

Ocean's Future to 2050:

SEAFOOD FORECAST

Executive summary

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FOREWORD

To achieve sustainable industry trajectories in the Blue Economy, we need a greater understanding of the ocean and the potential impacts of ocean-related activities, based on reliable data and scientific knowledge.

In 2021, at the start of the UN Decade of Ocean Science for sustainable development, we developed our first Blue Economy model to be able to address challenges and opportunities associated with a sustainable and equitable ocean economy through a series of forecasts. We published a *Marine Aquaculture Forecast* (DNV, 2021a) highlighting the critical role of farmed seafood in securing supplies of food for a global population that will exceed nine billion by 2050. Subsequently, in our *Ocean's Future to 2050* outlook (DNV, 2021b), we placed seafood production into a wider context of other ocean industries. There, we identified the key trends shaping the development of the Blue Economy and highlighted the urgent need for sustainable ocean management. Further, in our *Spatial Competition Forecast* (DNV, 2023b) we drew attention to a 'race for space' with increased pressure and congestion, particularly along coastlines, which must be carefully managed.

Mindful of the need to tackle the large system transitions in the Blue Economy, this *Seafood Forecast* provides further insight into the interactions between seafood value chains and other food systems, between the need for sustainable feed in balance with food, and between food security and growing supply-demand imbalances across different regions.

We forecast an increase in overall marine seafood production of about 20% to 2050. While capture fisheries output is stagnant, marine aquaculture will double and finfish production almost triple in this period. We do not, however, see any significant change in protein consumption patterns. Scaling up land-based food production to meet global food demand is facing significant challenges due to, among other issues, climate change and other sustainability concerns. A future shift in demand towards a more seafood-based diet could relieve some of this pressure, but this is a slow-moving process influenced by affordability, food culture, and other consumer preferences. Given a sufficient change

in demand, expanding marine aquaculture represents a significant worldwide opportunity in the Blue Economy.

As capture fisheries output globally remains stagnant, we point to a supply-demand gap for wild-caught seafood that marine aquaculture production will not close by 2050. Some regions, particularly across Africa and Asia, will see large increases in demand due to growing populations and rising living standards. However, these regions are not necessarily the same as those that will see an improvement in the availability of wild-caught seafood. We forecast that the supply-demand imbalances will drive a 50% increase in trade by 2050 and that seafood will remain among the world's most traded food products. These imbalances are tainted by illicit trading and lack of transparency, emphasizing the urgency of global measures that address sustainability challenges and safeguard both food security and livelihoods.

Marine aquaculture must maintain an intense focus on fish health and welfare, technological innovation, and sustainability measures to meet future growth. One key priority will be to meet the demand for feed ingredients by decoupling it from sources of food for human consumption. We forecast that feed supplies will improve on sustainability by transitioning to novel ingredients. Our study shows that the share of novel ingredients will rise from negligible levels today to reach 26% of the ingredient mix for feed for marine finfish and 37% of the mix for crustaceans. These developments are crucial for the long-term sustainability of fed aquaculture in our seafood mix.

Our aim has been for this forecast to serve as input towards greater transparency as well as understanding of the development of seafood in the Blue Economy at both the global and regional scale. I hope that you find our insights of value and look forward to your feedback.



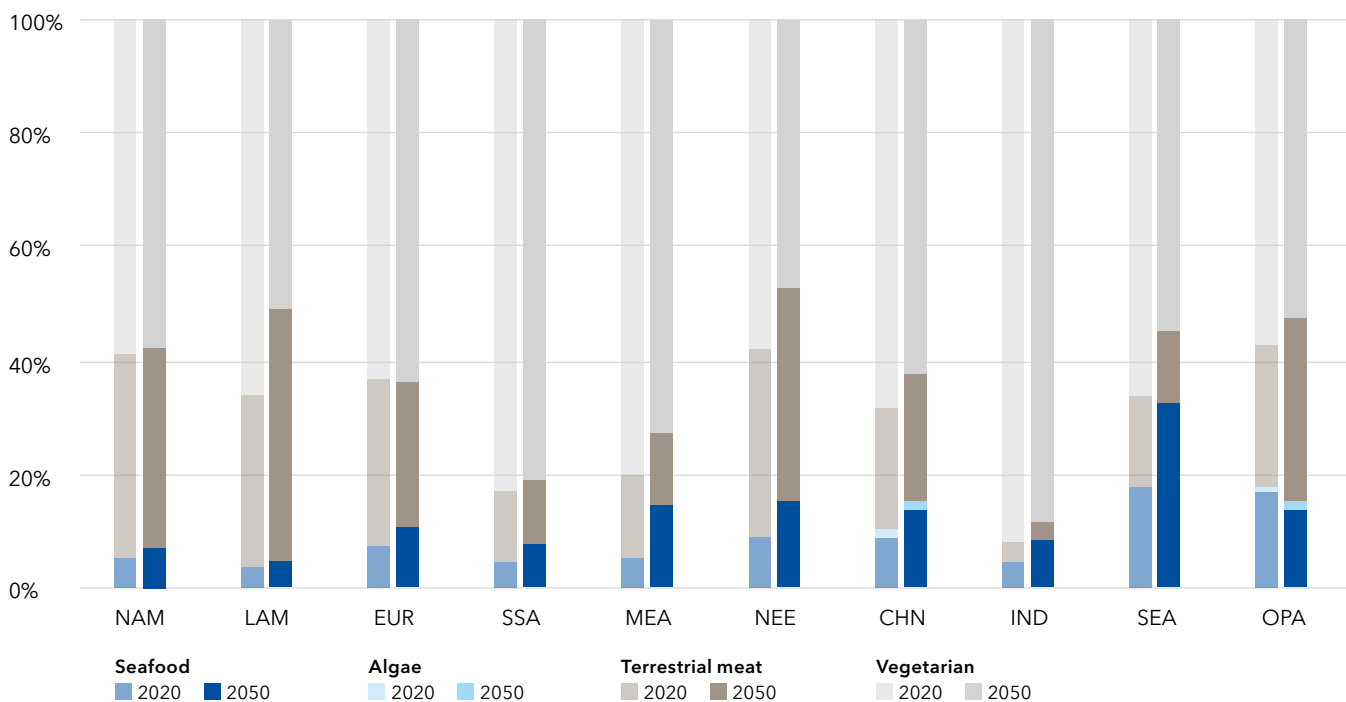
Bente Pretlove

Programme Director, Ocean Space

DNV Group Research and Development

What will be the role of seafood in global food demand?

Shares of vegetarian food, terrestrial meat, seafood and algae in protein demand



Seafood demand is on the rise, but there is no indication of large-scale dietary shifts.

All regions except Latin America and OECD Pacific will see per capita seafood demand increase more than the consumption of terrestrial meat and vegetarian foods, such as plants, eggs, and milk. However, this change in consumption patterns will not constitute a large-scale dietary shift towards seafood.

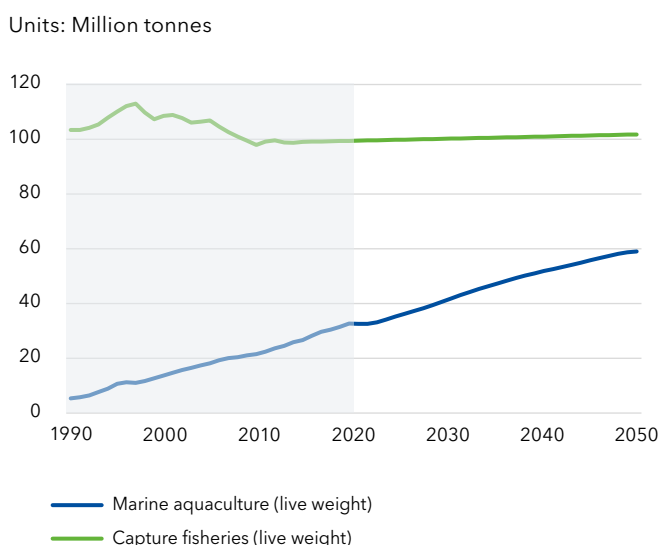
South East Asia's combined marine and freshwater seafood demand grows to comprise 30% of the region's protein demand. OECD Pacific is the only region where the share of seafood in protein demand decreases.

With an estimated 2050 population of just below 1.5 billion, Greater China will be the biggest marine seafood market in absolute numbers.

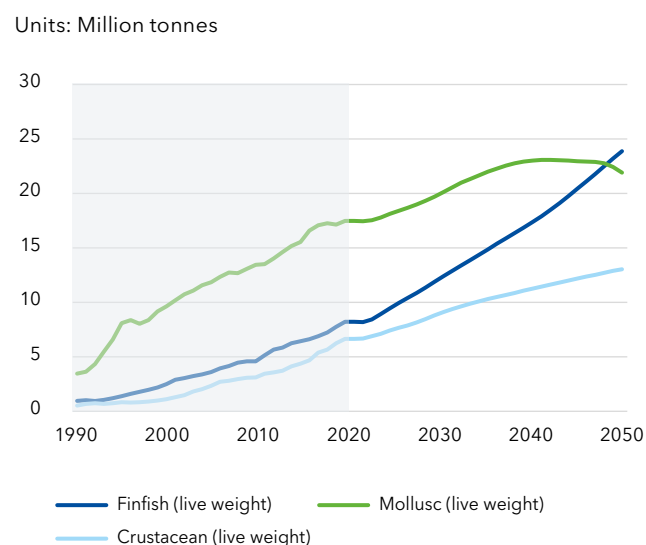
Seaweed production will grow rapidly in Europe and North America. This production growth will primarily be driven by demand for industrial and food additives, whereas consumption as direct food will be low.

How will marine aquaculture develop to meet seafood demand?

Seafood production from marine aquaculture and fisheries



Marine aquaculture production of finfish, crustaceans, and molluscs



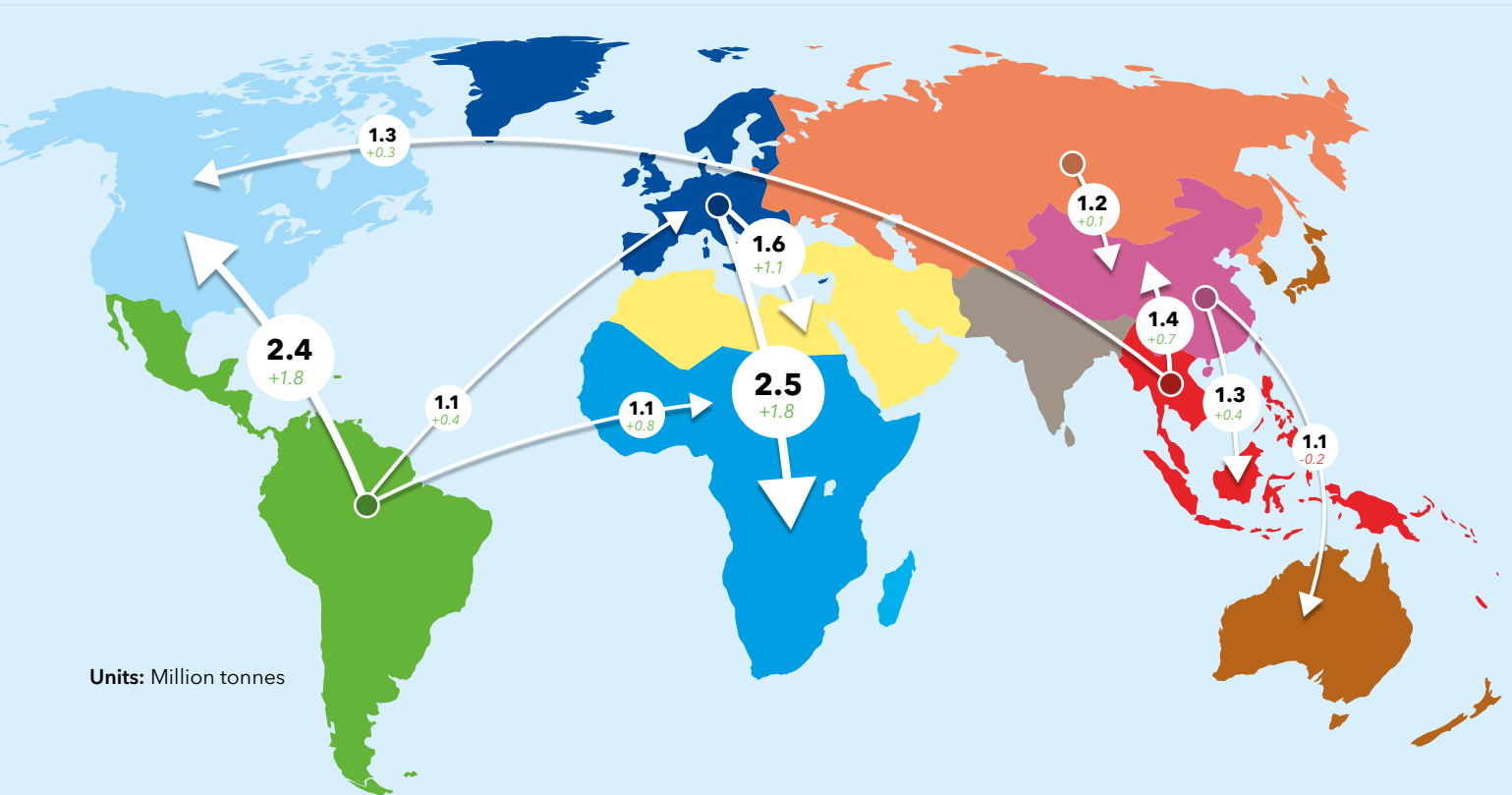
Marine aquaculture of finfish triples and overtakes molluscs as the leading farmed species type.

Marine aquaculture production will double and finfish production almost triple by 2050. However, capture fisheries output remains stagnant, leading to a 20% increase in the global production of marine seafood, including finfish, crustaceans, and molluscs.

Finfish maintains its position as the most preferred seafood item and overtakes molluscs as the leading farmed species type in terms of live weight. The demand for finfish is expected to grow to account for about 70% of the total market for marine seafood.

By 2050, marine finfish production increasingly expands from sheltered waters to onshore and offshore facilities, which reach a global share of 12% and 7%, respectively. Driven, among other things, by the need to overcome spatial constraints and limit the transmission of disease and sea lice, this trend will be most pronounced in regions with significant demand for high-value species and competition for coastal waters.

What will drive change in seafood trade patterns to 2050?



Seafood trade patterns change, driven mainly by increasing supply-demand imbalances in the capture fisheries.

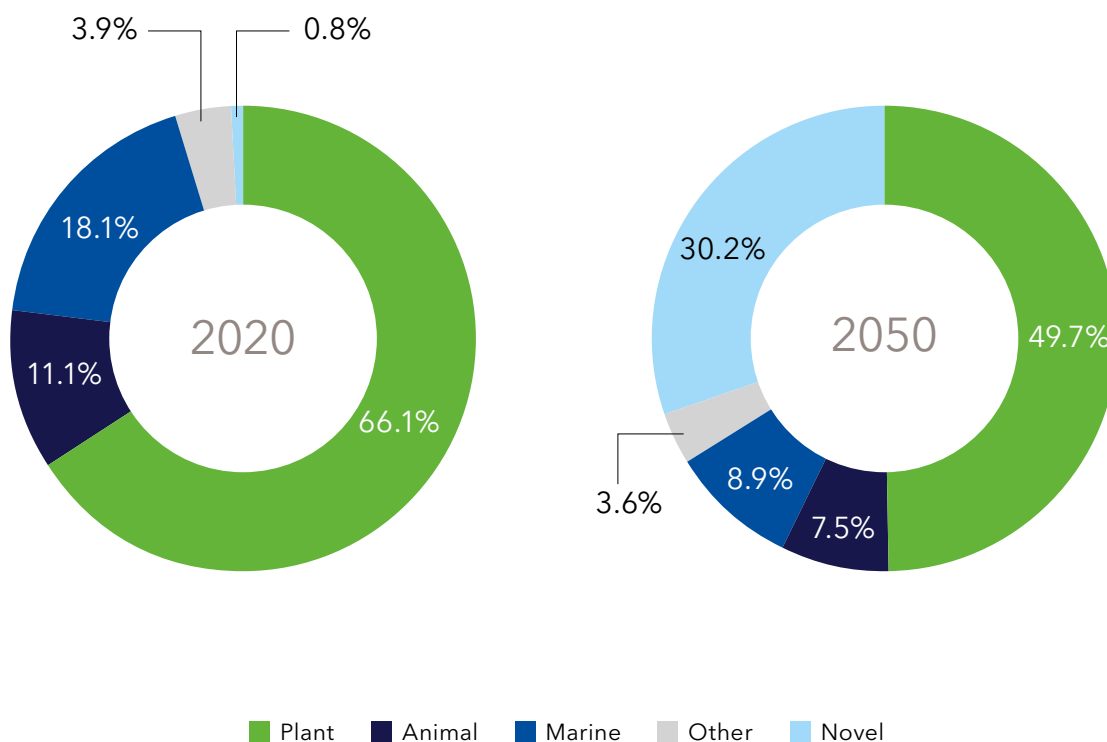
By 2050, interregional seafood trade will grow by 50%. This is considerably more than the 20% increase in global seafood production, implying that regions will become more dependent on imports. Sub-Saharan Africa, with its declining regional captures and fast-growing population, will face the greatest seafood production deficit and therefore become the biggest importer.

Europe and Latin America will be the leading exporter regions, accounting for 19% and 18%, respectively, of global seafood exports. European exports will mainly go to Sub-Saharan Africa and the Middle East and North

Africa, whereas Latin America will have North America, Europe, and Sub-Saharan Africa as its most important destinations.

North America's efforts to upscale offshore and onshore farming of marine finfish will not offset the region's reliance on seafood imports.

What will be the main sources of feed for marine aquaculture?



Aquaculture feed supplies will diversify further, reducing the dependence on marine and agriculture-based ingredients.

Fish meal and fish oil supply levels will peak around 2030 before falling below current levels by 2050, while the total aquaculture feed demand more than doubles. The combined share of fish meal and fish oil in aquaculture feed decreases from 18% in 2020 to 7.5% in 2050. Fish oil, being harder to replace due to its high omega-3 content, will not decrease as much as fish meal.

The usage of novel ingredients will rise from currently negligible levels to 30% of the feed mix, contributing to substitution of all other ingredient types.

Latin America will remain the primary exporter of marine ingredients for aquaculture feed. The variability in Peruvian anchoveta catches due to periodic El Niño events, in addition to other stressors impacting the capture fisheries, incentivizes a transition away from wild catch.

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Headquarters:
DNV AS
NO-1322 Høvik, Norway
Tel: +47 67 57 99 00
www.dnv.com

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