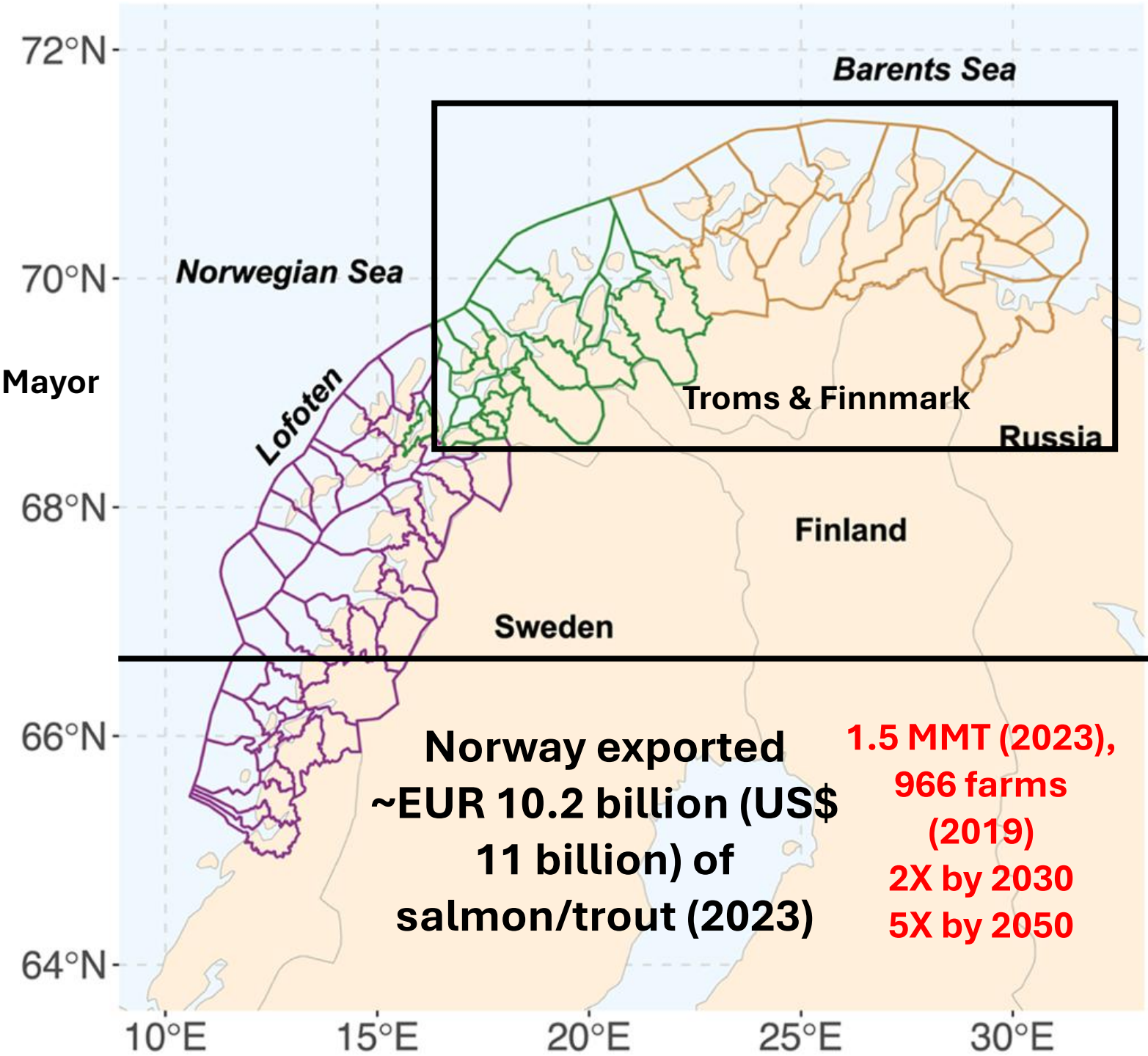
Norway Aquaculture

- Northern Norway
- 3 Counties…now 2
- Municipalities

Nordland County has 45 municipalities elect a County Council who elect a County Mayor



Aquaculture Act (1973)…revised many times

- In 2017, the coast was divided into

  13 aquaculture management areas

- Before 2002, licenses free (land-based licenses are free)

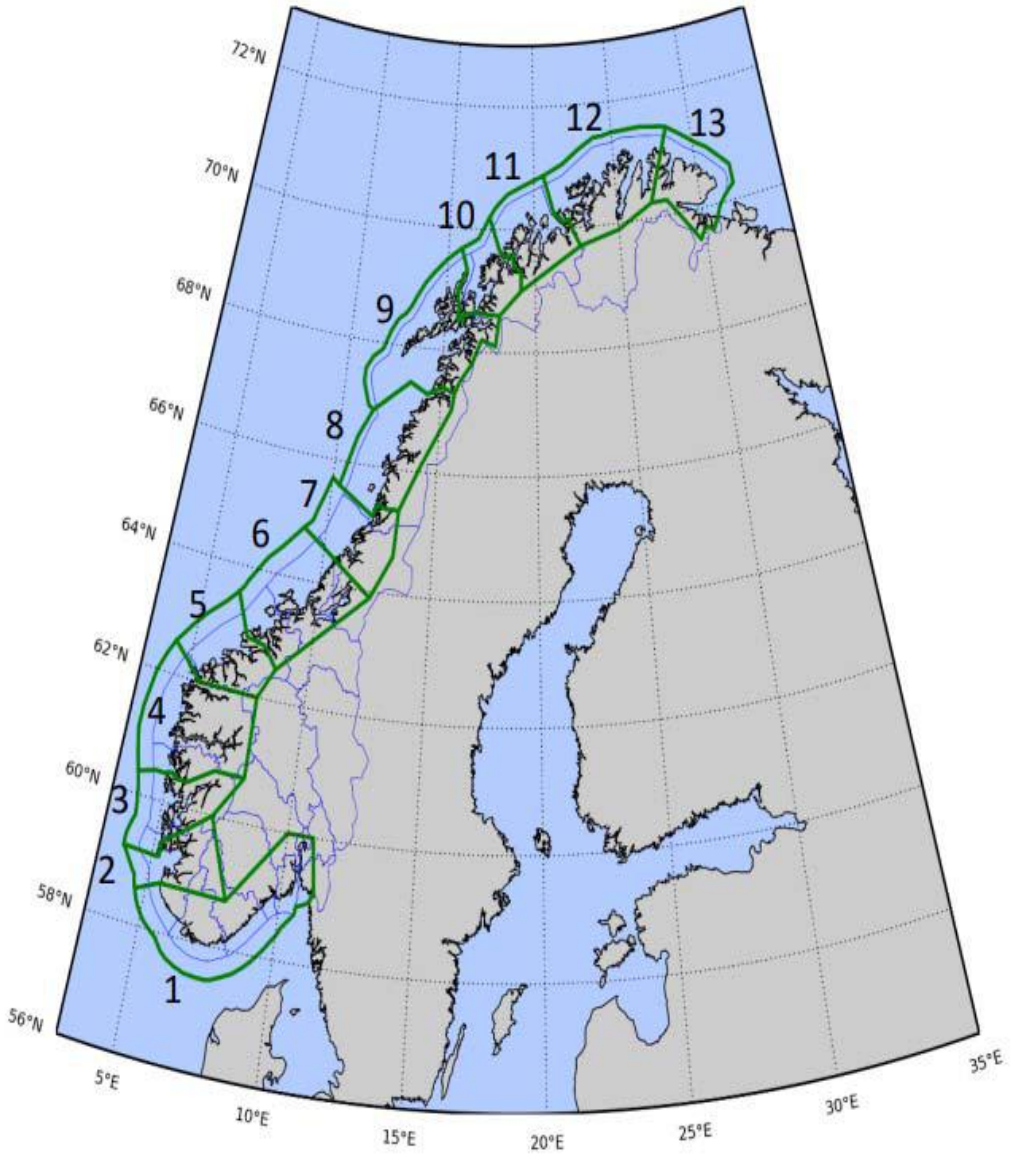
  From 2013, new **licenses auctioned**

  (now 2 to 10 mil NOK (Euro ~180,000 to 900,000)

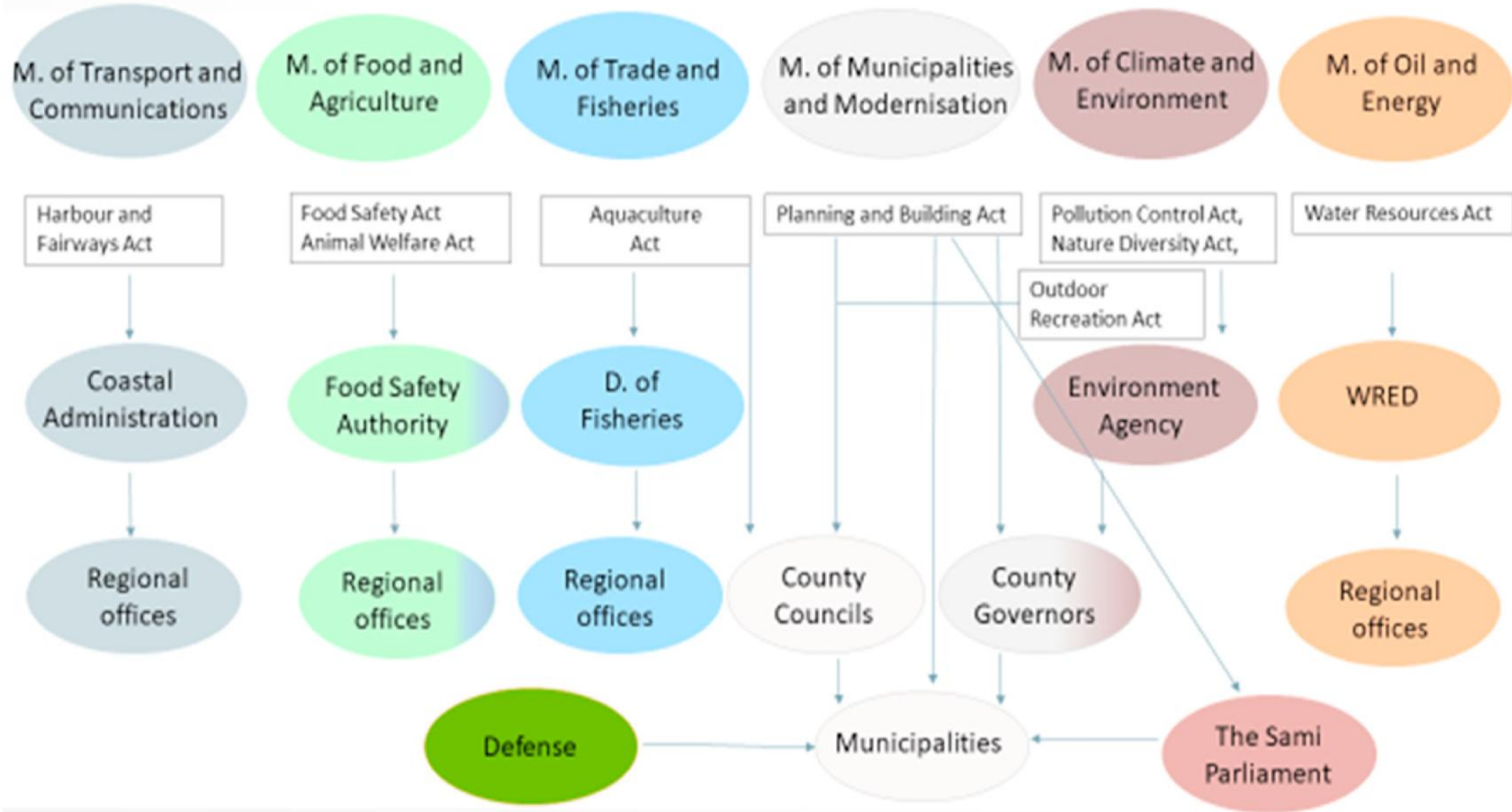
Aquaculture license has 2 parts

a company license to farm a specific species in a defined quantity (Norway Fisheries Directorate)

a location license gives the right to farm a specific quantity of fish at a single location (County)

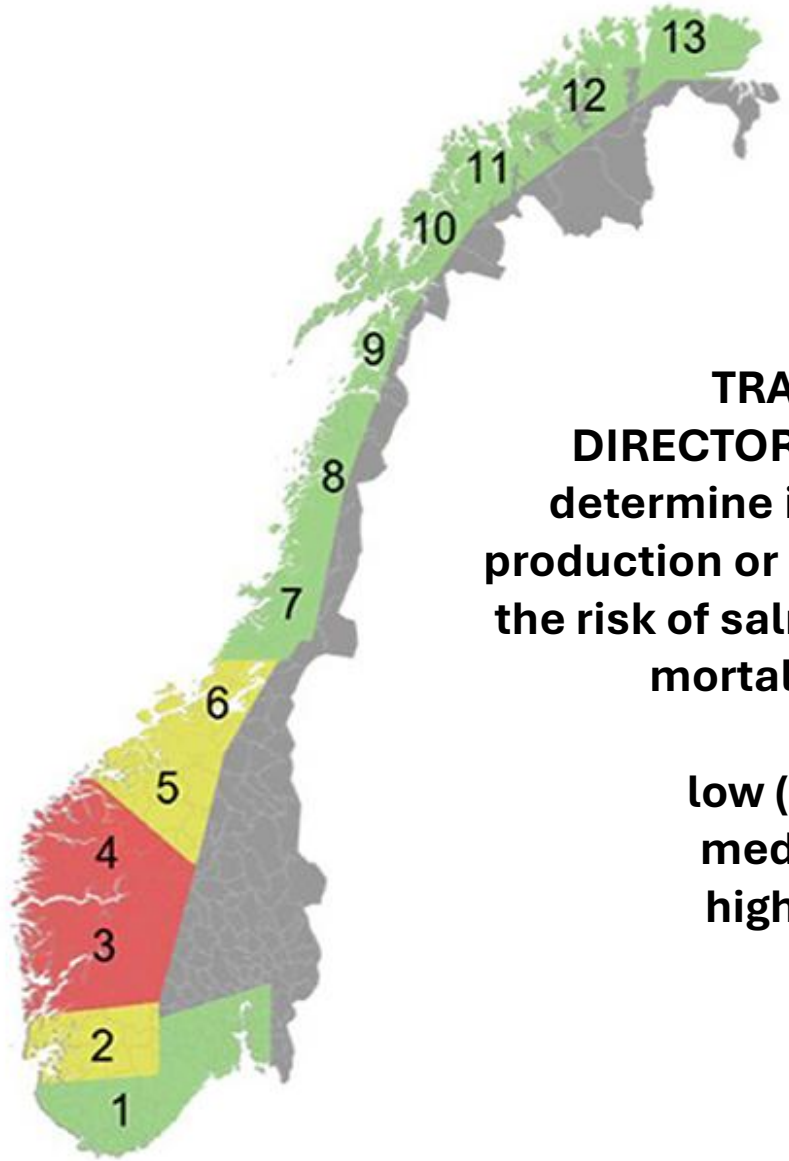


Governance: Formal organizations



Hersoug et al. (2021)

Percentage of salmon mortality per production area and year					
Area	Area names	2018	2019	2020	2021
1	Svenskegrensen til Jæren	6,0	10,8	11,3	10,4
2	Ryfylke	16,3	15,7	14,4	19,8
3	Karmøy til Sotra	20,8	19,1	19,9	19,9
4	Sotra til Stadt	18,0	19,4	27,2	22,5
5	Stad til Hustadvika	13,7	15,0	15,2	18,7
6	Nordmøre og Sør-Trøndelag	16,4	12,1	13,5	14
7	Nord-Trøndelag og Bindal	8,2	7,9	10,5	10,8
8	Helgeland til Bodø	13,3	10,2	9,7	12,1
9	Vestfjorden og Vesterålen	12,9	28,8	9,6	13,6
10	Andfjorden til Senja	8,4	23,0	10,2	10,9
11	Kvaløya til Loppa	9,6	10,7	15,7	12,6
12	Vest-Finnmark	11,6	8,2	11,1	13
13	Øst-Finnmark	9,4	16,1	6,7	10,2



TRAFFIC LIGHT SYSTEM
DIRECTORATE OF FISHERIES used to determine if farms allowed to increase production or decrease production based on the risk of salmon lice infestations to cause mortalities to wild salmonids

low (GREEN, increase 6%)
medium (YELLOW, none)
high (RED, 6% decrease)

LOCATION License (must follow 8 National Laws) - Nation State and Local (Counties & Municipalities) – IF NO AGREEMENT, Ministry of Local Government and Modernisation decides

Nation State

Aquaculture Act

- A location can be allocated only if permissions are granted according to the laws…gives sector directorates responsible for pollution, food safety, fish health/diseases, navigation, water resources a veto to block an application for aquaculture space

  Norwegian military (Troms County Navy have exclusive rights to ~30% of the inshore coastal area), Norwegian Food Safety Authority, the Directorate of Fisheries and the Norwegian Coastal Administration) have veto powers.

Municipalities

MSP Process (Plan and Building Act [plan-og bygningsloven])

- Municipalities plan sea (aquaculture) areas out to 1 nm beyond base lines. Coordinate licensing process.
- Consider all aspects of site before final decision to grant license such as - extent to which the proposed aquaculture activity supports regional economic development, control of spread of farmed fish diseases/reduce escapees (traffic light = Directorate), and sustain the Saami

Environmental Concerns (Lice, Diseases, Pollution, Mortalities)

Evolution of Aquaculture Systems

Flow through RAS & “Offshore” aquaculture

Concerns of Municipalities to New Aquaculture Sites

- **SOCIAL/ECONOMIC** - Limited economic benefits to the rural people (not a solution to unemployment and the economic struggles of remote municipalities
- The industry transformed from family-owned businesses to centralized, multi-national mega companies, some of which have little interest in the local economy. Locations of sites were chosen not where there was a highest demand for employment, but where it was most convenient for fish farmers.
- Industry paid taxes until recently only to the Norwegian state in Oslo, not to a municipality of production, so economic benefits were obscured. When threatened with a resource tax of 40%, Seafood Norway accepted, and farms now pay a small fee to municipalities.
- Increased recreational demands, tourism
- Increased marine conservation
- Increased energy development

ENVIRONMENTAL TECHNICAL

- Diseases/Parasites
- Semi-Closed Cages
- Flow Through Land Based
- “Offshore” is Nearshore

MUNICIPAL CONTROL OF THE AQUACULTURE FUTURE?

- **GOVERNANCE** - Plan and Building Act = control democratic influence on area allocation
- 225 municipal coastal areas = planning by 225 individual municipalities? Most municipalities lack capacity and competence to do integrated coastal management plans. Is this the best starting point for increased ecosystem-based management?
- Inter-municipal area planning, supported by their county?

ENVIRONMENTAL/HEALTH/WELFARE

Norwegian Food Safety Authority (2023)

62.8 million salmon died at Norwegian salmon farms (a mortality rate of 17%). This is an average, some farms are upwards of 50% or more. Income lost was ~EUR 1.9 billion (~US$ 2 billion).

Most fish died of injuries from sea lice treatments, “winter sores” and diseases, which have been increasing [(salmon pancreas disease (SPD), amoebic gill disease (AGD), infectious salmon anemia (ISA)]. Thirteen farms with known or suspected ISA and 40 farms with SPD are on the Norwegian Food Safety Authority’s “Barents Watch”. (ISA has been reported recently at Salmar and Sjøtroll Havbruk). Due to changes in ocean conditions (massive jellyfish outbreaks, etc.) the percentage of production grade fish was a historical high in 2023.

Harvested salmon are graded into 3 types-superior grade, ordinary grade, and production grade. Mortalities are sold as production-grade fish for use in fishmeal or biofuel.

Industry has discussed increasing spacing between farms and land-based farms or closed sea sites (for ex., Salmar’s “Marine Donut”). Innovative marine salmon cage concepts (Lerøy Seafood’s submersible cages [Gjengane] and Sinkaberg Hansen’s Otervika submersible cages [Bindal municipality] have had significant mortalities from sea lice and pancreatic disease (Norwegian Food Safety Authority). Land-based salmon farming remains unproven financially.

The Evolution of Aquaculture Systems

- **Open Net Pen Cages** – no more space due to environmental issues. Norwegian Food Safety Authority decided farms must have at least 2.5 km to the next farm and a minimum 5 km distance to a processing plant.
- **Semi-closed Cages –** allocated "green" licenses (2015), economic analyses indicate investments are not profitable. Salmon Evolution (Harøy Island) & Andfjord Salmon (Andøya Island). Note: Andfjord has had to treat for sea lice.
- **"Offshore" aquaculture -** inter-ministerial report on governing offshore aquaculture (NFD [2018])

6-month moratorium on land-based permits (2022)

Of the 23 land-based projects proposed in Norway, only 13 are RAS while 10 will use flow-through systems.

Assess new technologies and their use/discharges of seawater (Salmon Evolution says "65% recirculating is the sweet spot")

International Pressures

Ocean conservancy nonprofit BLOOM is calling on parliamentary officials – both incumbent and soon to be elected – to adopt its 15-point plan for saving the oceans and the livelihoods depending upon them, with *over 100 parliamentary candidates already pledging their support*. BLOOM's 15-point plan is to "ensure a fair, sustainable, and healthy future for the ocean, Europe, its citizens, and the rest of the world."

BLOOM is advocating for the suspension of new aquaculture projects along coastlines, ***except for shellfish and seaweed, and prohibiting the farming of carnivorous or invasive species to transition away from the industry's reliance on reduction fishing.***

Hersoug, B. et al. (2021) What's the clue; better planning, new technology or just more money? The area challenge in Norwegian salmon farming. *Ocean Coast. Management* 199 (2021), 105415.

"Summing up, within the existing management system, more sustainable operations and better incentives to the local municipalities could improve the aquaculture industry's access to larger (and better) areas."

Espinasse, M. et al. (2023) Seafood production in Northern Norway: Analyzing variation and co-development in aquaculture and coastal fisheries. *Marine Policy* 155 (2023) 105777