Nordic Marine Think Tank, ICES climate change forum, January 2025, Helsingborg

Eating for the environment

The Nordic Marine Think Tank and ICES organised the third Nordic climate change forum for aquaculture and fisheries in Helsingborg. This edition looked at how food choices affect emissions and how consumers can choose to eat in a way that benefits both themselves and the planet.

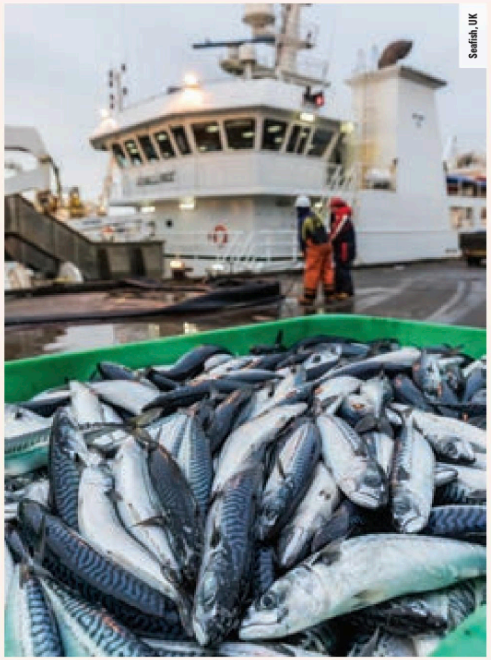
The Nordic Marine Think Tank (NMTT) is a network that brings together fisheries experts from the Nordic region. Its purpose is to support better public decision making and the sustainable exploitation of marine living resources by drawing on Nordic skills, experience, and solutions. Together with ICES, the International Council for the Exploration of the Seas, NMTT organises a climate change conference for aquaculture and fisheries. The events were held in 2021, 2023, and most recently in January 2025.

Organised in Helsingborg, Sweden, the 2025 edition was moderated by Carl-Christian Schmidt, formerly at the OECD and now a boa[illegible] The p[illegible] to understand how policies and measures, for instance labelling or information campaigns, can shift consumers towards more climate friendly food choices. It also sought to better understand the role of private companies along the seafood value chain in educating consumers about the climate impact of the food they eat.

Changes in fish distribution have several causes

In the opening intervention, David Reid, Chair of the ICES Science Committee, provided some useful background on some of the impacts of climate change including, rising global temperatures, changes in ocean pH and acidification, decreasing ocean oxygen levels, marine heatwaves, rising sea levels, shifts in Arctic ice melt, and ocean CO_2 absorption, and how they affect fish migration patterns, growth rates, and population distribution, fundamentally altering how fisheries operate which in turn has an impact on fisheries supply chains. Fish stocks, he said, are shifting their spatial distribution due to water temperature, salinity, and oxygen changes. As ocean temperatures rise, fish move toward cooler waters, either northward or into deeper regions. However, this shift isn't simply a direct response to temperature. Other ecological factors like food availability and eco[illegible]anges also play a role.

He pointed out that some fish species are moving northward, while others are moving southward, demonstrating a complex reaction to climate change. Moreover, a meta-analysis of European fisheries shows relatively stable fish distributions, except for certain species increasing in northern waters. Additionally, a study of the North American Atlantic coast found a change in fish locations after 2010, coinciding with a 1°C increase in sea surface temperatures but the shift was not uniformly northwards for all the species studied—some moved in a southern direction. The point, he emphasised, was that shifts in stock distribution cannot purely be attributed to higher temperatures but rather to a changing ecosystem.



Small pelagic fish like mackerel have lower climate intensities than pork, chicken, or eggs. Moreover, they are both tasty and healthful.

As fish experience higher water temperatures, their growth rates, maigration patterns, and reproductive cycles also change. Studies show that spawning takes place earlier as the temperature increases with the result that eggs, larvae, and young fish must contend with different conditions in the sea in relation to the feed they prey on as well as to water currents which affect larval dispersion. Warmer water leads to faster juvenile growth, but the young fish use more energy in the process and will reach smaller adult sizes. Fishing smaller adults means that greater numbers are taken per tonne of fish, to which, over time, the fish respond by maturing earlier. This slows their growth and decreases their fecundity as smaller fish produce fewer as well as smaller and less viable eggs. These changes are complex and have spillover effects that have real world implications for fishers and fisheries policymakers. Fisheries management needs to adapt to a more fluid environment with fluctuating productivity and shifting population boundaries.

Fishing could hamper the ability of the ocean to sequester carbon

Fishing also has an impact on the biological carbon pump, the processes that capture carbon from the sea surface and sequester it in deep waters. Phytoplankton absorb CO_2 from the atmosphere, which is then consumed by zooplankton and fish. Some of this carbon is returned to the atmosphere through respiration, but a significant portion sinks to the deep ocean via faecal matter and dead organisms helping to store carbon and mitigate climate change. Mesopelagic fish (living at 200-500m depth) play a critical role, contributing to 35% of deep-sea carbon sequestration. Overfishing these species could significantly disrupt the ocean's ability to store carbon, raising concerns over plans to exploit mesopelagic fish stocks. Macrozooplankton (krill) and mesozooplankton (copepods) are responsible for a further 45% of carbon storage.

Targeted spatial management measures are better than blanket bans

One of the most controversial issues in fisheries is the impact of bottom trawling on carbon release, Dr Reid said. A 2021 study claiming bottom trawling releases as much carbon as global air travel, sparked intense debate. However, he referred to subsequent reviews that found 61% of studies showed no significant carbon release, while some even showed increased carbon storage due to seabed disturbance. This suggests that fishing's impact on seabed carbon is a field that still needs in-depth research and varies by location, requiring targeted spatial management strategies rather than blanket bans. Fuel use in fisheries has steadily increased despite stable or declining catches. This is because depleted fish stocks require more effort to harvest. A more fuel-efficient fleet and better fishing gear design could reduce emissions. Reducing seabed contact in trawl fishing could create a win-win scenario, lowering both fuel consumption and habitat damage. And restoring fish stocks to sustainable levels would improve catch efficiency, further reducing emissions.

Concluding his presentation, Dr Reid pointed to the major policy challenges for fisheries management created by climate


Seafish, UK

Seafood is beneficial for all life stages. But, in most countries, per capita consumption is below recommended levels.

change. The overlapping effects of temperature, productivity changes, fish migration, and carbon cycling make decision-making complex. Potential policy solutions include, spatial fish-ment (protecting high-carbon storage areas from excessive fishing, decreasing the contact with the sea bottom, and fishing in low carbon storage areas); ecosystem-based fisheries management (integrating carbon sequestration considerations into fisheries policy); encouraging lower-carbon fisheries (promoting fuel-efficient gear and alternative fuels); and adaptive quota systems (allowing fishing rights to shift as fish populations migrate).

Dietary choices influence climate

Continuing the theme of the impact human behaviour has on climate, Prof. Elinor Hallström from the Technical University of Denmark's National Food Institute (DTU Food), reported on the influence of diet on climate, particularly in Nordic countries, with a focus on seafood consumption. She highlighted how the food system significantly contributes to environmental pressure, accounting for about one-third of global greenhouse gas emissions and consuming vast natural resources. From a health perspective, the global population faces a dual challenge: around 10% suffer from food insecurity, while 40% struggle with overweight and obesity. This imbalance underscores the urgent need for sustainable diets.

Research estimates that the climate impact of Swedish diets is approximately two tonnes of CO_2 equivalents per person per year, a figure mirrored in other Nordic countries like Denmark and Iceland. These numbers significantly exceed suggested planetary boundaries for sustainable food systems. Seafood's contribution to dietary climate impact is relatively small, ranging from 4% in Sweden to 6% in Denmark and between 4–11% in Iceland. Among Swedish adolescents, seafood accounts for only 3% of dietary climate impact, compared to 9% in older adults. However, seafood's environmental footprint varies widely by species and production methods. Studies show that small pelagic fish, bivalves, and species like Alaska pollock and pink salmon have lower climate intensities than pork, chicken, or eggs. In contrast, wild-caught crustaceans, cephalopods, and some farmed white fish can have climate footprints comparable to pork or beef per edible weight.

Consumption of red meat exceeds and of seafood falls short of recommendations

From a health perspective, seafood consumption is beneficial at all life stages. Current intake in Nordic countries varies from 30–80 grams per person daily, with Norway showing the highest consumption. However, most countries fall short of recommended levels of 43-64 g/d or between 300 and 450 g/week. Meanwhile, red meat consumption exceeds health recommendations, especially among men, sometimes by two- to threefold. Shifting diets toward increased seafood consumption and reduced red meat intake offers both health and climate benefits. Research shows that fish eaters who omit meat may have a dietary climate impact nearly 50% lower than heavy meat consumers. Studies also indicate that replacing meat with fish can reduce dietary climate impact by an average of 47%.

Despite the potential benefits of dietary shifts, Prof. Hallström reported that data limitations pose challenges. Many findings rely on self-reported dietary data, which can be unreliable due to misreporting and a lack of detailed information on seafood species consumed. Additionally, most environmental impact assessments focus on climate effects, often overlooking critical sustainability concerns such as overfishing and biodiversity loss, she said. There is a pressing need to develop comprehensive sustainability indicators to better assess seafood's overall environmental impact.

Prof. Hallström concluded by noting that the climate impact of Nordic diets far exceeds sustainable limits, with seafood contributing only a small portion to total emissions. However, seafood consumption is currently too low for optimal health, while red meat intake is excessive. Substituting red meat with sustainably produced seafood presents a promising strategy for reducing dietary emissions while improving public health. Finally, she pointed out that better data collection and sustainability assessments are necessary to guide informed dietary transitions.


FAO/Mattia Romano

Red meat consumption in Nordic countries exceeds official recommendations. Encouraging consumers to switch from meat to fish would have health and environmental benefits.

Taxes and subsidies could encourage more healthful, planet-friendly food choices

Voluntarily adjusting one's diet to resemble those described in official recommendations would lead to better outcomes for an individual's health as well as for the planet. However, we see very little of such spontaneous changes. Instead, policies, such as those governing taxes and subsidies could also induce consumers to shift their food consumption in a healthier and more sustainable direction, reported Jörgen Larsson, a senior researcher at Chalmers University of Technology in Gothenburg, Sweden. His intervention focused on two key aspects of taxes and subsidies: their impact on consumption levels and their acceptability among voters and politicians. He argued that while food choices are personal, they also have significant societal implications, particularly regarding public health, economic productivity, and climate change.

Rising obesity rates, especially among young people, are a major concern in Sweden and other countries. Since children cannot always make informed dietary choices, public policy can play a role in shaping healthier food environments. Additionally, poor dietary habits increase healthcare costs and reduce workforce productivity, while the environmental impact of food production, particularly meat consumption, is substantial—nearly double that of all passenger car traffic in Sweden. A previous report identified 17 different policy measures to promote healthier and more sustainable eating habits. Existing strategies, such as dietary guidelines and voluntary food labelling, are useful but insufficient. Stronger interventions include marketing regulations, for instance, promotional discounts (e.g., «buy three, pay for two») for unhealthy foods are banned in the UK; and food taxes and subsidies. These are widely used in transportation, but applying similar measures to food has faced resistance.

The effectiveness of pricing strategies in shaping consumption patterns is evident. For instance, when Sweden joined the EU in the 1990s, beef prices were cut in half, leading to a 50% increase in consumption and thus highlighting the price sensitivity of food choices. The research team—including

In Sweden, researchers found that removing VAT (currently 12%) on fruit and vegetables would increase consumption by 4.4% suggesting the power of taxes and subsidies to influence behaviour.

experts from the Karolinska Institute, the Swedish University of Agricultural Sciences, and Chalmers University of Technology—proposed a cost-neutral food tax shift. This means increasing taxes on certain foods while lowering them on others, ensuring that the overall food budget for consumers remains unchanged. Key principles guiding the reform are that taxes should be based on robust scientific evidence of health and climate effects; policies should minimise administrative costs by categorising food products broadly; and equity concerns should be addressed, as low-income groups spend a larger share of their budget on food.

Price increases trigger significant drops in consumption

The study relied on unique data which was collected from Sweden's largest food retailer, ICA, and included extensive sales and pricing figures. Price sensitivity (elasticity) was measured across various food categories. Findings showed that a 1% increase in meat prices typically led to a 0.7% drop in consumption. Additionally, the study analysed 13 different tax reform scenarios, but one model stood out as particularly effective and feasible: the Integrated Tax Shift Using Subsidies. This model predicted that excise taxes of SEK31/kg on beef and lamb (based on the carbon footprint) would result in a 19% drop in consumption and an excise rate of SEK5.4/kg on pork would deliver a 0.7% decline in pork consumption. Moreover, removing VAT (12% on food) altogether on wholegrain products, consumption increased 7%-18%. Consumption of fruits, vegetables, and legumes increased 4.4% when VAT was removed. The model also predicted that a tax of SEK3.7/litre on sugary beverages would shrink consumption 24%.

Using a model from the WHO, the researchers also established that the food tax reform would result in 700 fewer premature deaths per year—in comparison 230 people die each year in traffic incidents. The tax reform also reduces the climate impact by 4.4% corresponding to an 8% reduction in emissions from Swedish passenger cars. Dr Larsson also assumed that food manufacturers would respond to the food tax shift by changing their recipes (e.g. reducing sugar content in soft drinks) and their marketing (e.g. increased advertising of bread from which VAT has been removed). The state benefits too in the long run, he proposed, from lower medical costs, less time off due to illness, and fewer environmental costs. In conclusion, he said this model of the food tax reform (one of several that were studied) offers a practical way to improve public health and sustainability without raising food prices overall. For further reading visit www.matskatteväxling.se (in Swedish), scientific articles on impacts (https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5065746) and acceptability (https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5065746).

The impacts of climate change on fish stocks are complex but efforts to mitigate them including by encouraging more climate-friendly food choices should be taken seriously. The NMTT-ICES workshop featured several interesting and informative interventions which are freely available at https://www.nmtt.org/_files/ugd/ec7f32_6711ee8f3f3045e586768631dee8018f.pdf