

Blue foods—fish, shellfish, algae, and aquatic plants from freshwater and marine ecosystems—are critical to the nutrition, health, livelihoods, economies, and cultures of billions of people worldwide. They can be an important part of sustainable food systems by reducing the environmental footprint of nutritious diets and relieving pressures on overtaxed terrestrial systems. Yet blue foods are often overlooked in national and international climate discussions. To meet global climate targets, climate decision-makers will need to harness the opportunities for blue foods to contribute to net-zero food systems while protecting blue food systems from the impacts of climate change.

## Integrating blue foods into climate strategies

### 1. Embed blue foods in the climate agenda.

As food systems continue to gain prominence on the climate agenda, it is important to ensure blue foods are recognized and included. There are several opportunities within existing United Nations Framework Convention on Climate Change (UNFCCC) processes to ensure that food and climate action is not solely focused on land-based production, such as organizing a blue foods workshop under the Sharm El-Sheikh Joint Work, including blue foods in the Ocean and Climate Change Dialogues, and integrating them into reporting and evaluation mechanisms.

### 2. Integrate low-carbon blue foods into Nationally Determined Contributions (NDCs).

Many countries mention food systems in their NDCs, but few have specific strategies for blue foods. Since food systems contribute nearly a third of global greenhouse gas emissions, strategies to stay below 1.5 °C should include plans to adopt low-carbon production practices, minimize food loss and waste, and promote sustainable diets and consumption. Within blue food systems, countries can enforce carbon mitigation requirements for aquaculture and fisheries, promote shifts toward context-appropriate nutritious and low-carbon blue food diets, or adopt circular economies. To raise ambitions, NDCs could also include targets for restoring and conserving blue carbon ecosystems like mangroves, seagrasses, and salt marshes.<sup>1</sup>

<sup>1</sup> Spencer, R. and Tigchelaar, M. "Leveraging Blue Foods for Low-Carbon Food Systems," Stanford Center for Ocean Solutions, April 2023. <https://doi.org/10.25740/jk027nk1798>

### 3. Include blue foods and the ecosystems they depend on in National Adaptation Plans (NAPs).

Through low-carbon and climate-proofed blue food systems, it is possible to adapt to climate change and develop healthy, prosperous, and resilient communities. NAPs can draw on UNFCCC technical guidelines<sup>2</sup> to design strategies that safeguard blue food ecosystems and the livelihoods of small-scale actors. This could involve creating climate-smart agreements for transboundary resources and establishing climate information services, including early warning systems for extreme events.

### 4. Increase investments in adaptation and resilience.

Substantial investments in nature, infrastructure, technology, and governance are needed to enable the low-carbon potential of blue food systems and bolster their resilience. However, countries are falling short in their commitments to invest in adaptation and resilience. Currently only 3% of public climate finance is allocated to food systems. To fully realize the potential of blue foods, governments can support strategies like conservation financing, climate insurance, debt-for-nature swaps, fiscal reforms, and blue carbon ecosystem restoration, as well as expanding access to finance for small-scale actors on the frontlines of a changing climate.

<sup>2</sup> Brugere, C. and De Young, C. 2020. Addressing fisheries and aquaculture in National Adaptation Plans. Supplement to the UNFCCC NAP Technical Guidelines. Rome, FAO. <https://www.fao.org/documents/card/en/c/ca2215en>

## Read more about blue foods and climate change

### 1. Climate change threatens the nutritional, economic, and cultural contributions of blue foods.

Climate hazards endanger the productivity, quality, and safety of blue foods, particularly wild-capture fisheries. These hazards include increasing droughts, warming waters, more powerful storms, and shifting fish stocks. Regions that heavily rely on blue foods, such as Africa, South and Southeast Asia, and the Indo-Pacific, are particularly vulnerable. Under a high-emission scenario, by 2050 over 50 countries that heavily depend on blue foods will face high climate hazards yet have limited capacity to adapt—creating a “triple jeopardy.”<sup>3</sup>

### 2. Blue foods are a rich and diverse source of nutrition.

More than 2,500 animal species or species groups of blue foods are caught and harvested—approximately 97 million tons in wild-capture fisheries and 82 million tons in aquaculture.<sup>4</sup> These foods offer sustainable and affordable nutrients, including protein, essential micronutrients, and omega-3 fatty acids. Blue foods can also be a healthier source of animal protein than terrestrial livestock. They are rich in healthy fats and can help reduce obesity and non-communicable diseases.

### 3. Blue foods generally have lower environmental footprints than terrestrial animal-source foods, and there are opportunities to improve production practices.

Across a diverse sector, details matter. Certain production systems like bottom trawling or prawn aquaculture produce high emissions. However, shifting to lower-impact species can help reduce environmental footprints. Farmed bivalves such as oysters and mussels have low emissions and require minimal freshwater and land resources. They also offer 76 times more vitamin B-12 and five times more iron compared to chicken. In fisheries, small pelagic fish like sardines and anchovies have the lowest carbon emissions. Reducing feed usage and switching to deforestation-free inputs could reduce emissions from aquaculture by half, while the use of low-fuel gear could reduce greenhouse gas emissions in some fisheries by 61%.

### 4. Blue food production supports more than 800 million jobs, half of which are held by women.

Small-scale actors are the cornerstone of blue food systems, as about 90% of jobs in fisheries are small-scale.<sup>5</sup> These actors contribute over half of global fish catch and more than two-thirds of blue foods consumed directly by people. Despite their significance, they are often excluded from decision-making processes. Actively involving and empowering these actors—including women, Indigenous communities, and other marginalized groups—in environmental governance can enhance the effectiveness of environmental policies and improve food system outcomes.

### 5. Blue food systems are not without challenges.

An important initial step to harnessing the potential of blue foods is to identify and reform policies and practices that hinder transformation. This includes stopping or redirecting subsidies and production methods that enable overfishing and other unsustainable practices. One-third of marine fish stocks are still overfished, although many stocks are managed to sustain healthy populations. Aquaculture, too, can contribute to habitat destruction, excess nutrient and pathogen production, antibiotic use, and reliance on wild-caught fish and agricultural crops for feed. Recognizing these challenges while seeking to increase the contributions of blue foods to global goals is necessary to integrate them safely and sustainably into food systems transformation.

The **Stanford Center for Ocean Solutions** is a lead science partner of the Blue Food Assessment, which brings together over 100 scientists from more than 25 institutions around the world. Read the latest Blue Food Assessment research at: <https://bluefood.earth/science/>

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The **Aquatic Blue Food Coalition**, catalyzed by the 2021 U.N. Food Systems Summit, aligns more than two dozen governments and NGOs to raise the profile of blue foods and integrate them into food systems decision-making.

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3 Tigchelaar, M., Cheung, W.W.L., Mohammed, E.Y. et al. 2021. Compound climate risks threaten aquatic food system benefits. *Nat Food* 2, 673–682. <https://bluefood.earth/science/climate/>

4 FAO. 2020. The State of World Fisheries and Aquaculture 2020. Sustainability in action. Rome. <https://doi.org/10.4060/ca9229en>

5 FAO, Duke University & WorldFish. 2023. Illuminating Hidden Harvests – The contributions of small-scale fisheries to sustainable development. Rome. <https://doi.org/10.4060/cc4576en>

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