villaks og sjøørret ikke kan brukes som indikator på miljøpåvirkningen av lus fra oppdrettsanlegg. I klartekst betyr dette det ikke er noe faglig grunnlag for å bruke modellen som HI mener å kunne utvikle til å måle en eventuell miljøpåvirkning av lakselus i oppdrett. Det er i alle fall helt klart at det som departementet bruker som premiss for sine forslag, om at det er en sterk sammenheng mellom mengden oppdrettsfisk i sjøen og lakseluspåvirkningen på ville laksebestander, særlig sjøørret, ikke er korrekt. Det er således også faglig feil at “lakselus (fra oppdrett) er egnet som indikator” *FHL* submission, page 17).

and riverbank/salmon fishers’ organizations have in at least some industry actors. There were some suggestions in the submissions that the government was more interested in growing the industry than a real discussion of sustainability (*Norwegian Union of Municipal and General Employees, Finnmark County Council*), which can also be interpreted as a sign that these actors did not have confidence that the government was operating in good faith.

#### 7.5. Socio-political and community acceptance

A previous study suggested that a lack of enthusiasm for aquaculture on the part of Norwegian municipalities may hinder the expansion of Norwegian aquaculture, especially on the scale anticipated [13] and more generally, perceptions of aquaculture affect its acceptance [5]. Some of the commenters made this point explicitly, for example *Hammerfest Municipality* and the *Norwegian Union of Municipal and General Employees (NFKK)*, using the term “social contract”. The *NFKK* opened its submission by pointing out that it spoke for municipalities that had the power of determining area use – and tied the transfer of commons to private hands to the payment of yearly fees to the municipality. *Troms County government* noted that government wanted growth, and many were turning to the north as a place to expand – but warned that without adequate return to the municipality, it was increasingly difficult to prioritize aquaculture over other uses. It pointed out that having a concession would not matter unless the concession-holder could secure a site.

The submissions analyzed here do not seem to add up to an immediate danger of a widespread withdrawal of acceptance for the industry at the local level because of environmental or socio-economic concerns. Our findings suggest that the *NFKK* communities and one of the two municipalities that submitted a comment were optimistic; the vast majority of coastal communities may at least tacitly accept the government’s plan by not explicitly opposing it. However, the findings do suggest that support for the industry at the local level is conditional. The primary issue for municipalities in general is whether the benefits of the industry will be shared with local communities, which accords with earlier findings ([12] p. 52) and other findings in the social acceptance literature. However, it is striking that while no municipality flatly opposed aquaculture, there was no rush by municipalities to embrace either the new management plan or the ambitious plan of growth. Given that riverbank owners, recreational fishers and environmentalists were generally skeptical of the aquaculture industry’s expansion, the low number of submissions by individual municipalities could also indicate that disagreement at the local level inhibited responses.

The county level is also relevant to the question of geographically-anchored social acceptance. Here we see that popularly-elected county councils, which have important roles in assessing applications for concessions and which can be veto points in their approval, were generally optimistic about the growth of the industry (4 of the 5 that commented). While not all coastal county councils responded (5 of 17), the number and content of submissions by these elected bodies do not suggest that a strong challenge to the existing industry or its expansion will be forthcoming from these in the near future – with the key caveat, again, that local areas would have to directly benefit. County governors, who evaluate whether plans and concessions conform to the various national laws, including the law on biological diversity, were notably less optimistic about growth, although not all responded (4 of 17 with marine coastlines; 4 of the 9 which host aquaculture). The county governor, however, cannot veto an application on the basis of environmental issues ([12] p. 51).

At the national level, there is the question of general socio-political acceptance of the industry, that is, whether there is willingness at the generalized national level to not just accept but to actively facilitate the growth of the industry. Such willingness rests in part upon general public opinion. The aquaculture industry is concerned with its reputation and how the industry is represented in the news media [14,43], in

part an expression of the fear that social acceptance (as represented by public opinion) for the industry might be vulnerable. The submissions did not allow for evaluating public opinion. They did allow for an assessment of acceptance from the perspective of whether a national coalition of actors agrees that the industry can legitimately be described as environmentally sustainable (as the government asserts) and beneficial to the country. Nineteen of 57 submissions unambiguously expressed some opposition to growth. This constellation of doubters represents a broad spectrum of the Norwegian public that will have to be satisfied over the longer term, including the fishing industry, the most economically significant of these.

There was also substantial support for the government's ambition for growth and these actors represent a dynamic industry representing value creation far higher than that of its rivals. Discussion of these is best done with reference to what Wüstenhagen et al. [6] characterizes as market acceptance.

### 7.6. Social acceptance in northern Norway

The expansion of the aquaculture industry is expected particularly to affect Northern Norway, a region that at the time of the DWP had fewer sites relative to most other areas of the coast. This makes the question of social acceptance on the part of actors from this region particularly important. Several submissions are clearly from actors from Northern Norway (although others may have a Northern Norwegian component): The *County Councils of Finnmark, Nordland and Troms*; the *County Governor of Nordland*; the municipalities of *Alta* and *Hammerfest*; the *West-Finnmark chapter of Friends of the Earth, Norway*; the *Nordland Coastal Fishers' Association* and the riverbank/salmon fishers' association *Alta Salmon Fishing Association*. The *Sami Parliament* represents an indigenous group particularly numerous in Northern Norway although Sami are found throughout the country. The Sami Parliament is located in Karasjok (Kárášjohka), a town straddling the boundary between the former counties of Nordland and Troms. The Nordland chapter of the business association *Confederation of Norwegian Enterprise (NHO-Nordland)* represents aquaculture interests in the area. While the question here is primarily about whether non-industry actors are receptive, its submission remains relevant.

Almost all of the Northern Norwegian organizations express at least some concerns with respect to the industry. Even so, the *Nordland* and *Troms County Councils* and *Hammerfest Municipality* were optimists with respect to the growth of the industry. Other actors from Northern Norway were less enthusiastic or opposed. *Alta Municipality* and the *Sami Parliament* were classified as skeptical (leaning no) but the *Finnmark County Governor*, and *Alta Salmon Fishing Association* were classified as "pessimistic". The *West-Finnmark chapter of Friends of the Earth* and the *Nordland Coastal Fishers' Association* were the only two to be classified as a "hard no". *NHO-Nordland* on the other hand, was grouped together with those who supporting the "hard yes" position.

The submissions reveal a split in Northern Norway with respect to the foundational question about whether the industry is or can be made environmentally sustainable. Concerns about the environment have a distributional edge to them: environmental impacts of the aquaculture industry would likely damage the interests of coastal fishers and riverbank/recreational salmon fishers. However, these interests may not be appeased by an increase in fees paid to localities and possibly not by increased employment resulting from the growth of the industry in the area or other economic benefits. This is especially likely to be the case if there are greater issues of identity and aesthetics connected with these actors than their submissions on this occasion revealed. The support for growth from the popularly elected county councils of *Nordland* and *Troms* and *Hammerfest Municipality* suggest that there is a constituency

for growth in the North, but the opposition of others suggests that the acceptance of aquaculture facilities will be an issue of local politics in the future.

### 7.7. Market acceptance

Market acceptance refers to the willingness of consumers and investors to accept the innovation – in this case, the policy goal of industry expansion under the proposed plan [6]. In this context, market acceptance refers to the views of the industry since the hearing process did not solicit consumer views. Instead, the DWP left issues of demand to the industry to decide. The submissions analyzed showed overt support for the government's growth ambitions the industry supported by national business organizations and labor unions. The pro-growth aquaculture industry presented a more consolidated and spirited block compared to opponents and doubters, as indicated by the ratio of "hard yes" to "hard no" (7-2).

However, industry support for the proposed plan under which growth was to take place generated much less enthusiasm and much direct criticism. *FHL, Salmon Group* and the *Norwegian Union of Food, Beverage and Allied Workers*, among others complained that the proposed standards did not go far enough in laying the foundation for predictable and economically viable growth and stressed the priority of access of the industry to new areas. The quarrel many of industry actors had with using salmon lice as an indicator and their down-playing of the escaped fish issue fit into a general pattern of impatience with restraints placed upon the industry. The objections to current management raised by, for example, *Hardanger Fjord Association* among others, and the discomfort on the part of wide variety of industry actors with respect to the possible impact of the proposed plan on the profile of the industry within the country support the conclusion that there is strong industry acceptance for the growth of the industry – but distinctly less enthusiasm for the new management plan.

## 8. Conclusion

This paper found that many of the factors associated in the social acceptance literature are useful in understanding the social acceptability of substantial growth in the aquaculture industry in Norway. Of particular salience were issues of distributional justice, the existence of reliable information, the degree of disruption of traditional rights and access and the connection of local people to their land- or seascape. While importance of stakeholder participation is widely recognized, issues relating to participation were not much reflected in the submissions analyzed. The lack of participation issues and the relatively little mention of identity and aesthetic issues may reflect more the circumstances in which the submissions were written than the importance of these issues.

Many actors had real concerns about the industry, including environmental concerns that the government deemed relevant and some it did not deem relevant as well as socio-economic concerns the government sought to exclude from consideration. While concerns were real and widespread, there does not seem to be enough explicit and concentrated opposition to threaten the industry's social acceptance, particularly at the local level. Support for substantial future growth will require that the government pay attention to the concerns raised by stakeholders, especially those related to distributional justice and fairness.

If the key potential bottleneck is the willingness of local municipalities to host sites, the security of the industry's social acceptance has been enhanced by subsequent efforts to make the arrangement more appealing to localities. The government announced that payments from

the Aquaculture Fund, funded largely by the sale of concessions, would be made to host municipalities. After the first set of concession allocations, the government announced that approximately 160 municipalities are to share a pot of 2.7 billion NOK (about 308 million USD). Payments will range from an outlier of 103 million NOK (11.8 million US dollars) to Frøya municipality in Trøndelag county to a low of 563 thousand kroner (about 64 thousand USD) for Surnadal municipality, in Møre and Romsdal county [71]. The government also addressed concern about the future profile of the industry: In the first and primary round of concession sales 40% of the increase in production went to small and medium-sized firms [72].

**Declaration of competing interest**

The authors declare that they have no conflicts of interest.

**CRediT authorship contribution statement**

**Jennifer L. Bailey:** Conceptualization, Methodology, Validation, Investigation, Writing - original draft, Writing - review & editing, Visualization, Supervision, Funding acquisition. **Sigrid Sandve Eggeride:** Conceptualization, Methodology, Validation, Investigation, Writing - original draft, Writing - review & editing, Visualization.

**Appendix 1. Further comments on coding concern clusters**

These tables (A.1.1-A.1.7) provide additional information regarding the coding of the concern clusters and the assessment as to whether the submission raised the issue as a main, intermediary or “broached” concern.

**Table A.1.1**

| Addressed management (27 submissions) |   | Coding comments:   |
|---------------------------------------|---|--|
| <b>Main concern [5]</b>               | A) Directorate of Fisheries<br>B) Hardanger Fjord Association<br>C) Alsaker Fjordbruk A/S<br>D) Salmar ASA<br>E) Salmon Group   | A) Extensive treatment of management concerns; warned that the new regime might require new structures and more resources for management.<br>B) through E): Aquaculture industry actors raising management as a main concern – out of the 7 concern clusters, this was the most common “main concern” for these actors. All made it clear that they were unhappy with what they considered to be <i>over</i> management. B) took a particularly hostile position towards what they considered to be an overwrought management regime; this was effectively the only subject of the 3-page submission.  |
| <b>Intermediary concern [17]</b>      | A) Norwegian Food Safety Authority<br>B) WWF-Norway<br>C) Friends of the Earth, Norway, Hitra-Frøya Chapter<br>D) Norwegian Industry<br>E) County Governor of Nordland<br>F) County Governor of Sør-Trøndelag<br>G) Friends of The Earth, Norway, West Finnmark chapter<br>H) Nordland County Council<br>I) Troms County Council<br>J) The Norwegian Environmental Agency<br>K) Norwegian Fishers’ Union<br>L) Sami parliament of Norway<br>M) Sogn and Fjordane County Council<br>N) The National Association of Fishery and Aquaculture Businesses<br>O) Norwegian Federation of Hunters and Anglers<br>P) Cermaq<br>Q) Marine Harvest (MOWI) | These submissions were generally difficult to categorize, and there are borderline cases in both ends of the “intermediary concern”-category:<br>A) through D) were at the <i>high</i> end; bordering on “main concern”. The work of A) would be central to the new management regime, and they argued extensively that more attention had to be paid to several aspects of this. B) and C) had major environmental concerns related to management.<br>B) argued at length that current management was in no way up to the task of ensuring an environmentally sustainable industry (and were pessimistic about the prospects of the new regime). The central management concern in C)’s submission involved a change of management from allowances of “biomass” to allowances of individuals, in conjunction with demanding that individual farmed fish be traceable back to their producer. Management was a central concern to D) in that they argued that management should be used more actively to stimulate the aquaculture “business cluster”.<br>M) through Q) were on the <i>low</i> end of “intermediary”. Their management concerns largely resembled those of the aquaculture industry actors in the “main concern” category – but were <i>far</i> less central to the submissions, and voiced with less urgency. |
| <b>Broached [5]</b>                   | Salmon Camera<br>Bellona<br>Institute of Marine Research<br>NINA<br>Norwegian Salmon Rivers   |  |

**Table A.1.2**

| Addressed control/oversight (19 submissions) |   | Coding comments:   |
|--|---|--|
| <b>Main concern [2]</b>                      | A) WWF-Norway<br>B) Marine Harvest (MOWI)   | A) Began the submission by citing the Office of the Auditor General of Norway; focused throughout on the importance of, and urgent need to improve, government control and enforcement.<br>B) Had as a main focus the monitoring part of the new regulation; emphasizing that there must be independent lice counting teams. No mention of enforcement.  |
| <b>Intermediary concern [6]</b>              | A) Tekna<br>B) Troms County Council<br>C) Norwegian Food Safety Authority<br>D) Salmar ASA<br>E) Sami Parliament of Norway<br>F) Directorate of Fisheries | Three border cases were difficult fits for this “intermediary” category:<br>Both A) and B) argued fairly extensively for more government control; the distinction between these and the “main concern” is (somewhat hesitantly) based on the relative amount of space and sense of urgency devoted to the topic.<br>F) raised the oversight issue by pointing out that the data obtained from fish farmers’ self-reporting would be a “critical factor in the new system”. While this was nearly coded as a “broach”, the submission ultimately ended up in the “intermediary” class because of its specificity and the urgency signaled by “critical factor”. |

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Table A.1.2 (continued)

| Addressed control/oversight (19 submissions)   | Coding comments: |
|--|------------------|
| <b>Broached [11]</b><br>Friends of the Earth, Norway, Hitra-Frøya Chapter<br>Alsaker Fjordbruk A/S<br>Bellona<br>The Norwegian Veterinary Association<br>Grieg Seafood A/S<br>The County Governor of Sør-Trøndelag<br>Sogn Council for Wild Salmon<br>Norwegian Salmon Rivers<br>The National Association of Fishery and Aquaculture Businesses<br>Institute for Marine Research<br>Salmon Group |                  |

Table A.1.3

| Addressed the interests of smaller producers (11 submissions)  | Coding comments:   |
|--|--|
| <b>Main concern [4]</b><br>A) Coast Seafood A/S<br>B) Norwegian Seafood Association<br>C) Salmon Group<br>D) Sogn and Fjordane County Council  | All 4 submissions addressed several aspects of the problematic, expressed concern that the proposal would favor large producers and argued that smaller producers should be prioritized. C) and D) gave nearly identical comments on this; D) also pointed out that most small producers in the county belonged to C).<br>A) also emphasized that small producers should be given the opportunity to <i>grow</i> . |
| <b>Intermediary concern [2]</b><br>A) Nordland County Council<br>B) Troms County Council   | A) and B) raised concerns similar to those described above, but with considerably less emphasis.   |
| <b>Broached [5]</b><br>Norwegian Union of Municipal and General Employees<br>Network of Fjord and Coastal Municipalities<br>Norwegian Federation of Hunters and Anglers*<br>Norwegian Salmon Rivers*<br>Alta Salmon Fishing Interest Association*<br>*Three of the submissions “broaching” this concern came from wild salmon interest organizations. The two national organizations gave very similar (brief) comments describing the potential for conflict between large and small producers that lay in the proposed new system. The local <i>Alta Salmon Fishing Interest Association</i> made only a passing reference to “consolidation” – although there was context to indicate that this may have been a veiled invocation of the same conflict potential. |  |

Table A.1.4

| Addressed technology development/closed facilities (26 submission)  | Coding comments:   |
|---|--|
| <b>Main concern [7]</b><br>A) AkvaDesign AS<br>B) Brilliant Buildings<br>C) Fishfarming Innovation AS<br>D) Norcem<br>E) Norwegian Industry<br>F) Norwegian Salmon Rivers<br>G) WWF-Norway  | A) through D) were statements by producers of closed/inland facilities.<br>E) focused heavily on technology development in general ( <i>not</i> closed facilities), in the industry and its supply chain.<br>Argued for increased funding of research and development.<br>F) and G) focused on closed facilities technology development as clearly the best way to control the industry’s environmental impact.  |
| <b>Intermediary concern [5]</b><br>A) Friends of the Earth, Norway, Hitra-Frøya Chapter<br>B) Nofima<br>C) Salmon Group<br>D) County Governor of Hordaland<br>E) Nordland County Council  | A) argued extensively and in detail for the development and implementation of new technology for individual tagging/tracking of farmed fish. This was so central that it was almost coded as a “main concern”; ultimately became “intermediary” because the submission argued that there were already existing ways to make fish individually traceable – their <i>main</i> concern was the ID-tagging as such, and arguing that fish farmers can and should be made to account for each individual fish.<br>B) “complementing production technologies” was one of two main headlines in this (very) short submission. Mentioned smolt/post smolt production and “feed technologies”.<br>C) Expressed optimism about “technology development” at some length/in some detail.<br>D) Described technology development as necessary to achieve the goal of zero escapes; asked for policy to encourage/support closed facilities.<br>E) Expressed support for policy that would encourage the development of closed facilities. |
| <b>Broached [14]</b><br>Alsaker Fjordbruk A/S<br>Alta Municipality<br>Norwegian Confederation of Trade Unions -National organization<br>Norwegian Federation of Hunters and Anglers<br>Tekna<br>Nature &; Youth and Friends of the Earth, Norway<br>Friends of the Earth, Norway, West Finnmark Chapter<br>Government Pension Fund<br>NHO-Nordland<br>Hardanger Fjord Association<br>Salmar ASA<br>Salmon Camera<br>Sami Parliament of Norway ( <i>barely</i> )<br>Grieg Seafood A/S*<br>There was a notably large number of “broaches” of technology development. While all were very brief, their tone followed a predictable pattern: Environmental/wild salmon interests, Alta Municipality and the Sami Parliament broached (closed facilities) technology development in environmental terms; others invoked technology in terms of facilitating <i>investment</i> . Some made only the faintest reference to technology development, with no allusion to the |  |

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Table A.1.4 (continued)

| Addressed technology development/closed facilities (26 submission) | Coding comments:  |
|--|---|
|  | potential environmental benefits.<br>* <i>Grieg Seafood A/S</i> reference to technology stood out as “techno-negative”: It warned that developments in closed facilities technology would undermine Norway’s competitive advantage, and asked the government to not encourage this. |

Table A.1.5

| Addressed wild non-salmonids (13* > * submissions) | Coding comments:   |  |
|--|--|--|
| <b>Main concern</b> [3]                            | Norwegian Fishers’ Union<br>Norwegian Coastal Fishers’ Union<br>Nordland Fishers’ Union  | This was (unsurprisingly) a <i>clear</i> “main concern” for all fishers’ unions; no other submissions emphasized this in a way that resembles these.   |
| <b>Intermediary concern</b> [1]                    | NINA*  | *NINA was very concerned about cleaner fish, which are often captured wild fish.   |
| <b>Broached</b> (9*)                               | County governor of Hordaland<br>Alta Salmon Fishers’ Interest Association<br>Nature &; Youth and Friends of the Earth, Norway<br>Friends of the Earth, Norway, West Finnmark Chapter<br>Salmon Camera<br>Directorate of Fisheries<br>Tekna<br>WWF-Norway (reference to harvesting wild fish for feed)<br>Norwegian Veterinary Association* | * It is unclear whether this submission should be coded here at all; the broach may be intended to refer only to wild <i>salmonid</i> fish.<br>General comment on the other broachers: Mentions were brief, but to the point. The County Governor of Hordaland is a good example: “We lack knowledge about [the spread of chemicals/medicines], and what effect these substances have on the bottom fauna underneath and close to the facility, and how they may affect other fauna, such as shrimp, crabs, and fish”. |

Table A.1.6

| Addressed ID-tagging/genetic tracing of farmed fish (9 submissions) | Coding comments:   |  |
|---|--|--|
| <b>Main concern</b> [3]   | A) Friends of the Earth, Norway, Hitra-Frøya Chapter<br>B) Friends of the Earth, Norway, West Finnmark Chapter<br>C) Norwegian Salmon Rivers | A)’s entire submission revolved around the necessity of tagging individual farmed fish and the implications of such a requirement for the management of the industry. Both B) and C) also argued that the ability to trace individual farmed fish was essential, and should be mandatory; this was one of several “main concerns” for these two.   |
| <b>Intermediary concern</b> [3]                                     | A) Nature &; Youth and Friends of the Earth, Norway<br>B) WWF-Norway<br>C) Cermaq  | Both A) and B) argued along the same lines as the actors above; insisting that traceability be made mandatory. The comments were judged to be somewhat less central to these submissions.<br>Unlike for other technology developments, there was not much overlap between interest groups. C) was the only non-environmental or wild salmon interest to address this concern: The aquaculture company brought up genetic tracking, and stated that the fish “must be traceable in the future”. |
| <b>Broached</b> [3]   | Nina<br>Bellona<br>Salmon Camera   |  |

Table A.1.7

| Addressed fish welfare/mortality (20 submissions) | Coding comments:  |   |
|---|---|---|
| <b>Main concern</b> [1]                           | The Norwegian Veterinary Association  | The only submission where this was a “main concern”. Argued that fish health and welfare should be a distinct action rule for future growth and that allowing producers with repeated high losses to grow was “ethically difficult to defend”.  |
| <b>Intermediary concern</b> [9]                   | A) NINA<br>B) The National Association of Fishery and Aquaculture Businesses<br>C) The Veterinary Institute<br>D) Salmar ASA<br>E) Friends of the Earth, Norway, West Finnmark Chapter<br>F) Tekna<br>G) Norwegian Salmon Rivers<br>H) The Norwegian Environmental Agency<br>I) Salmon Camera | A) Close to a main concern. Concerned about welfare of other species as well as salmon; emphasized “cleaner fish” in particular.<br>B) and D) argued that fish health was unsuitable as an indicator for determining growth; B) in particular did so at considerable length.<br>C) main fish health concern was the risk of disease spreading to wild fish. Also wanted loss to be an indicator for determining growth<br>E) coded “intermediary” because fish health was one of many concerns addressed in this very critical submission. Argued that farmed fish loss “must be an indicator [in a new system]; not least as an indicator of animal welfare”.<br>F) Fish health/welfare and risk of infection were invoked throughout this submission. Coded as “intermediary” rather than “main” concern because the overall “main” message of the submission is quite clearly supportive of the new regulation (alternative 3), suggesting that the fish welfare concerns were not decisive.<br>G) <i>Low</i> “intermediary”; this was one of many concerns. Specifically concerned about the welfare of farmed salmon<br>H) and I): Also <i>Low</i> “intermediary”. notably concerned about the risk of disease spreading to wild fish. |
| <b>Broached</b> (10*)                             | Bellona<br>Directorate of Fisheries<br>Norwegian Food Safety Authority<br>Friends of the Earth, Norway, Hitra-Frøya Chapter   |   |

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**Table A.1.7 (continued)**

| Addressed fish welfare/mortality (20 submissions)                              | Coding comments: |
|--|------------------|
| Nature & Youth and Friends of the Earth, Norway (mention of spread of disease) |                  |
| Nordland Fishers' Union (mention of spread of disease)                         |                  |
| Salmon Group   |                  |
| <i>Barely "broached":</i>  |                  |
| Institute for Marine Research  |                  |
| Nofima   |                  |
| Sogn and Fjordane County Government  |                  |

**Appendix 2. Family profiles for coding support for growth of the aquaculture industry**

The researchers coding the submissions with respect to support for the growth of the salmon aquaculture industry used a “family resemblances” approach. In this approach, submissions sharing similar but not identical profiles are grouped together. The following table is not a complete catalogue of all features of all submissions. Instead, it groups together the submissions that share the greatest number of similar features. Where classification is based on marginal criteria, this is indicated in the table.

**Table A2**  
Family Profiles

| “Hard Yes” Family Profile  |   |
|--|---|
| National Association of Seafood and Aquaculture Businesses (FHL) statement (includes explicit support for the VBPH goal of a five-fold increase in production within the year 2050), explicit support for FHL statement (no explicit objections to its content)                              | FHL + Grieg Seafood; Confederation of Norwegian Enterprise – Nordland; Norwegian Industry; Salmar   |
| Explicit statement in favor of growth under current and/or likely future conditions  | Alsaker Fjordbruk; Confederation of Norwegian Enterprise - Nordland*; FHL, Grieg, Norwegian Industry; Salmar<br>*in Northern Norway   |
| Little or no discussion of environmental constraints   | Alsaker Fjordbruk, Confederation of Norwegian Enterprise – Nordland; FHL; Grieg   |
| Statement that environmental issues (lice and escapes, especially) are under control, can be dealt with, no new measures are needed, the industry is not demonstratively to blame for these or that the issues are not that important (ie. Environmental issues are not a barrier to growth) | Alsaker Fjordbruk; FHL; Grieg, Salmar*<br>* in some areas additional nutrients (nærings-salter) can be beneficial   |
| Endorsement of METALICE report as throwing significant doubt on significance of salmon lice on farmed salmon for wild salmon   | Alsaker Fjordbruk; FHL; Salmar  |
| Stress on economic contribution of the industry, and/or importance of international competition  | FHL; Grieg; Confederation of Norwegian Enterprise – Nordland; Norwegian Industry; Salmar  |
| Stress on sustainability of industry compared to other food production industries  | Alsaker Fjordbruk; FHL; Salmar  |
| Criticizes management alternatives offered as too restrictive for industry (example: Caution against politicians setting goals, better left to industry)   | Alsaker Fjordbruk; FHL; Grieg Seafood; Hardanger Fjord Association; Salmar  |
| Focus on market conditions or administrative/regulatory conditions as reasons why growth has not occurred; market should set limits for growth   | Alsaker Fjordbruk; Hardanger Fjord Association; FHL; Confederation of Norwegian Enterprise – Nordland; Grieg Seafood*<br>*Grieg Seafood – market should set limits  |
| Stress on need to make more area available to industry   | Hardanger Fjord Association*; Salmar<br>*Wants national salmon rivers/watersheds to be reassessed for use in food production  |
| Members of family  | Alsaker Fjordbruk; Confederation of Norwegian Enterprise – Nordland; FHL; Grieg Seafood; Hardanger Fjord Association; Norwegian Industry; Salmar  |
| <b>Optimist Family Profile</b>   |   |
| Explicit support for growth (not necessarily the VBPH rate), but more attention to issues that must be overcome (more research needed, etc)  | Bremnes; Brilliant Buildings; Cermaq; Government Pension Fund; Hammerfest Municipality; Marine Harvest; Nordland County Council; Norwegian Confederation of Trade Unions; Norwegian Seafood Association; Salmon Group; Sogn & Fjordane County Council; Troms County Council                                 |
| Endorses an alternative for growth; but recognizes some gaps in the suggested alternatives – proposes adjustments/fixes; Recognizes some research/development of plan required   | Brilliant Buildings; Coast; Government Pension Fund; Norwegian Confederation of Trade Unions; Marine Harvest; Møre & Romsdal County Council*; Nordland Fylkeskommun; Sogn & Fjordane County Council; Troms County Council<br>*implied   |
| Support more permissive handling of areas classified as “Yellow” (for example, that individual operators be allowed to continue); stress on ability of individual actors to produce sustainably; against collective punishment/sanction/or want decisions at facility/operator level         | Bremnes; Cermaq; Coast Seafood; Marine Harvest; Norwegian Confederation of Trade Unions; Nordland County Council; Sogn & Fjordane County Council; Troms County Council*<br>*marginal  |
| Right management will allow industry to handle environmental challenges  | Brilliant Buildings; Bremnes; Marine Harvest; Salmon Group; Government Pension Fund   |
| Stress on the economic importance of the industry to the country and/or local communities  | Coast; Government Pension Fund; Hammerfest Municipality; Norwegian Confederation of Trade Unions; Marine Harvest; Nordland County Council; Salmon Group; Sogn & Fjordane County Council   |
| Wants more attention to distribution of socio-economic benefits of growth that will come; Concern for method/effects of distribution of growth/new licenses (for example mix of small and medium vs large companies)   | Coast Seafood, Hammerfest Municipality; Marine Harvest; Network of Fjord and Coastal Communities (NFKK); Norwegian Confederation of Trade Unions; Nordland County Council; Norwegian Seafood Association; Salmon Group; Sogn & Fjordane; Troms County Council   |
| Relatively more (compared to “hard no”) but still relatively little, discussion of seriousness of environmental (especially) or other issues   | Bremnes; Coast Seafood, Government Pension Fund; Hammerfest Municipality; Møre & Romsdal County Council; Salmon Group; NFKK   |
| No additional indicators required ... (or not mentioned)   | Bremnes, Coast Seafood, Government Pension Fund; Hammerfest Municipality; Norwegian Confederation of Trade Unions, Marine Harvest, Norwegian Seafood Association*, Sogn & Fjordane County Council, Møre & Romsdal County Council<br>*agrees that emissions indicator should be developed (as proposal says) |
| Family Members   | Bremnes; Brilliant Buildings*; Cermaq; Government Pension Fund; Hammerfest Municipality; Marine Harvest; Nordland County Council; Møre & Romsdal County   |

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Table A2 (continued)

| "Hard Yes" Family Profile  |   |
|--|---|
|  | Council; Network of Fjord and Coastal Communities (NFKK); Salmon Group; Sogn & Fjordane County Council; Troms County Council<br>* Brilliant Buildings shared other positions with pessimists, making this a marginal case   |
| Lean yes ("hedgers") profile   |   |
| At least cautious agreement with growth in industry, but brings up significant potential problems  | Akva <sup>1</sup> ; Bellona; Directorate of Fisheries <sup>2</sup> ; Institute for Marine Research; Norwegian Union of Municipal and General Employees (Fagforbundet)<br><sup>1</sup> implied<br><sup>2</sup> Explicitly skeptical about the VBPH goal (five-fold increase, or what that works out to per year) but more modest growth possible; supports modest, slower growth   |
| Selects one alternative as better than others, but recognizes significant gaps or strongly recommends adjustment   | Akva <sup>1</sup> ; Bellona; Fagforbundet; Directorate of Fisheries; Institute for Marine Research <sup>2</sup> ; TEKNA<br><sup>1</sup> implied; <sup>2</sup> "a step in the right direction"   |
| Discusses environmental issues as serious  | Akva; Bellona; Directorate of Fisheries; Institute for Marine Research; TEKNA   |
| Questions whether proposed mortality for salmonids under plan will be in accordance with international agreements  | Institute for Marine Research   |
| Argues for consideration of more indicators, but these might be introduced after plan in place; other problematic aspects of the management plan can be adjusted once plan in place                | Directorate of Fisheries; Institute for Marine Research   |
| Acknowledges that some areas are in bad condition, but points to areas where growth could be permitted   | Directorate of Fisheries; Institute for Marine research   |
| No additional indicators are needed before plan launched   | Institute for Marine research, TEKNA  |
| Family Members:  | Akva; Bellona; Directorate of Fisheries; Institute for Marine Research; Norwegian Union of Municipal and General Employees (Fagforbundet)   |
| Lean No – "skeptics" (profile) Similar to "hedgers" but on balance oppose growth   |   |
| Cautious disagreement with goal for growth (or failure to explicitly agree to growth; or growth if many adjustments to the management alternatives are made before implementation (unlikely))      | Alta Municipality, Norwegian Confederation of Trade Unions; Norwegian Union of Food, Beverage and Allied Workers (NNN); Sametinget<br>*growth in the industry should not be a goal it itself  |
| Finds significant gaps/issues with proposed management alternatives,   | Alta Municipality; County Governor of Nordland; County Governor of Rogaland; Norwegian Food Safety Authority; NNN; Sametinget, Norwegian Food Safety Authority; Sami Parliament   |
| Points to important lack of knowledge in significant area  | Alta Municipality; County Governor of Nordland; County Governor of Rogaland; Norwegian Food Safety Authority  |
| Argues for more indicators, or other adjustments to proposed plans – gaps/shortcomings are serious.  | County Governor of Nordland; County Governor of Rogaland  |
| Suggestion that proposed plans will make the environmental (especially) or other conditions worse  | NNN; Sametinget   |
| Acknowledges importance of industry, but does not stress   | County Governor of Nordland   |
| In trade-off between creating predictability for industry or reaching environmental goals, choose environmental goals  |   |
| Family Members:  | Alta Municipality, Norwegian Confederation of Trade Unions; Norwegian Union of Food, Beverage and Allied Workers (NNN)*; Sami Parliament<br>*NNN shared other positions with the lean no and optimist category, making this a marginal case   |
| Pessimist Profile  |   |
| Explicit statement of skepticism that conditions required for growth (especially environmental) can be achieved with proposed alternatives or with moderate adjustments to one or another of these | Alta Salmon Fishing Interest Association*, Nature and Youth & Friends of the Earth, Norway; Norwegian Coastal Fishers' Union<br>*Writing only about their area (Vest Finnmark)  |
| There is too little knowledge about some significant area  | County Governor of Hordaland; County Governor of Sør Trøndelag; Finnmark County Council; Norwegian Environmental Agency, Norwegian Veterinary Association; Norwegian Fishers' Union, Norwegian Coastal Fishers' Union; Norwegian Veterinary Institute; SalmonCamera; WWF  |
| Stress on damage already done under existing management regime/industry operation  | Alta Salmon Fishing Interest Association; County Governor of Hordaland; Finnmark County Council, Norwegian Coastal Fishers' Union; Norwegian Environmental Agency, Norwegian Federation of Hunters and Anglers; Norwegian Fishers' Union, Norwegian Institute for Nature Research (NINA); SalmonCamera; Sogn Council for Wild Salmon; Finnmark County Council; Nature and Youth & Friends of the Earth Norway; NINA; Norwegian Coastal Fishers' Union; Norwegian Environmental Agency; Norwegian Federation of Hunters and Anglers; Norwegian Fishers' Union; Sogn Council for Wild Salmon; Norwegian Veterinary Institute; WWF |
| Focus on specific environmental challenges and how serious they are (lice, escapes of farmed fish, etc. (includes statements that the number of escaped farmed fish are greater than reported))    | County Governor of Hordaland; County Governor of Sør Trøndelag; Nature and Youth & Friends of the Earth, Norway; NINA; Norwegian Fishers' Union; Sogn Council for Wild Salmon   |
| States problems that must be solved before growth to be permitted  | County Governor of Sør Trøndelag; Norwegian Environmental Agency; Norwegian Federation of Hunters and Anglers; Sogn Council for Wild Salmon; Friends of the Earth Hitra-Frøya; Norwegian Federation of Hunters and Anglers, Alta Salmon Fishing Interest Association; County Governor of Sør Trøndelag, Nature and Youth & Friends of the Earth, Norway; NINA; Norwegian Environmental Agency; Norwegian Federation of Hunters and Anglers; Norwegian Coastal Fishers' Union; Norwegian Veterinary Institute, WWF   |
| Evokes "Quality Norm for Wild Salmon" and/or "0-vision" for salmon   | Norwegian Federation of Hunters and Anglers; Norwegian Salmon Rivers  |
| Wants tagging/marking of all fish  |   |
| Wants (more) indicators to be developed before management plan put into effect   |   |
| Significant restructuring of the aquaculture industry required before growth to be permitted   |   |
| Failure of current practice/regulations to achieve legal requirements for management of salmon stocks; at least suggestion new management plan won't either  | Norwegian Environmental Agency; Norwegian Federation of Hunters and Anglers; Norwegian Salmon Rivers; WWF   |
| Failure of current practice/regulations to meet international obligations regarding salmonids  | Norwegian Environmental Agency, Norwegian Federation of Hunters and Anglers, SalmonCamera, WWF  |

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Table A2 (continued)

| "Hard Yes" Family Profile   |  |
|---|--|
| Clear statement that production volume of farmed fish is linked to environmental problems | Norwegian Federation of Hunters and Anglers, Sogn Council for Wild Salmon; SalmonCamera, Veterinærinstituttet  |
| Failure of current practice/regulations to achieve sustainable production                 | County Governor of Hordaland; Norwegian Environmental Agency; Norwegian Fishers' Union; Norwegian Veterinary Association; Salmon Camera; WWF;  |
| Invoke the Precautionary Principle (Føre-var)   | Nature and Youth & Friends of the Earth, Norway; Norwegian Federation of Hunters and Anglers; Norwegian Salmon Rivers, WWF   |
| Family Members:   | Alta Salmon Fishing Interest Association; County Governor of Hordaland; County Governor of Sør Trøndelag; Finnmark County Council, Friends of the Earth Hitra-Frøya*; Nature and Youth & Friends of the Earth, Norway; Norwegian Coastal Fishers' Union; Norwegian Environmental Agency; Norwegian Federation of Hunters and Anglers; Norwegian Fishers' Union.; Norwegian Institute for Nature Research (NINA); Norwegian Salmon Rivers; Norwegian Veterinary Association*; Norwegian Veterinary Institute; SalmonCamera; Sogn Council for Wild Salmon; WWF |
|   | *implied, marginal   |
| Hard No Profile   |  |
| Explicit statement that growth should not be permitted                                    | Friends of the Earth West Finnmark; Nordland County Fishers' Union   |
| Otherwise, these share much of "pessimist" group characteristics                          |  |

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.marpol.2020.103898>.

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