Is a modal shift to Short Sea Shipping within reach for fresh fish?
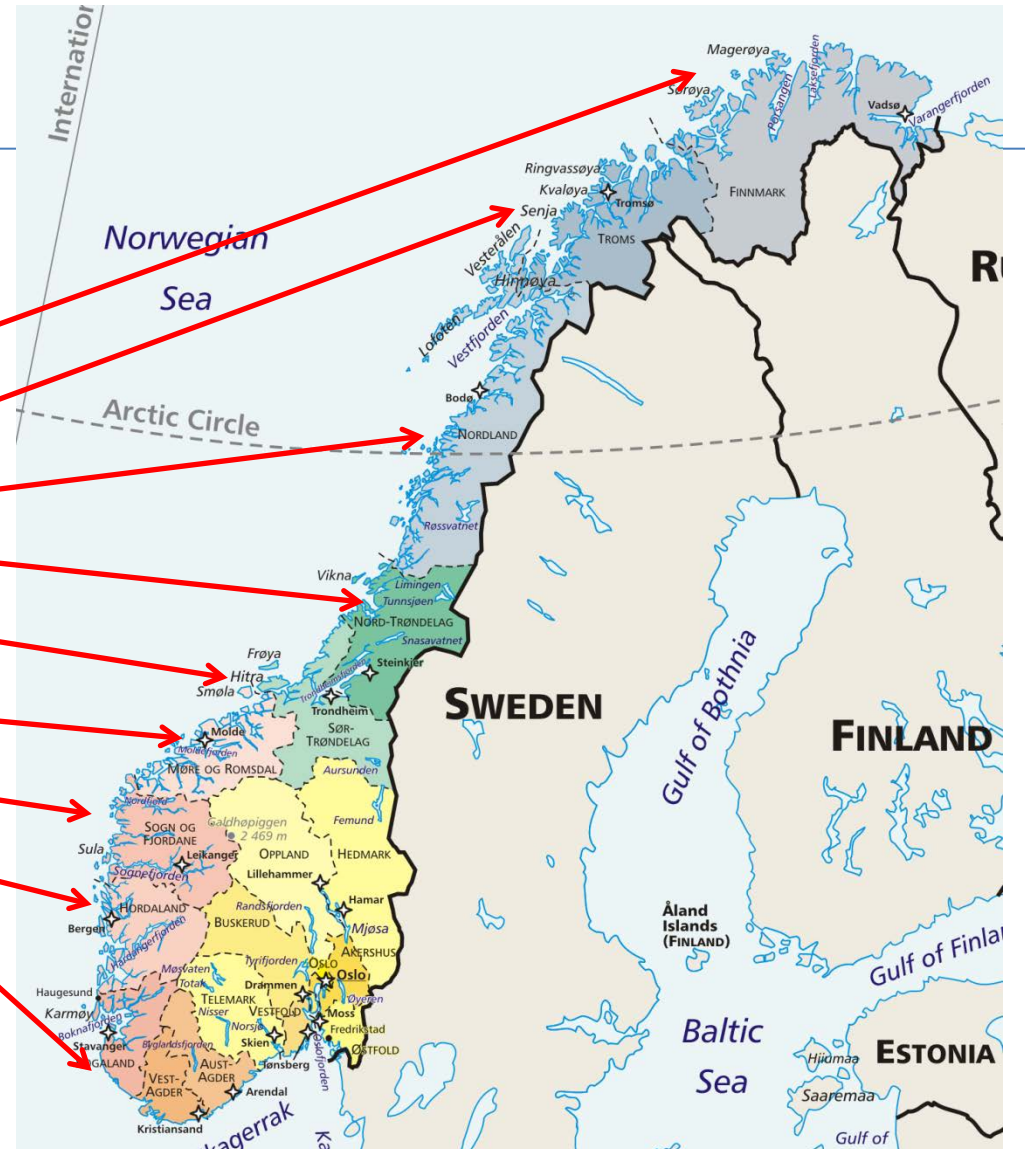# A feasibility study.

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Salmon production in Norway, 2010 -2012

Atlantic salmon (1000 metric tonnes)

| Fylke	2010	2012	
Finnmark	51	90	75%
Troms/Romsa	107	139	30%
Nordland	191	230	20%
Nord-Trøndelag	80	122	52%
Sør-Trøndelag	107	141	32%
Møre og Romsdal	112	118	6%
Sogn og Fjordane	78	96	23%
Hordaland	137	212	55%
Rogaland	64	80	24%
Øvrige fylker	12	14	21%
Totalt/Total	**940**	**1241**	**32%**

Objective

In order to….
reduce CO_2 emissions
and to make things more efficient...

Modal shift **from land-based transport to short-sea shipping**

1. land-based transport
2. short-sea shipping (SSS)
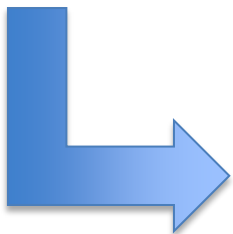
Feasibility study

a. CO_2 emission calculation
b. Technical feasibility
c. Economic efficiency
d. Market forces

a. CO$_2$ emissions calculation

Scenarios	Modalities	CO2 emissions (in kg) per kg (WTW)
Narvik – Bremerhaven	Truck	2,816
1. Narvik – Oslo – Bremerhaven	Rail – Truck	1,782
2. Mo i Rana – Trondheim –Oslo	Rail – Truck	1,546
3. Mo I Rana - Trondheim - Hitra - Kristiansund - Bremerhaven	Rail – Truck – Ship	1,009
4. Hitra – Bremerhaven	Ship	0,388
5. Hitra – Stavanger – Bremerhaven	Ship	0,409
6. Hitra – Aalesund –Bergen – Stavanger – Kristiansand – Bremerhaven	Ship	0,483
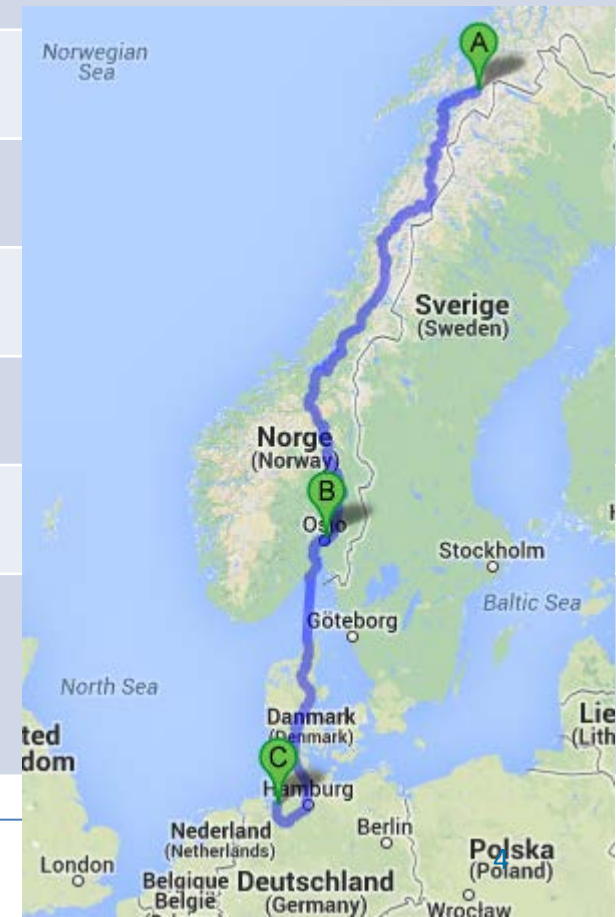
b. Technical feasibility
c. Economic efficiency

Scenarios	Modalities	Transport times (intermodal solution, in hours)	Tranport times (truck solution, in hours)
1. Narvik – Oslo – Bremerhaven	Rail – Truck	47,4	52,2
2. Mo i Rana – Trondheim –Oslo	Rail – Truck	40,9	42,2
3. Mo I Rana - Trondheim - Hitra - Kristiansund - Bremerhaven	Rail – Truck – Ship	55,3	42,2
4. Hitra – Bremerhaven	Ship	42,3	35,5
5. Hitra – Stavanger – Bremerhaven	Ship	46,5	35,5
6. Hitra – Aalesund – Bergen – Stavanger – Kristiansand – Bremerhaven	Ship	51,5	35,5

Realistic transport times with truck take more time due to rest periods and the use of ferries for some parts of the transport.

Costs

Based on market prices

- **Truck transport from Mid-Norway to Bremerhaven costs approx. 2600€/Container**

- **Ship transport Aalesund – Bremerhaven costs approx. 1000€/Container incl. services, excl. transport to and from the port.**

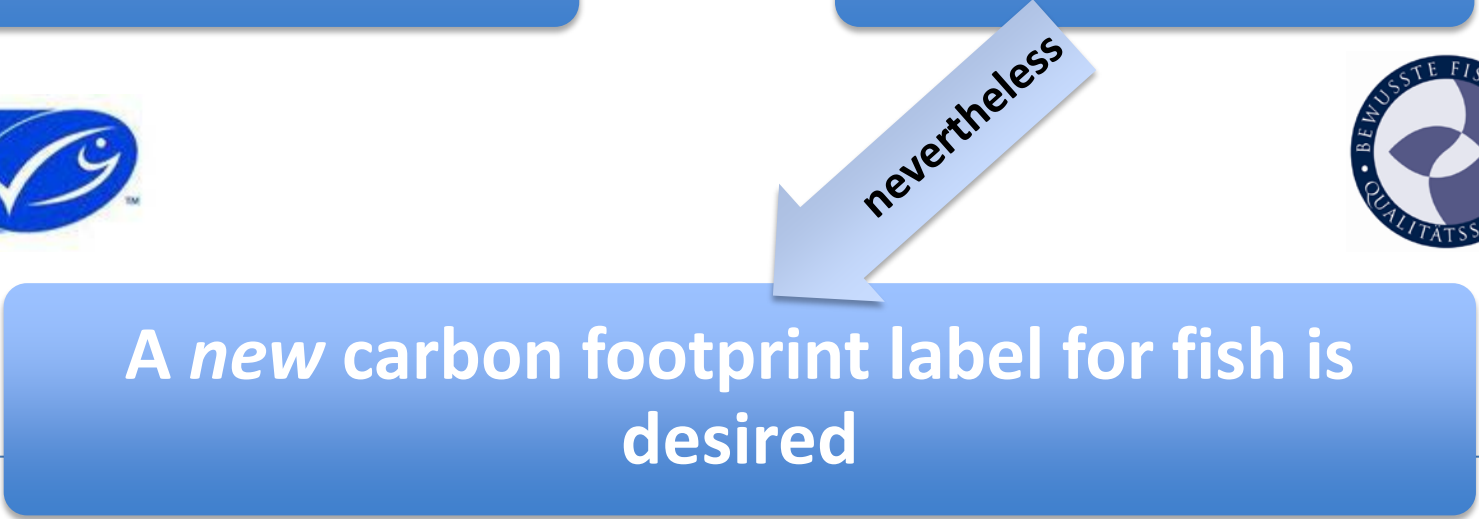✓ **<u>Already today financially attractive.</u>**

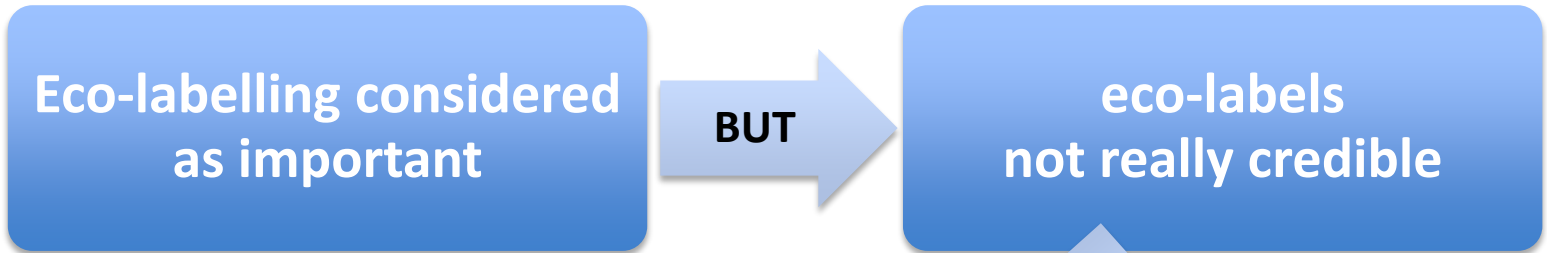**<u>BUT:</u>**

✓ **Today's cut-off times at the port or origin and handling at the port of destination increase the travel time of 2 days up to a total time for the transport of**
5 days => unacceptable for fresh fish

Quantities needed

- **Market for fresh fish requires daily delivery but volumes are far below the a full ship load**

- **Total German quantities today would cover around 10% of the available reefer capacity of a feeder ship**

- **Alternative solutions and further requirements:**
  - **Use of smaller feeder ships**
  - **Accept a very low load factor or subsidize sea transport**
  - **Identify additional load (anyhow needed for the non-reefer capacities on the feeder ship)**
  - **Identify return cargo**

d. Market forces

Visual appearance of fresh fish → reveals → **degree of quality** → which is → **more important than CO_2 - Emissions**

Eco-labelling considered as important → BUT → **eco-labels not really credible**

nevertheless

A *new* carbon footprint label for fish is desired

Results

- **Modal shift from land-based transport to short sea shipping of salmon is attractive, but not yet feasible**

  - **with regard to CO2 emissions calculations > YES**
    Note: CO_2 calculations are solely based on transportation process and do not represent the overall carbon footprint of the product.

  - **with regard to costs > YES, but affected by the critical success factors „time" and „quantities"**

  - **with regard to market forces > YES, but quality is put before the reduction of CO_2 emissions**

  - **with regard to quantities that could be carried by a feeder ship > NO**

… another modal shift with zero CO2

Thank you for your attention!

a. CO_2 emissions calculation

Assumptions:

1. **40' reefer container (3780kg) + 25 pallets à 567kg each = 17955 kg**

2. **Well-to-Wheel (WTW)**

3. **Per modal shift one charging process**

4. **Truck: consumption of 34l/100km incl. cooling unit**

5. **Ship speed: 17,1 kn**

6. **Feeder ship with 585 container TEU, and 204 reefer TEU**

7. **Electricity production for rail is highly dependent on energy mix (renewable energies) > Tank-to-Wheel (TTW) would be nearly zero in Sweden and Norway**

8. **Capacity utilisation ship: 65%; truck and rail 80%**