# OECD Review of Fisheries 2025

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BETTER POLICIES FOR BETTER LIVES

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# Foreword

The 2025 edition of the *Review of Fisheries* comes at a critical juncture for international fisheries policy. This year will see the 3rd United Nations Ocean Conference take place in Nice as well as continued negotiations at the World Trade Organization on disciplines to eliminate environmentally harmful fisheries subsidies. Now, more than ever, countries require strong evidence to take concrete actions for sustainable fisheries. The *OECD Review of Fisheries 2025* can help to provide just that.

The *Review* presents unique country-level data on the health of fish resources, fisheries management policies, government support to the sector (including subsidies) and the overall performance of the sector. It also features background material on climate change adaptation and mitigation in fisheries, as well as an initial exploration of gender issues in the sector.

This year's edition highlights that ensuring the sustainability of fish resources remains a challenge. While the majority of fish stocks that are scientifically assessed are healthy (81%), many are not abundant enough to allow for optimal productivity (41%). This means that with optimal management, the sector could contribute even more to the livelihoods of coastal communities and to local and global food systems. Further, the knowledge base to sustainably manage fish stocks remains very limited in some countries. To overcome those limitations, the *Review* offers concrete suggestions for investment in knowledge-building and better fisheries regulation.

The report also finds that public money could be better spent to support the sector and improve its resilience to shocks, including those caused by climate change. About USD 10 Billion were provided to fisheries, annually, in the countries and territories covered in the report between 2020 and2022, which is just over 10% of the value of landings. But 65% of this support was provided though policies that risk driving unsustainable fishing if fishing is not managed effectively. Such support also risks harming the fishers governments want to help. In other words, there is significant opportunity for governments to better support the sector and the communities that rely on it, while also better protecting Ocean ecosystems, by re-purposing and better targeting support. The *Review* also offers a framework that governments can use to identify priorities for reform.

Reforms are already taking place. The balance of risks posed by government support has improved significantly since 2010, with a marked reduction in policies that pose the highest risk (e.g. fuel subsidies) in favour of policies where the risk posed is less direct (e.g. income support). OECD Members have notably increased their spending on fisheries management, monitoring, control and surveillance, which is critical both to improve the health of resources and also reduce the risks posed by other types of support policies. This positive trend in spending on fisheries management is likely to also help countries respond to the challenges posed by climate change, which is already having a noticeable impact on fishers and fish resources.

In 2025, countries have a golden opportunity to leverage international processes to secure a sustainable and resilient future for both their fisheries sector and the Ocean ecosystems. However, co-ordinated efforts are needed to ensure these opportunities do not slip through the net. This edition of the *Review* offers data, evidence and recommendations that policymakers can use to accelerate and amplify reforms that support sustainable and resilient global fisheries.

# Acknowledgements

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# Acronyms and abbreviations

| | |
|---|---|
| AFS | Agreement on Fisheries Subsidies |
| CSIRO | Commonwealth Scientific and Industrial Research Organisation |
| DisMAP | Distribution Mapping and Analysis Portal |
| EU | European Union |
| FAO | Food and Agriculture Organization |
| FSE | Fisheries Support Estimate |
| GHG | Greenhouse gas |
| GT | Gross tonnage |
| ICES | International Council for the Exploration of the Sea |
| IPCC | Intergovernmental Panel on Climate Change |
| ITQ | Individual transferable quota |
| IUU | Illegal, unreported and unregulated |
| kg | Kilogramme |
| km | Kilometre |
| LNG | Liquified natural gas |
| MSY | Maximum sustainable yield |
| MCS | Monitoring, control and surveillance |
| MMCS | Management, monitoring, control and surveillance |
| Mt | Million tonnes |
| NA | Not available |
| NEAFC | North-East Atlantic Fisheries Commission |
| NOAA | National Oceanic and Atmospheric Administration |
| RCP | Representative Concentration Pathway |
| RFMO | Regional fisheries management organization |
| SDG | Sustainable Development Goal |
| SME | Small and medium-sized enterprise |
| TAC | Total allowable catch |
| US | United States |
| USD | United States dollar |
| WTO | World Trade Organization |

# Executive summary

Fisheries and aquaculture provide food for billions of people thereby playing a key role in global food security. The sector also plays an important role in the local economy and cultural life of coastal communities around the world, while fish products are among the most traded foods. But fish stocks and ecosystems are under stress from climate change, illegal fishing, overfishing and pollution.

Sustainably managing fish stocks and ensuring government support to fisheries does not compromise the health of resources is fundamental to the social, economic, and environmental performance of the fisheries sector and its resilience against shocks, notably those driven by climate change.

**Against this background, the OECD Review of Fisheries aims to monitor the sector's performance and sustainability and explore how smarter public policies can reinforce fisheries' role in global food security and the ocean economy.**

This 2025 edition covers 41 countries and territories: 30 OECD Members and 11 non-Members, including the three largest global producers of fish – the People's Republic of China (hereafter China), India and Indonesia. Together, they accounted for the majority of global fish production in 2020-22, namely: 87% of aquaculture production (excluding seaweeds), 69% of marine capture fisheries production and 93% of seaweed production. **>> See Chapter 1**

## Performance and sustainability of the fisheries sector

### *Fish production and trade are growing driven by the expansion of aquaculture in Asia while, in OECD Members, overall, aquaculture is generating more value and fishing is creating fewer jobs*

The overview of sector performance presented in this report underscores the major and increasing role the Asian non-Members play in global fisheries production, driven by the rapid growth of their aquaculture production. Taken together, however, the OECD Members remain a major actor in capture fishing, and the primary actor of international trade in aquatic products.

Overall, the fisheries and aquaculture sector is growing again (after a slow-down or even contraction during the COVID-19 pandemic): international trade is at a high; aquaculture production is seeing sustained growth (with a 450% increase in nominal value and a doubling of production volumes compared to 2005); and the value of capture fisheries peaked in 2021 (a 65% increase in nominal value since 2005) despite a decline in volume. In the OECD Members, employment in capture fisheries has declined by 20% since 2005. **>> see Chapter 2**

### *The majority of assessed fish stocks are healthy, but many are below levels that allow production volume or value to be maximised*

Healthy fish stocks are essential for economically, socially, and environmentally sustainable fisheries. Regular stock assessments are the basis of the science-based fisheries management needed to harvest fish stocks in ways that preserve their health and maximise their productivity and hence benefits to society including in terms of food security.

However, stock assessments can be expensive and complex, thus only a subset of harvested stocks are rigorously assessed. Examining stock status data provides information on what is known about stock health and productivity but also about the extent of knowledge gaps. The OECD gathers information on stocks assessed by the countries and territories covered in this Review and uses the data to compute country-level stock status indicators to provide policymakers with information on the extent to which their sectors rely on healthy and productive resources at the level of decision-making.

Based on the most recent data collected from 1 623 stocks assessed, fisheries management works. Where it was possible to determine a health status, 81% of assessed stocks were healthy. This is more than the Food and Agriculture Organization's estimated global share of 62% of sustainable stocks. One explanation for this difference could be that fish stocks are healthier where scientific management is possible thanks to rigorous stock assessments. The proportion of healthy stocks has also increased by 5 percentage points since 2019.

However, more could be done to harvest healthy stocks optimally. Only 59% of healthy stocks also meet productivity targets aimed at maximising the catch or value of landings. This highlights the importance of improved fisheries management to optimise food production or fisher incomes and reduce greenhouse gas (GHG) emissions, even for healthy stocks. **>> see Chapter 3**

### *Climate change is leading to changes in fish abundance and location that will increasingly complicate sustainable fisheries management and require adaptation*

Climate change is one of the major challenges facing fisheries. Variations in ocean temperatures, changes in currents and acidification, and more frequent extreme weather events are all having significant and growing impacts on fish stocks and fishers' livelihoods across the globe. Understanding how climate change is already affecting the performance and sustainability of capture fisheries, as well as the projections of climate impact into the future is important for sustainable fisheries management both at domestic and multilateral levels.

At the same time, the sector needs to reduce its GHG emissions to contribute to national and international efforts to move towards net zero economies. This edition reviews evidence on fisheries GHG emissions, highlighting the use of fuel as the main source of emissions, and shows that fish is a relatively low-carbon and nutrition-rich food compared to other animal food products, noting vast difference in emissions intensity depending on targeted fishes and fishing techniques. Enhancing co-operation between scientists, stakeholders and policymakers from across the globe is key to help anticipate climate impacts and identify adaptation and mitigation strategies. **>> see Chapter 4**

## Better policies for sustainable and resilient fisheries

### *The majority of fish production from commercially important fisheries comes from species that are subject to catch limits, but climate change calls for caution and flexibility*

Sustainable fisheries management is a win-win-win strategy to increase fisher welfare, preserve ocean health and contribute to climate change mitigation and adaptation. Effective management requires a co-ordinated collection of policy tools that limit how much, how and where fish can be caught. This usually includes regulating catch volumes through limits on the total allowable catch (TAC) of specific species in specific fisheries (and sometimes further dividing and distributing the TAC into individual or community quotas); regulating fleets (e.g. vessel size, power and type of gear); and defining where and when fleets can operate.

Using TAC limits allows managers to control the amount of fish caught and ensure it stays at levels that allow for healthy and productive fisheries. In 2022, the majority (60% by value) of fish production from commercially important fisheries came from species that were fully subject to TAC limits. However, scope for progress exists, with an overall 28% of the production value still coming from species that are not subject to any catch limit, and another 12% from species that are only partially covered by catch limits.

Moreover, to adequately address the impacts of climate change, management institutions at both national and international levels need to be flexible and able to make changes in a timely manner. For fisheries where stocks shift across borders, this may mean regional fisheries bodies, and other types of co-operative agreements, have to adjust overall catch limits and quota allocations, to prevent the overall pressure on stocks exceeding sustainable levels.

Restoring the health and productivity of fish stocks is critical to increase the resilience of the sector, because more abundant stocks are less impacted by and recover more quickly from short term extreme climatic events such as marine heat waves. More abundant stocks will also reduce the emissions intensity of production by increasing catch per unit of fishing effort, meaning less energy is required to catch the same volume of fish. **>> see Chapter 5**

### *Government support to fisheries amounted to just over 10% of the value of landings with support to income almost doubling since 2010-12*

Over USD 10 billion goes to support capture fisheries in the countries and territories covered in this report every year. Over 2020-22, government support amounted to 10.6% of the value of fish landed, or an average of USD 552 per fisher per year. To ensure support benefits the fishers who need it and contributes to stated goals, governments need to understand how public money is being spent, where benefits are distributed and how it impacts all dimensions of the sector's performance.

Six economies accounted for 85% of the support reported in the period 2020-22, therefore driving the overall trends observed in spending: China (36.1%), Japan (12.4%), the United States (11.0%), Canada (10.7%), EU Member states (combined; 8.0%) and Brazil (6.4%). Overall, support to fisheries in 2020-22 was 3% lower than what it was in 2010-12. Over the period considered, total support peaked in 2012-14 (at USD 12.9 billion) and was the lowest in 2016-18 (at USD 9.0 billion)

Three other key trends are, first, an increase in spending on fisheries management, monitoring, control and surveillance in the OECD Members, which is good news, as assessing the health of fish stocks and managing fisheries sustainably is vital to ensuring they are profitable in the long term and resilient to climate change. The gap in spending on management, monitoring, control and surveillance between the OECD Members and the non-Members is however growing as spending has decreased in a number of non-Members. Second, support to income has almost doubled since 2010-12, with most of the increase occurring during and after 2020, as governments aimed to mitigate the impacts of the COVID-19 pandemic on fishers. Third, fisheries support to fuel consumption has fallen in recent years, albeit at a slower pace than in the first half of the last decade. However, the lack of information on broader fuel support policies that target fisheries alongside other sectors means the true scale of fuel support and how it is changing over time are not completely understood. **>> see Chapter 6**

### *In 2020-22, almost two-thirds (65%) of all support to fisheries presented a risk of encouraging unsustainable fishing in the absence of effective management*

Some government support to fisheries is critical to ensure sustainability and help boost productivity and build resilience in the sector. But subsidies that make it easier and cheaper to fish can drive unsustainable and illegal fishing, particularly where fisheries management is weak. When it results in above-optimal fishing effort, support not only risks fish stock health and productivity but also ultimately harms the fishers governments seek to help and undermines other policy objectives such as reducing GHG emissions.

The OECD has developed a framework to identify the policies that may present a risk of encouraging unsustainable fishing in the absence of effective management. It shows that across all countries and territories, in 2020-22, almost two-thirds (65%) of all support to fisheries presented a risk of encouraging unsustainable fishing in the absence of effective management. In the OECD Members, almost half (49%) of total support presented no risk in 2020-22; this consisted mainly in spending on fisheries management and enforcement. However, scope for reform remains: 42% of support still presented a high (8%) or moderate (34%) risk of encouraging unsustainable fishing. In the non-Members, 90% of fisheries support in 2020-22 presented a risk (moderate or high) of encouraging unsustainable fishing.

Ensuring fisheries sustainability calls for policy reform along three priorities: 1) favouring support policy types that do not present a risk of encouraging unsustainable fishing; 2) designing support policies carefully to target the provision of support to sustainable fisheries and fishing practices; and 3) mitigating the risk inherent in the support policy mix by ensuring the effectiveness of fisheries management and enforcement with adequate and sufficient funding. In practice, this means that a significant share of the current spending could be re-purposed away from policies such as subsidies for fuel, vessels, and access to infrastructure and instead be directed to investment in stock assessments, management and enforcement as well as targeted time-bound income support for fishers detrimentally affected by crises with higher social benefits. **>> see Chapter 7**

### *A lack of gender-disaggregated data limits our understanding of gender issues in the sector and calls for gender mainstreaming in the analysis of sector performance as a basis for informed policy-making*

Gender equality and equity is a fundamental human right, and it is proved to support economic performance and sustainability. However, in capture fisheries and aquaculture, across the world, women and girls continue to face persistent and long-standing barriers and systemic disadvantages as in many domains of social and economic life. A review of available evidence shows that the lack of relevant gender-disaggregated data only provides a limited understanding of gender issues in the sector. Information on the policies being used to promote gender equality and equity in the sector also remains limited but suggests that in many cases, impulse for gender equality and equity comes from cross-sectoral policies. The report concludes that a systematic effort to research and better understand gender issues in fisheries and aquaculture in the OECD Members is needed to complement existing research, which focuses on developing country case studies, and help understand how solutions can be transferred to different contexts. Such research would benefit from a cross-sectoral perspective. **>> see Chapter 8**

# 1 An introduction to the 2025 edition of the *OECD Review of Fisheries*

This chapter is a short introduction to this edition of the *OECD Review of Fisheries*. It presents the key objectives of the report and discusses how different audiences might be interested in the different parts of the report. It also describes the geographical coverage of the report and its structure.

## 1.1. What is the purpose of this *Review* and who is it for?

The *OECD Review of Fisheries* (hereafter "the Review" or "this report") is the flagship report of the OECD Fisheries Committee, which is published every two years.[1] It monitors and evaluates fisheries performance and policies across countries and territories in recent years to help countries investigate how public policies could better support fisheries' sustainability and contribution to global food security and the ocean economy. The report notably focuses on policies aimed at ensuring the health of fish stocks and government support to capture fisheries.

The 2025 edition of the *OECD Review of Fisheries* brings together data on fisheries performance – covering both capture fisheries and aquaculture as well as the sustainability of capture fisheries in 41 countries and territories, which are the OECD Members and non-Members participating in the work of the Fisheries Committee and the three other largest producers of fish globally.

The 2025 edition of the Review can be used differently by distinct groups of readers:

- Policymakers will be interested in the key messages and the policy recommendations highlighted at the start of each chapter. Thematic policy briefs summarising the key findings from the report can also be found on the OECD fisheries and aquaculture main web page.
- Researchers and fisheries stakeholders will be interested in the detailed analysis presented throughout the report, as well as the statistics that have been collected and computed for the report, which can be downloaded from the OECD Data Explorer or the OECD fisheries and aquaculture main web page.

Some sections of the report are also useful to various specialised audiences:

- Experts on global food systems will be interested by the detailed data and discussion of the production of fish products, and projections for the future production, which informs on a key and often overlooked aspect of the outlook for food production.
- Climate change experts will be interested in elements which focus on climate change and the future of fisheries, which illustrates how climate change is affecting a sector whose performance is particularly interlinked with natural conditions.
- Gender experts will be interested in the Chapter discussing gender issues in fisheries, which provides an original sector-specific perspective on the issue of gender inequalities.
- Trade and environment experts will be interested by the analysis and discussion of the sustainability impact of support to fisheries, which presents a framework that could inspire ways to evaluate the environmental impact of subsidies in other sectors.

## 1.2. Why are capture fisheries and aquaculture important and why should countries strive for better policies?

**Capture fisheries and aquaculture provide food for billions of people and are critical for global food and nutrition security.** Aquatic animals (hereafter referred to as 'fish') are a central element of traditional diets in many cultures and are a major source of animal protein and vital nutrients (FAO, 2022[1]; Kawarazuka and Béné, 2010[2]; Khalili Tilami and Sampels, 2017[3]; HLPE, 2014[4]; Béné et al., 2015[5]; Maulu et al., 2021[6]; Béné et al., 2016[7]; FAO, 2024[8]). In 2021, they provided 15% of total animal protein and 6% of all protein consumed globally and accounted for at least 20% of the average per capita protein intake from all animal sources for 3.2 billion people (or 40% of the global population) (FAO, 2022[1]). Fish is a particularly important source of food in developing countries thanks to its relative affordability, availability and accessibility for poor communities. Across the OECD, the estimated annual average per capita consumption of aquatic animals was 24.9 kilogrammes (kg) in 2022, well above the global per capita average of 20.6 kg. However, at the OECD level, these numbers varied from a high of 55 kg per person in Korea to a low of 5.4 kg in Türkiye (FAO, 2022[1]). Fish products are among the most traded food commodities (FAO, 2024[8]). Trade in fish products is particularly important for coastal and insular communities for whom exports constitute a substantial proportion of overall trade, generating earnings and jobs.

As global food security continues to pose a pressing challenge, with an estimated 757 million people suffering from hunger – equating to one out of 11 people in the world in 2023 (FAO et al., 2024[9]), capture fisheries and aquaculture, hold the potential to contribute to more resilient and sustainable food systems that provide affordable nutritious food. In this way fish can also play a key role in achieving key targets pursued by the international community with respect to Sustainable Development Goal (SDG) 2 "ending hunger and malnutrition in all its forms" (HLPE, 2014[4]; FAO, 2024[8]).

**Fish is a relatively low-carbon food.** Fish generally have a lower greenhouse gas emissions intensity of production than other animal food products, both by live weight and by gramme of protein. The lowest emissions-intensive fish, such as small pelagics and certain molluscs, are produced with emissions intensities comparable to those of plant-based protein (Chapter 4). Likewise, algae and seaweeds are increasingly recognised for their rich micronutrient content, and have been identified as a healthy, high-fibre and low-calorie food option. The cultivation of algae and seaweeds generates relatively few emissions, requires relatively little arable land and freshwater and can even support the restoration of aquatic ecosystems (Cai et al., 2021[10]; World Bank, 2023[11]; UNCTAD, 2024[12]). The sector, therefore, has a role to play in achieving resilient food systems that minimise impacts on biodiversity, ecosystems and the climate.

**But fish stocks and ecosystems are under stress from climate change, illegal fishing, overfishing and pollution.** Sustainably managing fish stocks, and aquaculture production systems and supporting the fisheries sector in ways that do not compromise the health of resources is fundamental to the social, economic and environmental performance of the fisheries sector. Sustainability is also important for the sector's resilience to shocks, including those caused by climate change. This involves a range of measures to control how much fish can be caught and how, when and where it can be caught, as well as investment in the underlying science.

## 1.3. What are some of the challenges facing the sector?

**Ensuring effective fisheries management:** Creating an economic, environmental and socially sustainable sector requires fisheries management systems that can constrain fishing activity to levels that protect the health of fish stocks while allowing fishers to operate profitably. There is no perfect management system, and the way that fisheries respond to management action can be complex and unpredictable. Fisheries management must, therefore, be able to adapt to changing circumstances.

**Adapting to climate change:** The changing climate is increasingly altering marine ecosystems and creating uncertainty in how fish stock health is affected by fishing pressure. Climate induced changes, such as the rise in sea surface temperatures and ocean acidification, are affecting the effectiveness of existing fisheries management measures, highlighting the need to make climate change a central consideration when taking management decisions.

**Assessing the status of stocks regularly and accurately:** A good understanding of the status of fish stocks is fundamental to a sustainable and productive sector and requires accurate and regular stock assessments. Without stock assessments, fishers are likely missing out on potential profits either through underfishing or overfishing. However, in some countries, very few stocks are assessed, which complicates the job of fisheries managers.

**Reducing emissions to contribute to climate mitigation imperatives**: Like all economic sectors, fisheries need to reduce their greenhouse gas emissions to contribute to national and international efforts to move towards net zero emission economies, calling for mitigation strategies.

**Avoiding unintended support policy impacts:** Governments regulate and support fisheries to ensure they are productive, sustainable and resilient in the face of external threats. But government support can pose risks to the sustainability and productivity of fisheries when it encourages overfishing and illegal, unreported and unregulated (IUU) fishing. This ultimately compromises fishers' livelihoods while potentially making them more dependent on support and less competitive in the process.

**Preventing illegal, unreported and unregulated fishing:** IUU fishing is a major issue for global fisheries. It complicates the stock assessments needed for effective and evidence-based management and causes unfair competition over resources and in markets.

**Maintaining effective global co-operation:** Regional fisheries bodies (such as regional fisheries management organisations and arrangements) play a key role in regulating the fishing of migratory and straddling fish stocks and fishing on the high seas. International co-operation is, however, key, even when it comes to domestic fisheries policies. As fish stocks cross borders, migrate and are part of complex food chains and ecosystems, fisheries regulation and support have direct impacts beyond countries' own waters. The importance of collectively working towards more sustainable fisheries has been flagged by a series of international commitments calling for policy reforms (Box 1.1).

### Box 1.1. International commitments to reform fisheries policies with sustainability objectives

- **Sustainable Development Goal (SDG) 14** "Conserve and sustainably use the oceans, seas and marine resources for sustainable development" contains two fisheries-related targets:
  - Target 14.4: "by 2020, effectively regulate harvesting, and end overfishing, illegal, unreported and unregulated (IUU) fishing and destructive fishing practices and implement science-based management plans, to restore fish stocks in the shortest time feasible at least to levels that can produce maximum sustainable yield as determined by their biological characteristics."
  - Target 14.6: "by 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, and eliminate subsidies that contribute to IUU fishing, and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the WTO fisheries subsidies negotiation."
- **Target 18 of the Kunming-Montreal Global Biodiversity Framework** covers support to all sectors with a biodiversity impact by inviting Parties to the Convention on Biological Diversity to "identify by 2025, and eliminate, phase out or reform incentives, including subsidies, harmful for biodiversity, in a proportionate, just, fair, effective and equitable way, while substantially and progressively reducing them by at least USD 500 billion per year by 2030, starting with the most harmful incentives, and scale up positive incentives for the conservation and sustainable use of biodiversity".
- The World Trade Organization (WTO) Agreement on Fisheries Subsidies (AFS): Formally adopted by WTO Members in June 2022, after over 20 years of negotiations, notably in response to SDG Target 14.6, the agreement has three main prohibitions. It prohibits subsidising vessels or operators engaged in IUU fishing and fishing-related activities (article 3), subsidising fishing and fishing-related activities regarding an overfished stock if there are no measures to rebuild that stock (article 4) and subsidising fishing or fishing-related activities

outside of the jurisdiction of a coastal Member or a coastal non-Member and outside the competence of a relevant RFMO/A (article 5.1) – alongside other disciplines, which notably target subsidies to vessels not flying the subsidising Member's flag and subsidies to fishing or fishing related activities regarding stocks the status of which is unknown. The agreement will enter into force once two-thirds of WTO Members have deposited their instrument of acceptance of the Protocol of the WTO AFS. At the end of December 2024, 87 deposits were received and 24 more were needed for entry into force. In addition, since 2022, WTO Members have continued discussions to achieve a comprehensive agreement on fisheries subsidies, including through further disciplines on certain forms of fisheries subsidies that contribute to overcapacity and overfishing.

## 1.4. What is the geographical coverage of this report?

This edition of the *OECD Review of Fisheries* **covers 41 countries and territories**:

- Thirty OECD Members: All the OECD Members who report data on support to fisheries to the OECD: Australia, Belgium, Canada, Chile, Colombia, Costa Rica, Denmark, Estonia, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Korea, Latvia, Lithuania, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Türkiye, the United Kingdom and the United States.
- Eight non-Members who regularly participate in the work of the OECD Fisheries Committee and report data on support to fisheries to the OECD: Argentina, Brazil, Bulgaria, Chinese Taipei, Croatia, Indonesia, Peru and Romania.
- The three other largest global producers of fish products: The People's Republic of China (hereafter "China"), India and Viet Nam.

**The majority of global fish production is covered**. Together, over the period 2020-22, the 41 countries and territories covered in this report accounted for 79% of the global production of aquatic animals by volume (that is, 87% of global aquaculture production excluding seaweeds and 69% of global marine capture fisheries production). They also accounted for 93% of seaweed production from aquaculture. The report covers all top 10 producers of capture fisheries (in volume), with the exception of the Russian Federation, as well as six of the top 10 aquaculture producers (with the exception of Bangladesh, Ecuador, Egypt and Myanmar).[2]

Throughout the report, average statistics are reported across the OECD Members (and the non-Members, despite the heterogeneity of that group), to provide context for Members to situate the relative performance and sustainability of their fisheries.

## 1.5. What can be found in this report?

**Part I reviews available data on the performance and sustainability of fisheries** – both capture and aquaculture – in recent years. Chapter 2 focuses on socio-economic performance, reviewing recent trends in production, trade, employment and fleet and discussing the outlook for the next decade based on projections made in the latest edition of the *OECD-FAO Agricultural Outlook* (OECD/FAO, 2024[13]). Chapter 3 then reviews the facts on fish stock health and productivity, based on data collected by the OECD, and discusses how stock status and knowledge have evolved in recent years. Finally, Chapter 4 discusses the impact of climate change on capture fisheries and the outlook for expected changes in fish abundance and location under different climate scenarios.

**Part II turns to policies** and monitors recent developments in the 41 countries and territories covered in the report. It looks at the management tools governments use to regulate their most valuable fisheries in Chapter 5 and the policies they use to support capture fisheries in Chapter 6. It then investigates how better support policies could help ensure the sustainability of the resource base while maximising benefits for societies in Chapter 7. Finally, Chapter 8 discusses issues related to gender equality in the fisheries and aquaculture sectors and how to better address them.

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## Notes

[1] Due a change in publication timing from the end of the year to the beginning of the year, the time-lapse since the last edition (published in December 2022) has been slightly over two years.

[2] The Review also covers eight of the top 10 global producers of marine and coastal aquaculture, missing only Ecuador and the Philippines.

# Part I

## Fisheries in the OECD and beyond

# 2 Fisheries performance in recent years

This chapter reviews the performance of capture fisheries and aquaculture in the OECD Members and the non-Members covered in this report in the past 15 years, thereby setting the scene for the policy analysis conducted in the second part of this report. It highlights the major role played by Asian economies in global fisheries production, especially aquaculture production, which is much more concentrated geographically than production from capture fishing. It also discusses how the OECD Members remain important in capture fisheries production and trade in fisheries products. The chapter further reviews trends in employment and fleet. Finally, it discusses the outlook for the sector.

## Key messages on fisheries performance

- **At the level of all 41 countries and territories covered in this report, the fisheries and aquaculture sectors have recovered from the COVID-19 pandemic**.
  - International trade is at an all-time high in value terms.
  - Aquaculture production is growing: production doubled in volume and has increased by 450% in value since the mid-2000s.
  - The value of capture fisheries production peaked in 2021 (a 65% increase in nominal value since 2005) despite a decline in volume.
- **The trends in production are largely and increasingly driven by the Asian non-Members**. In 2022, the OECD Members accounted for:
  - 40% of the capture fisheries catch volume and 34% of the value of landings from the 41 countries and territories covered in this report (down from highs of 47% of volume in 2006 and 54% of value in 2005)
  - 9% of the aquaculture production volume and 17% of the production value (down from highs of 13% of volume in 2005 and 30% of value in 2006).
- **Aquaculture is continuing to grow in importance, including in the OECD Members.** Across the 41 countries and territories covered in this report, aquaculture (excluding seaweeds) accounted for 72% of the value and 60% of the volume of aquatic animal production in 2022. Across OECD Members, it accounted for 55% of the production by value but only 25% of production volume.
- **In the OECD Members, employment in fishing has declined by 20% since 2005**, but the value generated by capture fisheries has been stable in nominal terms.
- **Global fish production is projected to grow over** the next decade (driven by the continued expansion of aquaculture in Asian non-Members). However, the pace of growth will be slower than previous year.

## 2.1. What's the issue?

In recent years, fish production and trade were affected by the COVID-19 pandemic which reduced production and trade in many parts of the world. More generally, sector performance is impacted by variations in the price of inputs, most notably fuel; the health of fish stocks; government policies for the sector and socio-economic trends that cut across sectors. Capture fisheries, for example, are facing an ageing workforce in several OECD Members.

This chapter reviews data from the 41 countries and territories covered in this report[1] (Chapter 1), on the socio-economic performance of capture fisheries and aquaculture in recent years thereby setting the scene for the policy analysis conducted in Part II of this report. It reviews trends in production, trade, employment, and fleets, and ends with a discussion of projections for production in the coming decade based on a recent OECD-FAO report (OECD/FAO, 2024[1]). Throughout this chapter, figures are presented either at the level of "all countries and territories", which refers to the 41 countries and territories covered in the report, or at the level of "the OECD Members" and "the non-Members" amongst them. Values are all expressed in nominal terms.

## 2.2. Total production of aquatic animals and plants is growing, driven by aquaculture

Overall, in 2022, the 41 countries and territories covered by this report produced 172 million tonnes of aquatic products: 56 million tonnes of aquatic animals from marine capture fisheries and 116 million tonnes from aquaculture, including 82 million tonnes of aquatic animals and 34 million tonnes of seaweeds (Figure 2.1a). The volume of total production has increased by 50% over the last 15 years (that is, +2% yearly over the period), with aquaculture's share growing from 45% of total production in 2005 (or 39% when excluding seaweeds) to 68% in 2022 (or 60% when excluding seaweeds). Aquaculture production has surpassed production from capture fisheries in volume since 2013 when all countries and territories are considered.

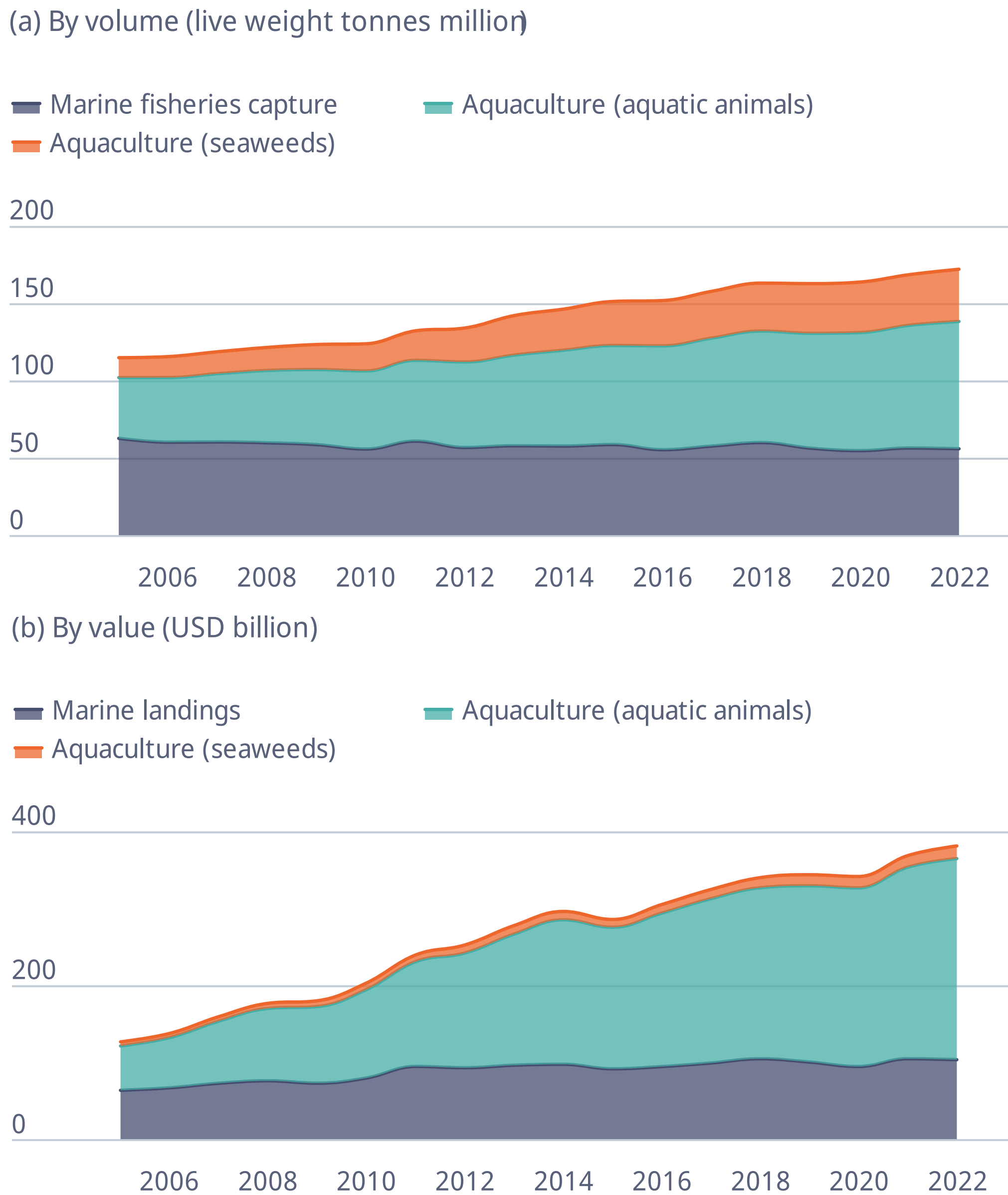
The increase in total production is even more significant in value, rising from USD 127 billion in 2005 to USD 381 billion in 2022, tripling its value in 15 years (an equivalent of 7% yearly over the period). The influence of aquaculture is also more evident in value than in volume, as aquaculture accounted for 73% of total production by value in 2022 (72% excluding seaweeds).

In the OECD Members, total production reached 32 million tonnes for a total value of USD 80 billion in 2022 (Figure 2.2). The share of production from the OECD Members in the production of all countries and territories has decreased since 2005 to about a fifth in both volume and value (specifically from 31% to 19% in volume and from 41% to 21% in value).

The share of aquaculture in the total production volume in the OECD Members has increased over time, but it still only represented 25% in 2022. In value terms, however, aquaculture surpassed landings from capture fisheries since 2019. In 2022, aquaculture accounted for 55% of total production value in the OECD Members (excluding seaweeds). This is due to a steady increase in aquaculture value (not a decline in the value of capture fisheries landings, which has remained stable since 2005), reflecting the focus on producing predominantly higher value species (such as salmon).

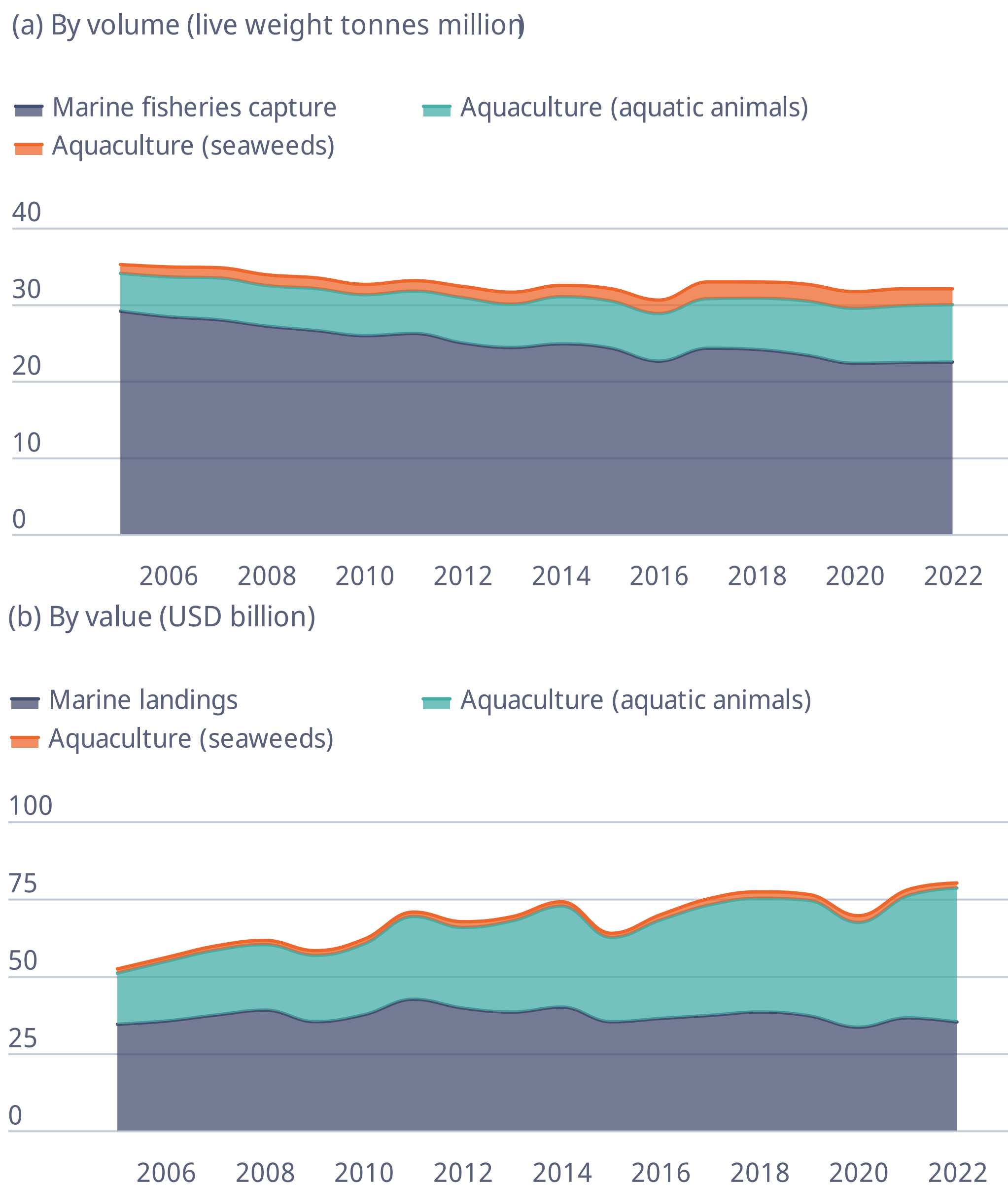
Aquaculture is the main source of domestic fish production in many countries, both major fish producers and countries where overall fish production is modest on a global scale. Notably, aquaculture accounted for 93.5% of fish production volume in Slovenia, 86.3% in China, 77.9% in Romania, 73.7% in India and 70.4% in Colombia. At the other end of the spectrum, aquaculture represented less than 2% of total fish production in Latvia (1.4%), Belgium (1.3%), Estonia (1.1%) and Argentina (0.7%).

**Figure 2.1. Marine capture fisheries and aquaculture production in all countries and territories, 2005-22**




Note: Official data were complemented with estimates where data were not available. Mammals are not included. Values are expressed in nominal terms.
Source: OECD (2025), Marine landings, http://data-explorer.oecd.org/s/gn. FAO (2024), FishStat: Global aquaculture production 1950-2022 and Global capture production 1950-2022, www.fao.org/fishery/en/statistics/software/fishstatj (Accessed on 31 July 2024).

**Figure 2.2. Marine capture fisheries and aquaculture production in the OECD Members, 2005-22**

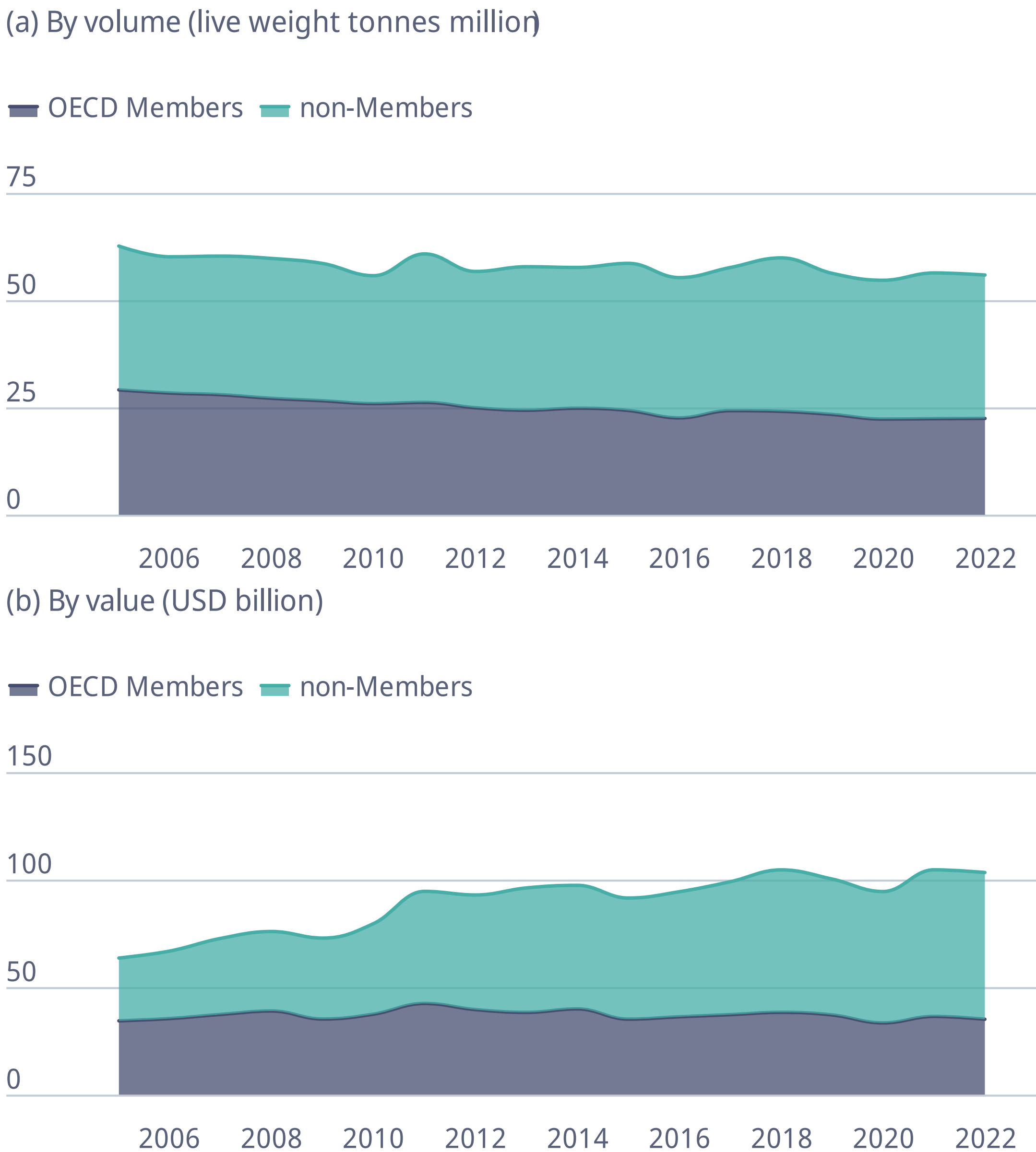



Note: Official data were complemented with estimates where data were not available. Mammals are not included. Values are expressed in nominal terms.
Source: OECD (2025), Marine landings http://data-explorer.oecd.org/s/gn. FAO (2024), FishStat: Global aquaculture production 1950-2022 and Global capture production 1950-2022. www.fao.org/fishery/en/statistics/software/fishstatj [Accessed on 31 July 2024].

## 2.3. Capture fisheries production is declining in volume, but its value is rising driven by growth in the non-Members

In 2022, the 41 countries and territories covered in this report together captured 56 million tonnes of aquatic animals and plants in marine waters, down from 63 million tonnes in 2005 (and from a more recent high of 60 million tonnes in 2018).[2] The landings were worth USD 103 billion in 2022, almost double their value in the mid-2000s, and almost back to the all-time high of USD 105 billion in 2018 (Figure 2.3).

**Figure 2.3. Marine capture fisheries production in all countries and territories, 2005-22**



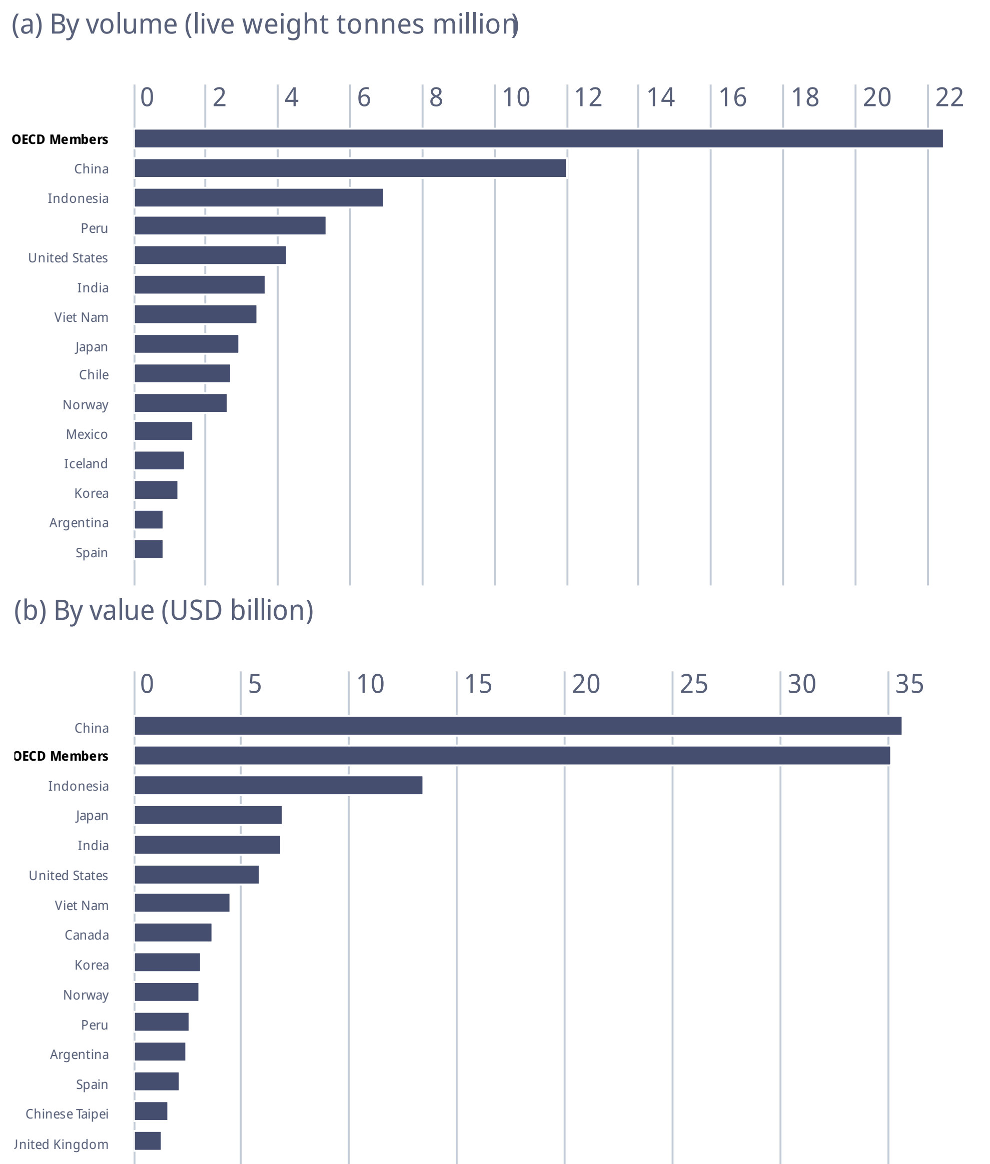

Note: Official data were complemented with estimates where data were not available. Mammals are not included. Values are expressed in nominal terms.
Source: OECD (2025), Marine landings http://data-explorer.oecd.org/s/gn. FAO (2024), FishStat: Global capture production 1950-2022, www.fao.org/fishery/en/statistics/software/fishstatj (Accessed on 31 July 2024).

Overall, trends in marine capture fisheries performance are also increasingly driven by what is happening outside the OECD as the OECD share of production is decreasing – but to a lesser extent than what is observed for overall production. In 2022, the OECD Members accounted for 40% of the catch volume from the countries and territories covered in this report (down from a high of 47% in 2006) and 34% of the value of landings (down from a high of 54% in 2005). In 2022, China alone accounted for 21% of the catch volume and 35% of the value of marine landings, and Indonesia for 12% of catch volume and 13% of value. In terms of catch volume, they were followed by Peru (10%); the United States (8%); India (7%); Viet Nam (6%); Japan, Chile and Norway (all 5%); and Mexico (3%). In value terms, the other top 10 producers were

Japan and India (7%), the United States (6%), Viet Nam and Canada (4%), Korea and Norway (3%), and Peru (2%) (Figure 2.4).

In volume, two species stood out: Anchoveta and Skipjack tuna, which made up respectively 9% and 3% of total catches. They were followed by Alaska pollock, Atlantic herring, Pacific chub mackerel, Jumbo flying squid, Pacific sardine, Chilean jack mackerel, Largehead hartail and Japanese anchovy, each accounting for 2% of catches.[3]

### Figure 2.4. Marine capture fisheries production in the largest producers (and total for the OECD Members), 2022



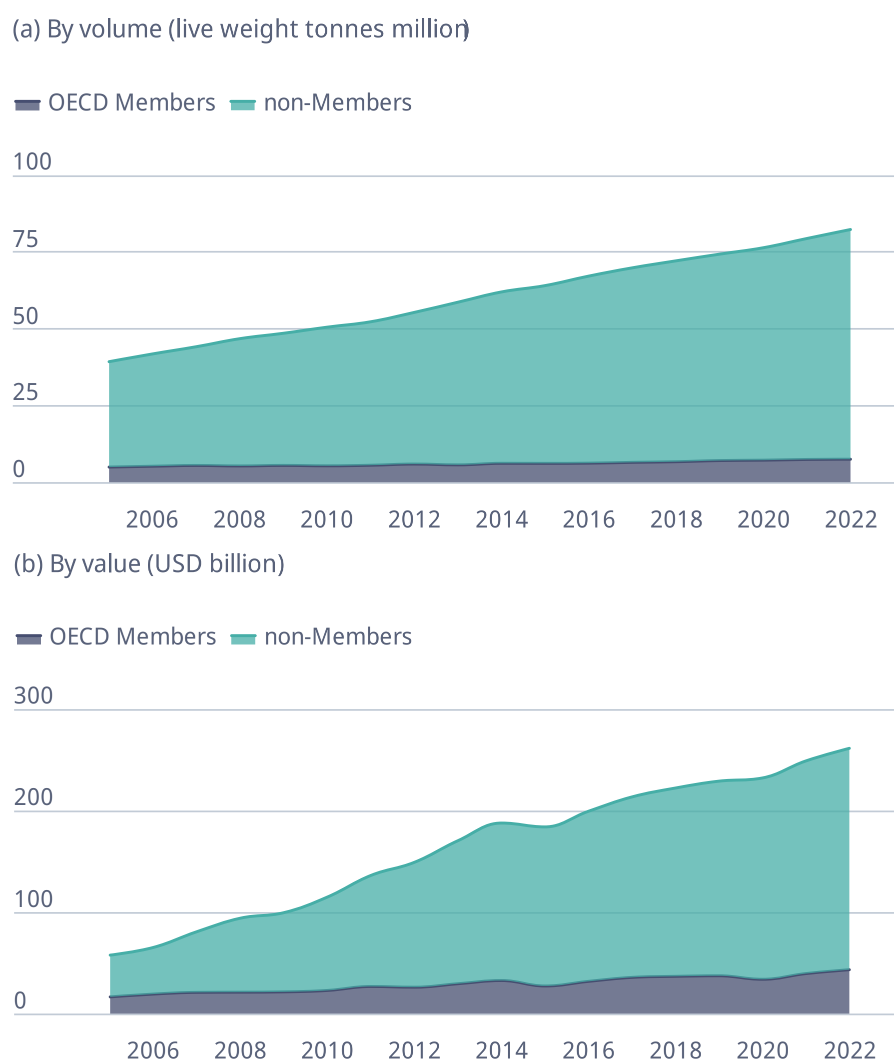

Note: Official data were complemented with estimates where data were not available. Mammals are not included. Values are expressed in nominal terms.
Source: FAO (2024). FishStat: Global capture production 1950-2022, www.fao.org/fishery/en/statistics/software/fishstatj [Accessed on 31 July 2024]. OECD (2025), Marine landings http://data-explorer.oecd.org/s/gn.

In 2022, the 41 countries and territories covered in this report also captured more than 4 million tonnes of aquatic animals from inland waters, a level of production in line with what was seen over the last 15 years. India and China were the largest producers, together accounting for 74% of the total inland catch. Carps, barbels and other cyprinids were the most important species for inland production (22%). No data are available on the value of inland catches at the cross-country level.

## 2.4. Aquaculture production has expanded significantly, but more slowly in the OECD Members than in the non-Members

In 2022, aquaculture production (excluding seaweed farming) reached 82 million tonnes in the 41 countries and territories covered in this report, about twice as much as in 2005, following a continuous growth since then. Aquaculture production was worth USD 261 billion in 2022, almost five times its value in the mid-2000s (Figure 2.5).

### Figure 2.5. Aquaculture production in all countries and territories, 2005-22

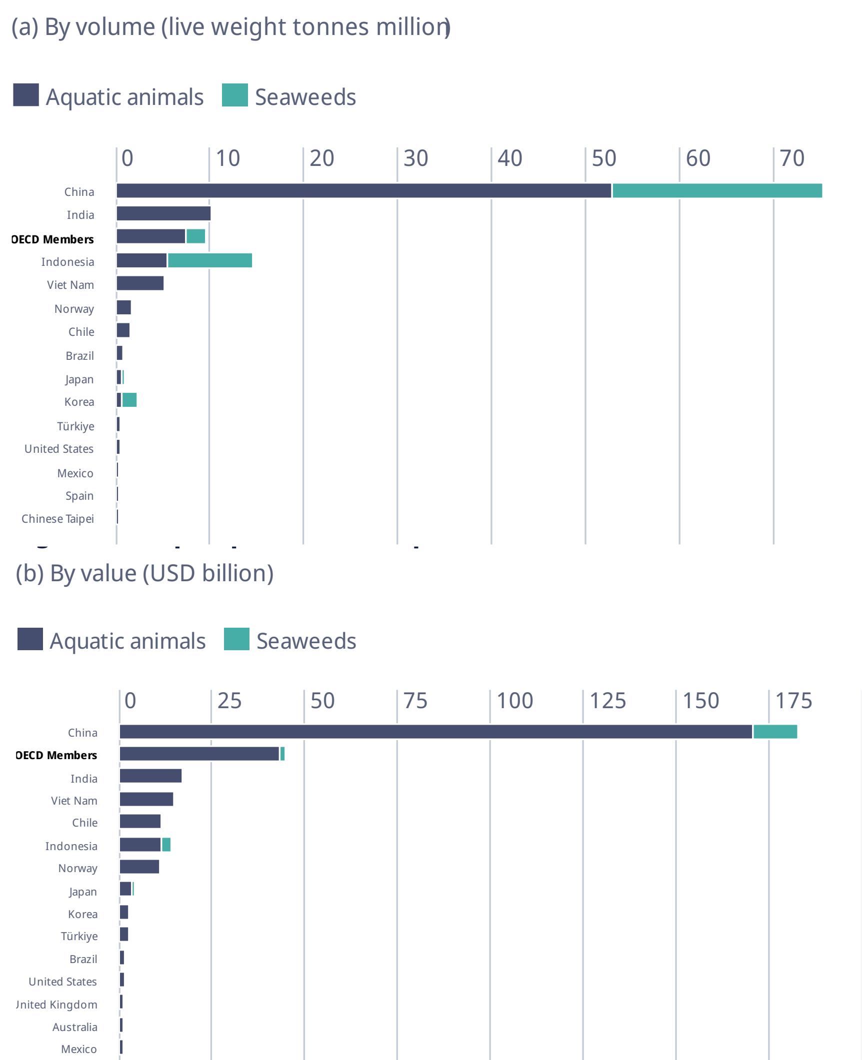



Note: Seaweeds are not included. Values are expressed in nominal terms.
Source: FAO (2024), FishStat: Global aquaculture production 1950-2022, www.fao.org/fishery/en/statistics/software/fishstatj (Accessed on 31 July 2024).

Trends in aquaculture production (excluding seaweed farming) are also increasingly driven by what is happening outside the OECD, and even more so than for capture fisheries. The OECD Members only accounted for 9% of the production volume and 17% of the production value in 2022, down from highs of 13% of volume in 2005 and 30% of value in 2006. The OECD share of aquaculture production has declined over the last 15 years both in volume and value, despite an overall increase in production in the OECD Members (on average +2.5% yearly in volume and +5.8% in value), due to greater growth in the non-Members (on average +4.7% in volume and +10.3% in value).

Aquaculture production of aquatic animals (i.e. excluding seaweed) is dominated by China, which accounted for 64% of the volume and 65% of the value of production in all countries and territories (Figure 2.6). In volume, the other major producing countries were India (12%), Indonesia (7%), Viet Nam (6%), Norway and Chile 2% each). In value terms, India accounted for 7%, Viet Nam 6%, Chile, Indonesia and Norway all accounted for 4% each, and Japan for 1.3%. Other countries and territories individually did not account for more than 1% of either volume or value.

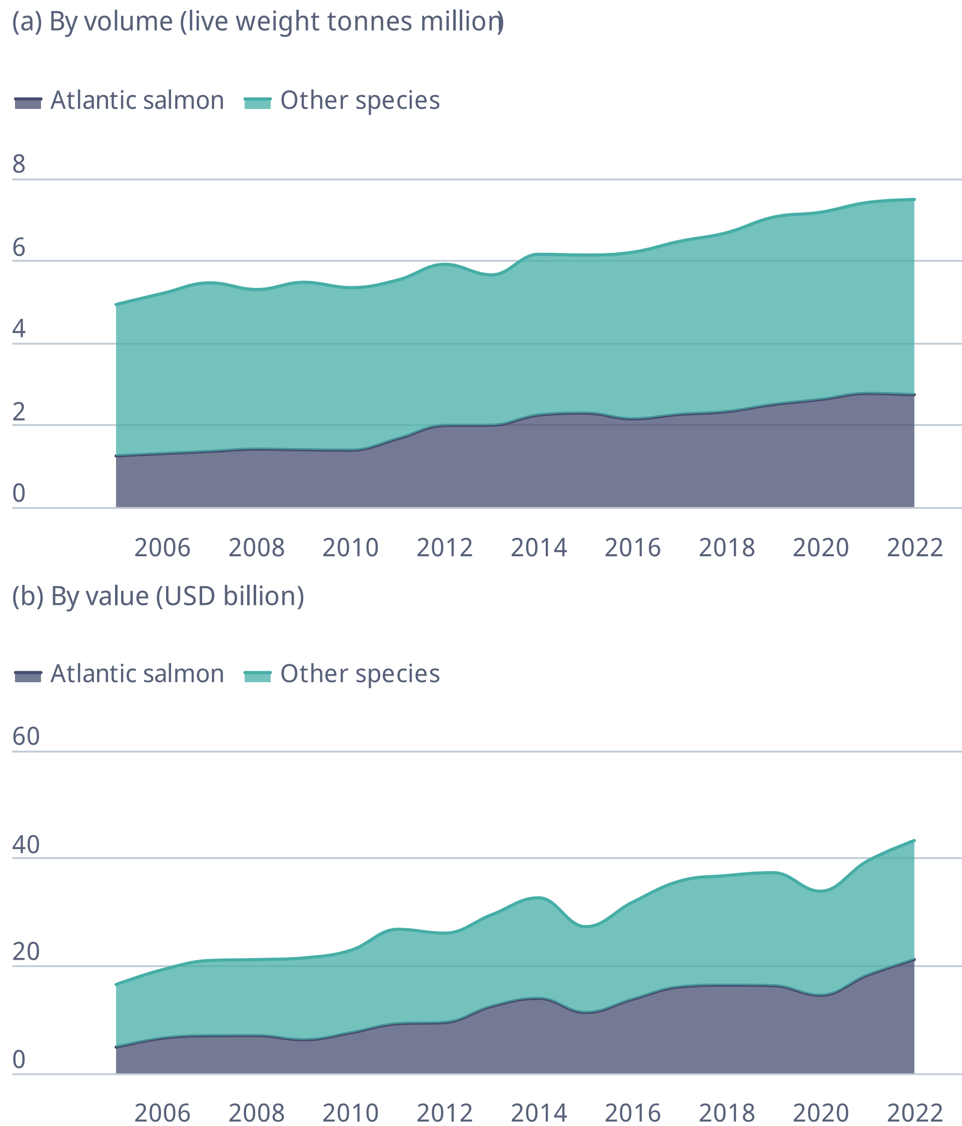
## Figure 2.6. Aquaculture production in the largest producers (and total for OECD Members), 2022




Note: Values are expressed in nominal terms.
Source: FAO (2024), FishStat: Global aquaculture production 1950-2022, www.fao.org/fishery/en/statistics/software/fishstatj (Accessed on 31 July 2024).

Aquaculture production in OECD Members focuses on high-value species, most notably Atlantic salmon, whose production has increased over the last 15 years, reaching 2.7 million tonnes in 2022 (up from 1.2 million tonnes in 2005) and USD 21.2 billion (up from USD 4.9 billion in 2005). As a result, in 2022, Atlantic salmon accounted for 37% of production volume and 49% in value in the OECD Members (Figure 2.7).[4] Norway accounts for more than half of the production of this species in OECD Members (1.5 million tonnes and USD 10.5 billion, or 57% of the volume and 50% in value). The second largest producer was Chile, with about 760 000 tonnes (28% in volume and 35% in value).[5]

### Figure 2.7. Production of Atlantic Salmon and other species in the OECD Members, 2005-22




Note: Data refers to aquaculture production, excluding seaweeds. Values are expressed in nominal terms.
Source: FAO (2024), FishStat: Global aquaculture production 1950-2022, www.fao.org/fishery/en/statistics/software/fishstatj (Accessed on 31 July 2024).

Seaweed farming in the 41 countries and territories covered reached almost 34 million tonnes in 2022, worth more than USD 16 billion – up from 13 million tonnes and USD 5 billion in 2005 (on average +5.8% yearly in volume and +6.9% in value). The production was highly concentrated. In 2022, China and

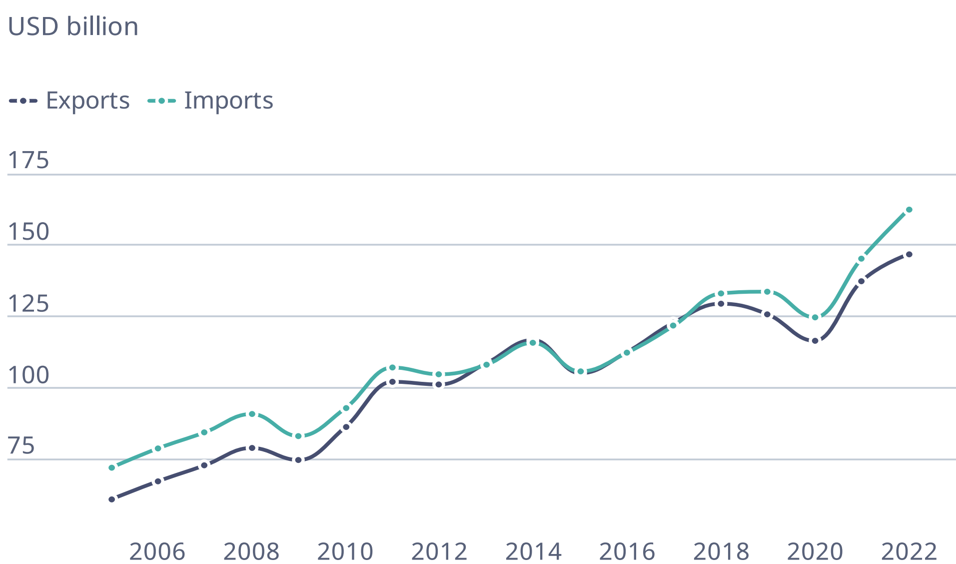
Indonesia dominated production, accounting for 67% and 27% of the production volume (respectively) and 73% and 17%, of the value. They were followed by Korea (5% of volume and 3% of value), Japan (1% of volume and 5% of value) and Chile (0.05% in volume and 1% in value). Another 15 countries and territories reported production, all individually accounting for below 0.05% (of volume or value).

Overall, the OECD Members thus produced 6% of the total volume of seaweed and 10% of the total value in 2022 and have seen their production shares decrease over the last 15 years, despite an increase in production volume and value in absolute terms, due to greater growth in China and India.

## 2.5. Trade in fish products at an all-time high after recovery from the impacts of the COVID-19 pandemic

Fish is one of the most traded food commodities (FAO, 2024[2]). In 2022, global trade in fish products accounted for just over 9% of total agricultural trade in value and about 1% of total merchandise trade value. Trade is also an essential part of fisheries sectors in the countries and territories covered in this report. In 2022, exports of fish products from all of them were worth USD 147 billion – an all-time high, following a recovery in trade after a drop in 2020 due to the impacts of the COVID-19 pandemic (+ 26% since then) (().[6] The top five exporters were: China (USD 22.6 billion), Norway (USD 15.6 billion), Viet Nam (USD 11 billion), Chile (USD 8.7 billion) and India (USD 7.9 billion). On the other hand, the top five importers were the United States (USD 32.4 billion), China (USD 23.2 billion), Japan (USD 15.4 billion), Spain (USD 9.5 billion) and France (USD 8.2 billion).[7]

### Figure 2.8. Trade in fish products, 2005-22




Note: Values are expressed in nominal terms.
Source: FAO (2024), FishStat: Global Aquatic Trade Statistics 1976-2022, www.fao.org/fishery/en/statistics/software/fishstatj (Accessed on 31 July 2024).

## 2.6. OECD Members are a major trading bloc

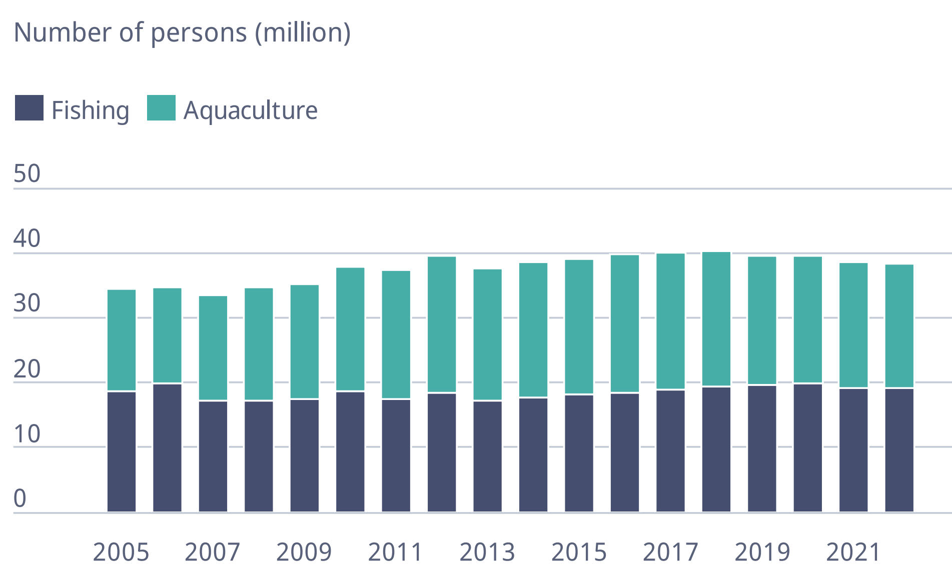
With an export value of USD 91.1 billion in 2022, the OECD Members accounted for 62% of the exports from the 41 countries and territories covered in this report by value and for 60% by volume. A large portion of that trade was between OECD Members: 64% of OECD exports in volume and 75% in value were to an OECD destination. This highlights the importance of high-income territories as trading partners for valuable fisheries exports.

Overall, the OECD Members have been net importers of aquatic animal products over the past 15 years. The species group with the biggest trade deficit in 2022 were: shrimps and prawns (USD -16.9 billion); tunas, bonitos and billfishes (USD -7.7 billion); squids, cuttlefishes and octopuses (USD -5.9 billion); and cods, hakes and haddocks (USD -3.1 billion). Salmons, trouts and smelts, on the other hand, was both the most exported and most imported species group by the OECD Members, with USD 34.4 billion in exports and USD 30.1 billion in imports, making it the species group with the largest trade surplus (USD 4.3 billion).

## 2.7. Employment in fishing and aquaculture has overall been relatively stable, and dominated by the Asian non-Members

In 2022, in the countries and territories covered by this report, 38 million people were employed in fishing[8] and aquaculture production – a small increase from 2005 when it was around 34 million (Figure 2.9).[9] The vast majority of workers in the fishing and aquaculture sectors (94%) were in the Asian non-Members, as has been the case over the last 15 years.

**Figure 2.9. Employment in fishing and aquaculture in all countries and territories, 2005-22**



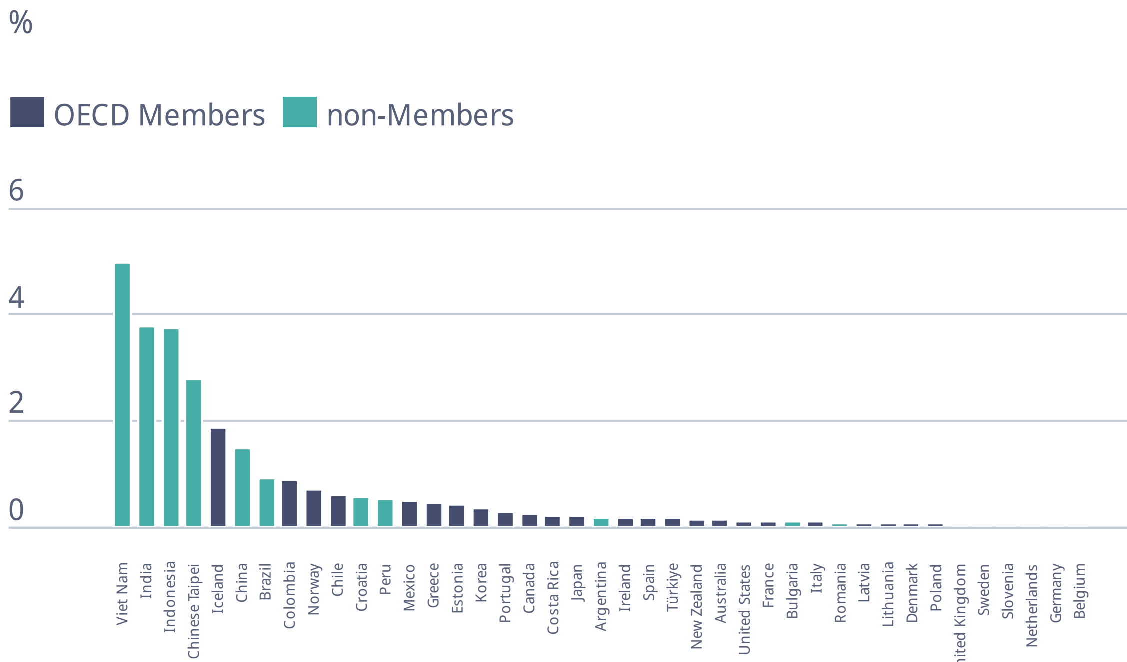

Note: Fishing includes both marine and inland fishing but excludes subsistence and recreational fishing. The number of workers reported under 'Sector unspecified' (e.g. that cannot be allocated to fisheries and aquaculture) are not included in the graph (significant numbers of workers were reported under this category only by India). Official data were complemented with estimates where data were not available.
Source: OECD/FAO (2025), Employment in fisheries, aquaculture and processing, http://data-explorer.oecd.org/s/h1.

### *2.7.1. The sector employed a much smaller share of the workforce in the OECD Members than in the non-Members*

Employment in fishing and aquaculture accounts for a much higher share of total employment in the non-Members than in the OECD Members. Over the past 15 years, on average, fishing and aquaculture made up about 2.5% of total employment in the non-Members, compared to about 0.2% in the OECD Members.

These shares were confirmed in 2022 (2.4% versus 0.2%). However, significant differences can be observed at the country level, with shares ranging from 5% in Viet Nam to 0.01% in Belgium (Figure 2.10).

### Figure 2.10. Share of fishers and fish famers in total employment, 2022




Note: Fishing includes both marine and inland fishing but excludes subsistence and recreational fishing. Official data were complemented with estimates where data were not available.
Source: OECD/FAO (2025), Employment in fisheries, aquaculture and processing, http://data-explorer.oecd.org/s/h6; OECD (2024), Annual labour force survey, summary tables, http://data-explorer.oecd.org/s/h7; ILOSTAT (2024), Employment by sex and age (thousands).

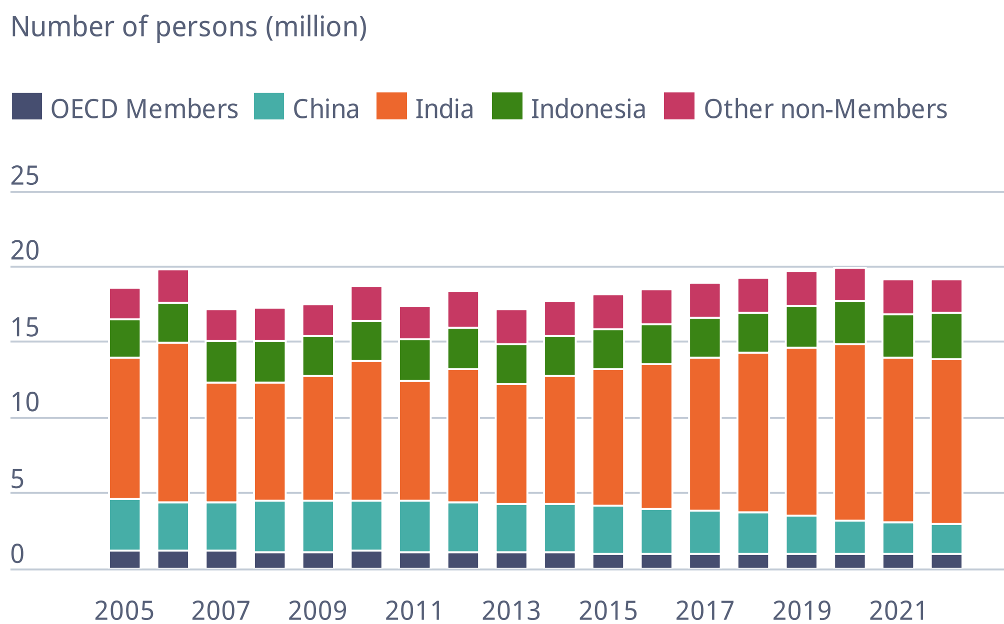
### *2.7.2. Overall, fishing and aquaculture had similar levels of employment in 2022 but shares and trends vary considerably across countries and territories*

While overall jobs were equally shared between fishing and aquaculture production in 2022, the split between sectors varies considerably across countries and territories. Within the OECD Members, fishers made up 74% of total employment. This share was 81% in 2005 and has decreased steadily over the last 15 years, highlighting the growing relative importance of the aquaculture sector. In the non-Members, aquaculture accounted for just over half of the employment (51%) in 2022, a modest increase since 2005 when aquaculture already employed almost as many workers as fisheries (47%).

Across all countries and territories, there were 19 million jobs in fishing in 2022, in line with figures seen since the mid-2000s, which fluctuated between 17 million and 19 million jobs (Figure 2.11). In 2022, the sector employed about 1 million people in the OECD Members (5% of the total number of jobs in fishing across all countries and territories), down 20% compared to 2005. Together, the OECD Members would rank fourth in terms of employment in fishing after India, Indonesia and China, which together accounted for 83% of the total number of fishers. This OECD share of jobs in fishing has remained relatively stable over the past 15 years.

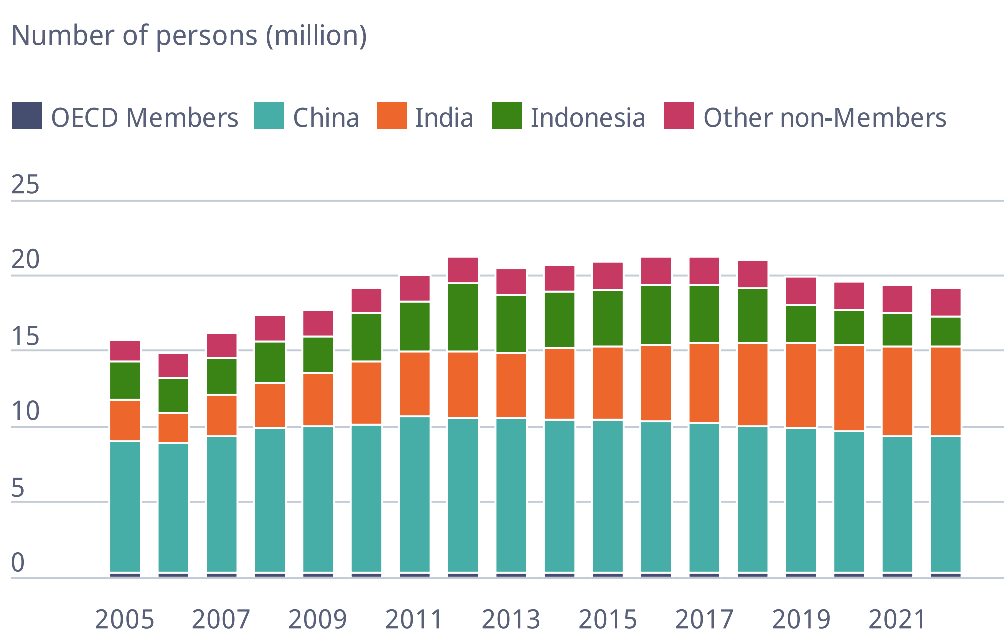
Aquaculture, on the other hand, employed just over 19 million people in 2022. Most of the workers were in Asian non-Members, particularly China (47%), India (31%) and Indonesia (10%), which together accounted for 88% of total employment in the sector. Their combined share of aquaculture employment has remained stable since 2005 as a reduction in the Chinese share has been offset by the growing Indian share. The share of aquaculture employment in the OECD Members has remained stable at around 2% since the mid-2000s (Figure 2.12).

### Figure 2.11. Employment in fishing, 2005-22




Note: Fishing includes both marine and inland fishing but excludes subsistence and recreational fishing. Official data were complemented with estimates where data were not available.
Source: OECD/FAO (2025), Employment in fisheries, aquaculture and processing, http://data-explorer.oecd.org/s/h1.

### Figure 2.12. Employment in aquaculture, 2005-22



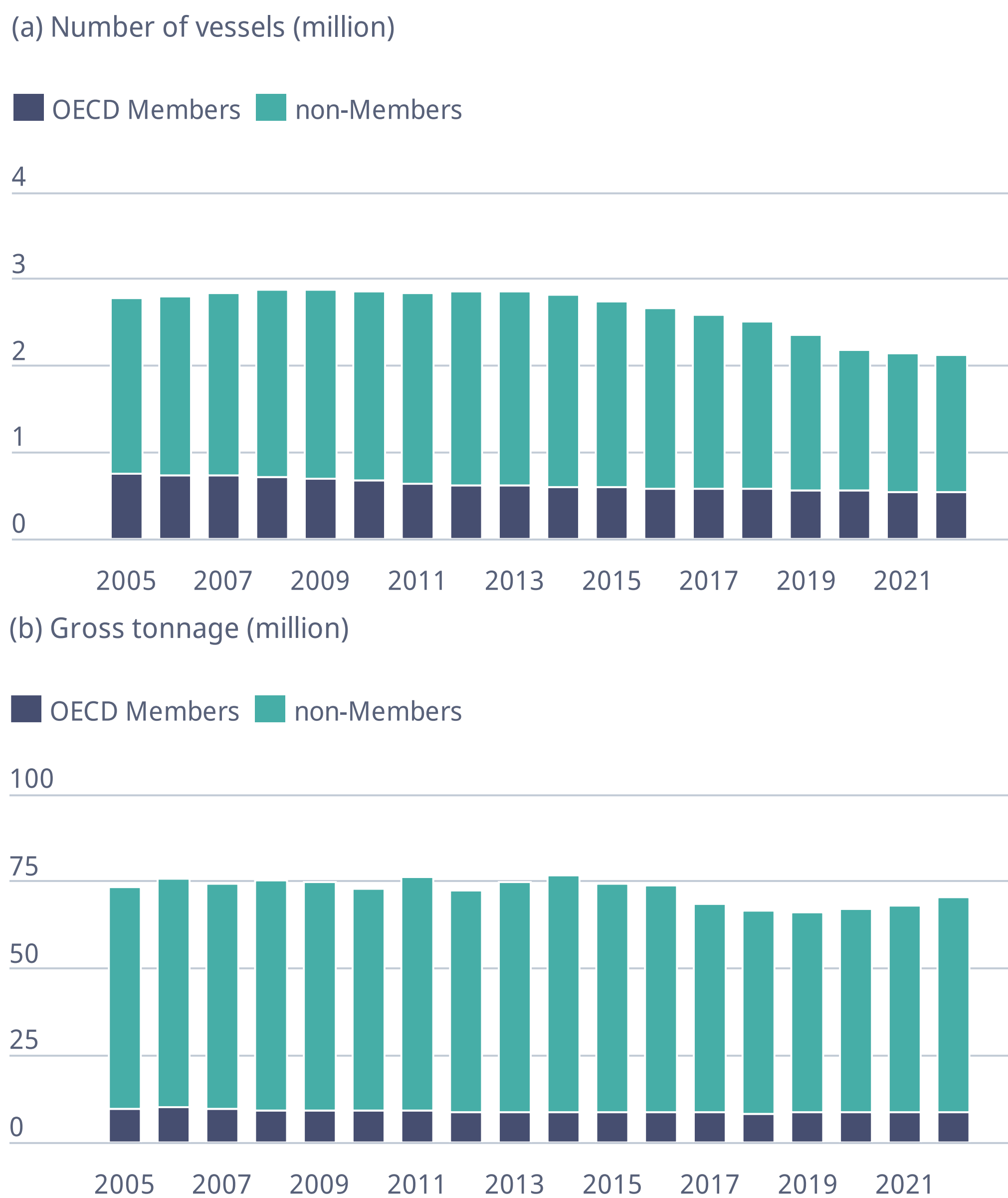

Note: Official data were complemented with estimates where data were not available.
Source: OECD/FAO (2025), Employment in fisheries, aquaculture, and processing, http://data-explorer.oecd.org/s/h1.

## 2.8. Fewer vessels but fleet capacity has increased

### *2.8.1. The number of vessels has decreased in the OECD Members since 2005, but has only done so since 2013 in the non-Members*

In 2022, more than 2  million vessels of all sizes were recorded by all countries and territories, down from over 2.8  million in 2005 (Figure 2.13). The total number of vessels has declined by 26% since 2013, mostly due to a decline in the number of vessels in the non-Members since then. This followed from a period (2005-13) when the number of vessels declined in the OECD Members but increased in the non-Members with an overall stable total number of vessels.

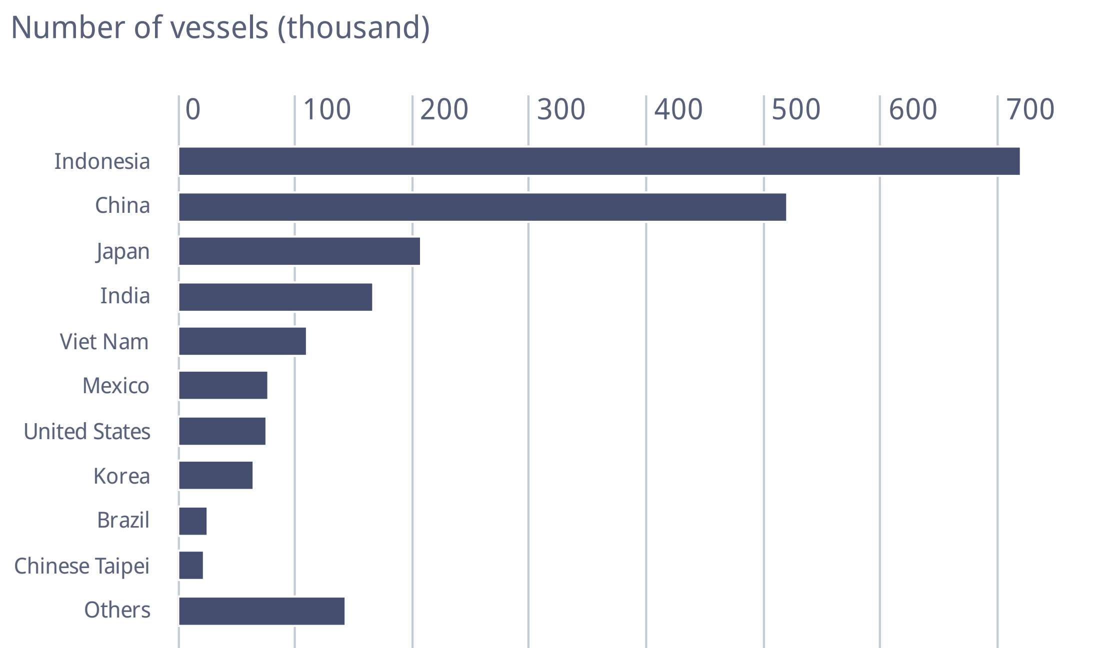
#### Figure 2.13. Fishing fleets in all countries and territories, 2005-22




Note: Official data were complemented with estimates where data were not available.
Source: OECD (2025), Fishing fleet, http://data-explorer.oecd.org/s/h5

The OECD Members accounted for 25% of the number of vessels in 2022, coming back to the share seen in the mid-2000s after having declined until 2014, to a low of 21%. In 2022, the vast majority of vessels (81%) were in Asia: Indonesia (34%), China (24%), Japan (10%), India (8%) and Viet Nam (5%) (Figure 2.14).

**Figure 2.14. Number of vessels in the countries and territories with the largest fishing fleets (and total number of vessels in all others), 2022**




Note: "Others" includes all countries and territories covered in the report not otherwise listed in the graph. Official data were complemented with estimates where data were not available.
Source: OECD (2025), Fishing fleet, http://data-explorer.oecd.org/s/h8.

### *2.8.2. Total fleet capacity is increasing after a few years of decline*

In terms of gross tonnage, however, fleet capacity is returning towards the levels seen in the 2000s, after a declining over 2014-19. The combined fleets of all countries and territories considered in this report was estimated to about 71 million gross tonnage in 2022 (down by 3 million from 74 million in 2005 and a more recent peak of 77 million in 2014) (Figure 2.13b).[10] The OECD Members accounted for 12% of the gross tonnage in 2022, a share which has remained stable since 2005.

Information on vessel length is missing for the majority of vessels (79%), as several of the countries with the largest fleets do not provide data on vessel length: China, India, Indonesia, Japan and the United States. Considering only countries where information on vessel length is available, small-scale vessels (0-12 metres in length) represented 78% of the total number of vessels in 2022. This share has increased since 2017 but most of this increase is due to the addition of detailed data from Viet Nam, when the country started to publish the number of national vessels by length overall in 2017. In the OECD Members, small-scale vessels (<12m) represented 85% of the number of vessels, with significant differences among countries (98% in Estonia versus 0% in Belgium). In the non-Members, small-scale vessels accounted for 67% of the total number of vessels, with country shares ranging from 37% in Argentina to 94% in Bulgaria (Figure 2.15).[11]

**Figure 2.15. Composition of the fishing fleets (in number of vessels by length categories), 2022**

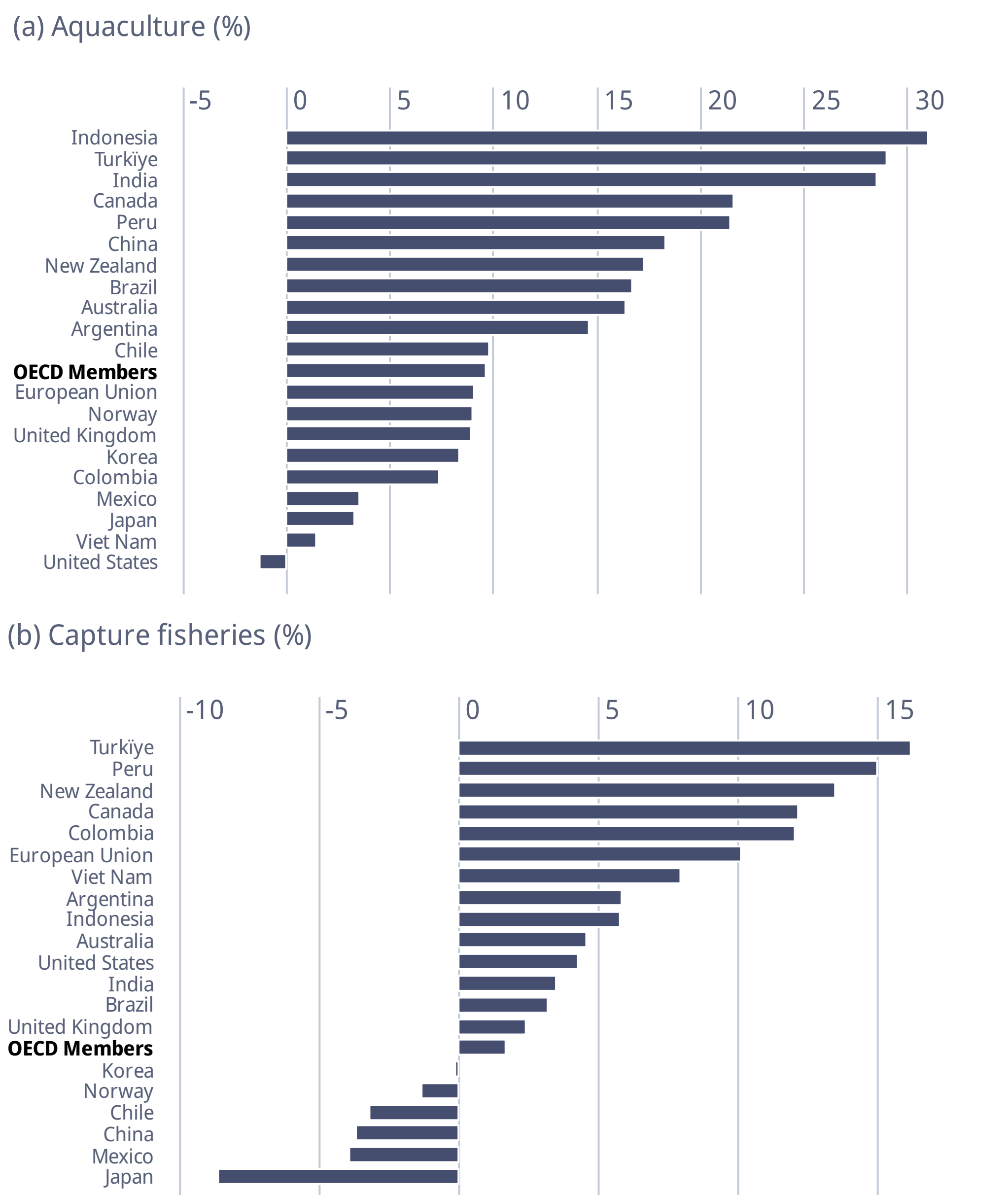

Note: Official data were complemented with estimates where data were not available.
Source: OECD (2025), Fishing fleet, http://data-explorer.oecd.org/s/h8.

### *2.8.3. Outlook: Slower growth in production and trade*

According to the 2023 edition of the OECD-FAO *Agricultural Outlook*, the global production of aquatic animals is expected to continue growing in the next decade, albeit at a slower pace than in previous decades (Box 2.1). The vast majority of the production growth is expected to take place in the Asian non-Members through aquaculture.

The individual projected growth rates vary quite considerably across the countries and territories covered in this report (Figure 2.16). Generally, aquaculture production is expected to grow faster – at the level of OECD Members total production growth is projected to be +9.6% for aquaculture and +1.7% for capture fisheries. In some economies, such as Colombia, the European Union, the United States and Viet Nam, however, capture fisheries production is expected to grow faster than aquaculture production.

## Figure 2.16. Total projected growth in production volume, 2022-32




Note: Aquaculture production excludes seaweeds. The average production in 2020-22 is used as the base period for calculating projected growth rates to 2032.
Source: OECD/FAO (2024), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

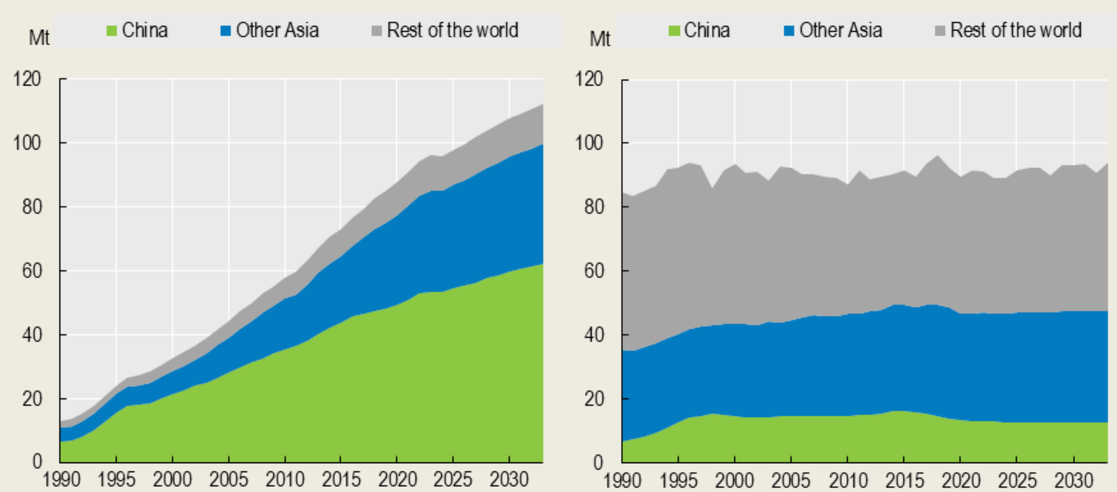
## Box 2.1. OECD-FAO *Agricultural Outlook* trends for fisheries and aquaculture

The OECD-FAO *Agricultural Outlook 2024-2033* provides a comprehensive analysis of the ten-year prospects for agricultural commodity and fish markets at national, regional and global levels. The Outlook has been produced jointly by the OECD and Food and Agriculture Organization for 20 years, in collaboration with their Members and international commodity organisations. This box provides a summary of the results from a global level projection and therefore the country coverage is broader than the 41 countries and territories featured elsewhere in this edition of the *OECD Review of Fisheries*.

### *Growth in fish production and trade are expected to slow between 2024 and 2033*

Global fish production is anticipated to rise between 2024 and 2033, reaching 206 million tonnes (Mt) by 2033, an increase of 22 Mt from the 2021-23 average. However, the pace of growth is expected to be slower compared to the previous decade when it grew by 32 Mt. The rise in production is driven by the ongoing expansion of aquaculture, particularly in Asia (Figure 2.17). Over 85% of the additional projected production will stem from aquaculture, elevating its share in global fish production to 55%. The largest production increases are expected in the People's Republic of China, India and Indonesia, accounting for nearly 80% of the additional aquaculture output. Capture fisheries production is anticipated to grow modestly, with volumes ranging between 89 Mt in *El Niño* years and 94 Mt.

### Figure 2.17. Global aquaculture production (left) and capture fisheries (right), 1990-2033




Note: Data are expressed in live-weight equivalent.
Source: OECD-FAO (2024[1])"OECD-FAO Agricultural Outlook", *OECD Agriculture Statistics* (database, accessed 17 October 2024).

Global exports of fish for human consumption are expected to continue growing between 2024 and 2033, although at a slower rate compared to the previous decade. This trend reflects a long-term slowing of trade expansion. Asia, led by China, will continue to be the main force behind the rise in exports, followed by the Americas. Conversely, exports from Africa and Oceania are expected to decline over the Outlook period. Africa and the Americas will absorb the majority of the import growth, while import levels for Asia and Europe are anticipated to decline over the period, as demand will increasingly be met by domestic production in these regions and due to a lower per capita consumption in Europe.

Source: OECD-FAO (2024[1]).

## References

Calado, R. et al. (2021), “Summer is coming! Tackling ocean warming in Atlantic salmon cage farming”, *Animals*, Vol. 11/6, p. 1800, https://doi.org/10.3390/ani11061800. [4]

FAO (2024), *The State of World Fisheries and Aquaculture 2024*, Food and Agriculture Organization, Rome, https://doi.org/10.4060/cd0683en. [2]

Moe Føre, H. et al. (2022), “Technological innovations promoting sustainable salmon (Salmo salar) aquaculture in Norway”, *Aquaculture Reports*, Vol. 24, p. 101115, https://doi.org/10.1016/j.aqrep.2022.101115. [3]

OECD/FAO (2024), *OECD-FAO Agricultural Outlook 2024-2033*, OECD Publishing, Paris/Food and Agriculture Organization, Rome, https://doi.org/10.1787/4c5d2cfb-en. [1]

## Notes

[1] The report covers 30 OECD Members (Australia, Belgium, Canada, Chile, Colombia, Costa Rica, Denmark, Estonia, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Korea, Latvia, Lithuania, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Türkiye, the United Kingdom and the United States); and eleven non-Members (Argentina, Brazil, Bulgaria, Chinese Taipei, Croatia, India, Indonesia, the People's Republic of China, Peru, Romania, and Viet Nam). See Chapter 1 for more details on the geographical coverage.

[2] In 2022, 1.2 million tonnes of seaweed were captured.

[3] In value terms, American lobster ranked first, with 5% of the overall landings value; followed by Queen crab, Argentine red shrimp, Atlantic cod, Anchoveta and Skipjack tuna (3% each); and Atlantic mackerel, Yellowfin tuna, Bigeye tuna, Yesso scallop and Atlantic herring (2% each). However, this ranking does not include data from Brazil, China, Denmark, Iceland, India, Indonesia and Viet Nam as species-level landings data were unavailable. Nor does it include the species that are not separately reported, as confidential, by Canada, Ireland, Latvia and the United States.

[4] The most important species after Atlantic salmon is Rainbow trout, which accounts for 7% of total production value.

[5] Most of the value of aquaculture production in Chile and Norway came from the production of Atlantic salmon (66% and 95%, respectively). Both Norway and Chile have large areas suitable for producing certain aquaculture species due to a prevalence of sheltered fjords and bays, with deep cool water (Moe Føre et al., 2022[3]; Calado et al., 2021[4]).

[6] These trade figures include both captured fish (from fisheries production) and farmed fish (from aquaculture production), as trade data do not distinguish between the two.

[7] The top five species groups exported in 2022 were: salmon, trout and smelt (USD 35.4 billion); shrimp and prawns (USD 19.1 billion); cod, hake and haddock (USD 13.4 billion); and squid, cuttlefish and octopus (USD 11.2 billion). The top five species groups imported in 2022 were: salmon, trout and smelt (USD 33.4 billion); shrimps and prawns (USD 28.7 billion); cod, hake and haddock (USD 16.4 billion); tuna, bonito and billfish (USD 13.3 million); and squid, cuttlefish and octopus (USD 10.3 billion). The species groups refer to the International Standard Statistical Classification of Aquatic Animals and Plants (ISSCAAP).

[8] Fishing includes both marine and inland fishing but excludes subsistence and recreational fishing.

[9] This number includes full-time, part-time and occasional fishers.

[10] Data on fleet gross tonnage for Canada, India, Indonesia, the United States and Viet Nam (which together account for half of the vessels from the 41 countries and territories covered in this report) was estimated.

[11] The absence of information on vessel capacity and/or length for major fishing fleets, in part because fleet management measures are based only on gross tonnage or length in some countries, hinders a more detailed comparative analysis of the fleet composition across countries and time.

# 3 The sustainability of marine fish resources

This chapter reviews the individual stock status data available for the countries and territories covered in this report and analyses the sustainability and productivity of fisheries resources at the country level and at an aggregate level. The analysis sheds light on how much is known and on the overall health and productivity of the assessed fish stocks. By focusing on assessed stocks, it provides a unique perspective on the effectiveness of science-based management at maintaining a sustainable and productive resource base. The chapter also explores trends in fish stock health and productivity since 2019.

## Key messages on resource sustainability

- **Healthy and productive fish stocks are essential for an economically, socially and environmentally sustainable fisheries sector**. Regular stock assessments are the basis of the science-based fisheries management needed to harvest fish stocks in ways that preserve their health and maximise their productivity and hence benefits to society.
- **Stock assessments can be expensive and complex**, hence only a subset of harvested stocks are assessed. Examining stock status data provides information on what is known about stock health and productivity but also about the extent of knowledge gaps.
- **The OECD collects and publishes individual stock status data** for the stocks harvested by the countries and territories covered in this report that are assessed and publicly released or reported to the OECD.
- **In 2024, data were recorded for 1 623 assessed stocks**, across 31 OECD Members and non-Members, specifying whether stocks were healthy (i.e. above their limit thresholds) and whether they were meeting productivity targets (i.e. catch or value is sustainably maximised). For 23% of these stocks, the assessment was not conclusive (i.e. it was not possible to determine the health status).
- **Data suggest that management works**. Where it was possible to determine a health status, 81% of assessed stocks were healthy. This is more than the FAO estimated global share of 62% of sustainable stocks. One explanation for this difference could be that fish stocks are healthier where scientific management is possible thanks to rigorous stock assessments.
- **More could be done to harvest healthy stocks optimally**. Looking at stocks for which both the health and productivity statuses were known suggests that only 59% of healthy stocks also meet productivity targets aimed at maximising the catch or value of landings. This highlights the importance and the potential of improved fisheries management to optimise food production or fisher incomes and reduce greenhouse gas emissions, even for healthy stocks.
- **At the country level, there is considerable variation** in both the status of stocks and the number of stocks assessed.
- **The proportion of assessed stocks known to be healthy increased by 5 percentage points between 2019 and 2024** and the proportion of unhealthy stocks also declined by 5 percentage points. While this indicates that the health of assessed fish stocks is likely improving, this trend must be interpreted with caution given changes in the underlying database.
- **The sustainability and productivity of the sector could be improved by:**
    - **Investing in stock assessments and data collection more generally** to ensure, where possible, all commercially important stocks are assessed on a regular basis (at intervals appropriate to the biology of the species), and that stock assessments conclusively report against both health (limit reference points) and productivity (targets) status.
    - **Investing in research and development to refine existing stock assessment methodologies and develop new assessments for difficult to assess stocks**, particularly low-cost and low data methodologies that are applicable to multispecies stock complexes.

## 3.1. What's the issue?

Healthy and productive fish stocks are essential for an economically, socially and environmentally sustainable fisheries sector. A fish stock is considered healthy when the population is large enough that the risk of collapse in the short term is small (i.e. it is above limit thresholds often defined in terms of biomass). The health of fish stocks is not only impacted by fishing, but also by a range of natural factors (such as climate) and other economic activities (such as recreational fishing) and pollution. The goal of sustainable fisheries management is to ensure that stocks are not only healthy but also productive; in other words, the catch value or volume can be maximised under sustainability constraints.

Unhealthy fish stocks are bad for both the marine environment and the profitability of fishers, leading to negative impacts on the communities in which they live. Further, unhealthy fish stocks will also result in lower food production, which leads to negative impacts on food security, particularly in vulnerable coastal communities.

Regular stock assessments are fundamental to fisheries management and essential for ensuring decisions are based on scientific evidence. Ideally, stock assessments should accurately model the population dynamics of a stock and adequately model all the key natural processes that define the status of the stock, including natural mortality, recruitment and growth (Punt, 2023[1]). However, the accuracy of most stock assessment is limited by the availability of resources and data. As such, it is rarely possible to conduct "ideal" assessments. Instead, fisheries managers must balance the need for accuracy against available resources and the socio-economic importance of the stock. Consequently, the ability of any given stock assessment to accurately diagnose the state of the stock varies, with some assessments having higher uncertainty than others (Edgar et al., 2024[2]).

Climate change will exacerbate these issues, with long-term warming trends, short-term weather events (e.g. marine heatwaves) and ocean acidification having significant impacts on the distribution and abundance of stocks (IPCC, 2019[3]) (for more information see Chapter 4). The increased variability in fish stocks from year to year and changing ecosystems only increase the importance of conducting regular accurate stock assessments for effective fisheries management.

Accuracy of stock assessments is important because it directly impacts the decisions fisheries managers take. Recent evidence suggests that overfished stocks tend to have less accurate stock assessments, with a systematic bias towards overestimating the underlying stock biomass (Edgar et al., 2024[2]). Further, stocks of lower value species or in warmer waters are also more likely to have positively biased assessments, suggesting the resources available for assessment and the technical challenges to assessment (stocks in warmer waters are more likely to be part of multispecies stock complexes) also play an important role. While the direction of causality is not yet clear – i.e. are the stocks overfished due to inaccurate stock assessments or are the assessments inaccurate due to the stocks being overfished – better stock assessments are associated with healthier stocks, further underlining the important role they play in fisheries management systems.

The Food and Agriculture Organization (FAO) estimates that, globally, the proportion of fish stocks outside biologically sustainable levels increased from 10% in 1972 to 37.7% in 2021, driven primarily by overfishing (FAO, 2024[4]). These declines in the health of fish stocks are still ongoing and the proportion of overfished stocks globally has increased 2.3% since 2019. However, these global numbers mask important regional trends, with some regions (e.g. Mediterranean and Black Sea and North West Pacific) having a much higher proportion of overfished stocks than others. Importantly, some fish stocks are much larger than others, so despite 37.3% of stocks being overfished, only 23.1% of capture production came from overfished stocks in 2021 (FAO, 2024[4]). Finally, these figures are based on a fixed list of 445 reference aggregated stocks from which global and region totals are extrapolated. The geographical scale of the published figures does not highlight local nuances, making it difficult to translate them into actionable policy recommendations in individual countries.

## 3.2. An OECD perspective on fish stock health and productivity

The OECD approach to stock status attempts to complement the FAO's global approach by collecting and publishing individual stock status data for the assessed stocks harvested by the countries and territories covered in this report where the results of the assessments are publicly released or reported to the OECD. For this edition of the *Review of Fisheries*, stock assessment results were received or identified from public sources for 1 623 stock assessments across 31 OECD Members and non-Members.[1] Data are presented at an aggregated and a national level, with respect to both health limits and productivity targets, as explained in Box 3.1.

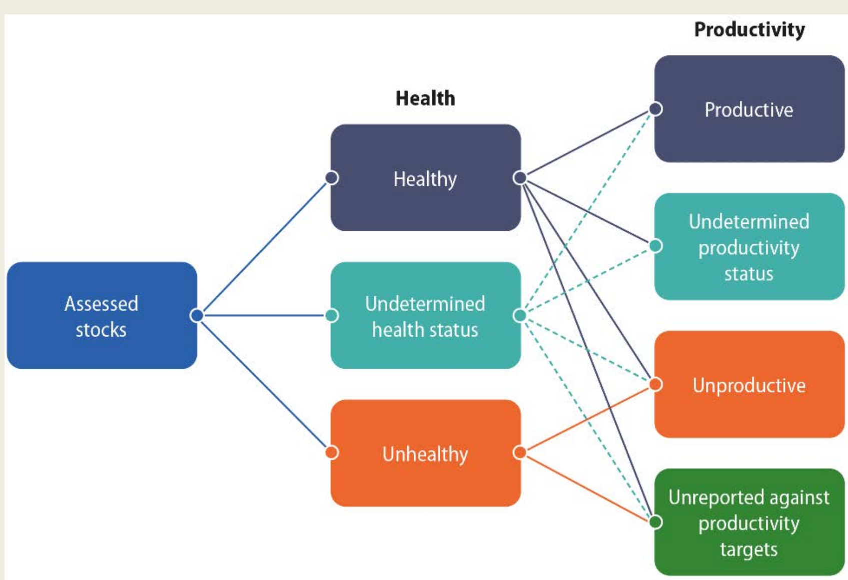
The database underpinning the analysis in this chapter has been compiled from a range of sources, including country submissions, publicly available documents from regional fisheries management organisations/arrangements (RFMO/As)[2] and data downloaded directly from the International Commission for the Exploration of the Seas. It is likely there are data sources that have not been included, because they are either not publicly available or difficult to access. As such, the chapter illustrates both the most up-to-date understanding of stock status in the countries and territories covered in this report and also the extent of publicly available information on the status of the resources on which their fisheries sector relies.[3]

### Box 3.1. The OECD stock status indicators database

As part of the *OECD Review of Fisheries*, the OECD regularly collects data on recent fish stock assessments ("recent" being defined as within the last ten years) with nationally (or regionally) determined standards for:

- **health limits** (i.e. limit reference points, typically defined in terms of biomass or mortality thresholds)
- **productivity targets** (i.e. target reference points, typically aimed at optimising catch value or volume, such as maximum sustainable yield (MSY) and maximum economic yield (MEY).

#### Figure 3.1. Structure of the stock status indicators database



While national authorities may use different terms for stocks within the ranges described above, in this chapter a healthy fish stock is one that exceeds the health limits, and a productive stock is one that meets productivity targets.

Not all stock assessments are conclusive. A number of them conclude an undetermined health status (23%) and an undetermined productivity status (21%). Additionally, a number of stock assessments report status only against health limits (29%), in which case the status is said to be unreported against productivity targets. By definition, unhealthy stocks cannot meet productivity targets (but sometimes their status is unreported against productivity targets). The data do not contain any information on unassessed fish stocks.

Stock status data are used to produce a series of aggregate and country-level indicators, including the total number of stocks assessed, and the proportions of assessed stocks with different health and productivity statuses.

## 3.3. Health and productivity of assessed fish stocks in 2024

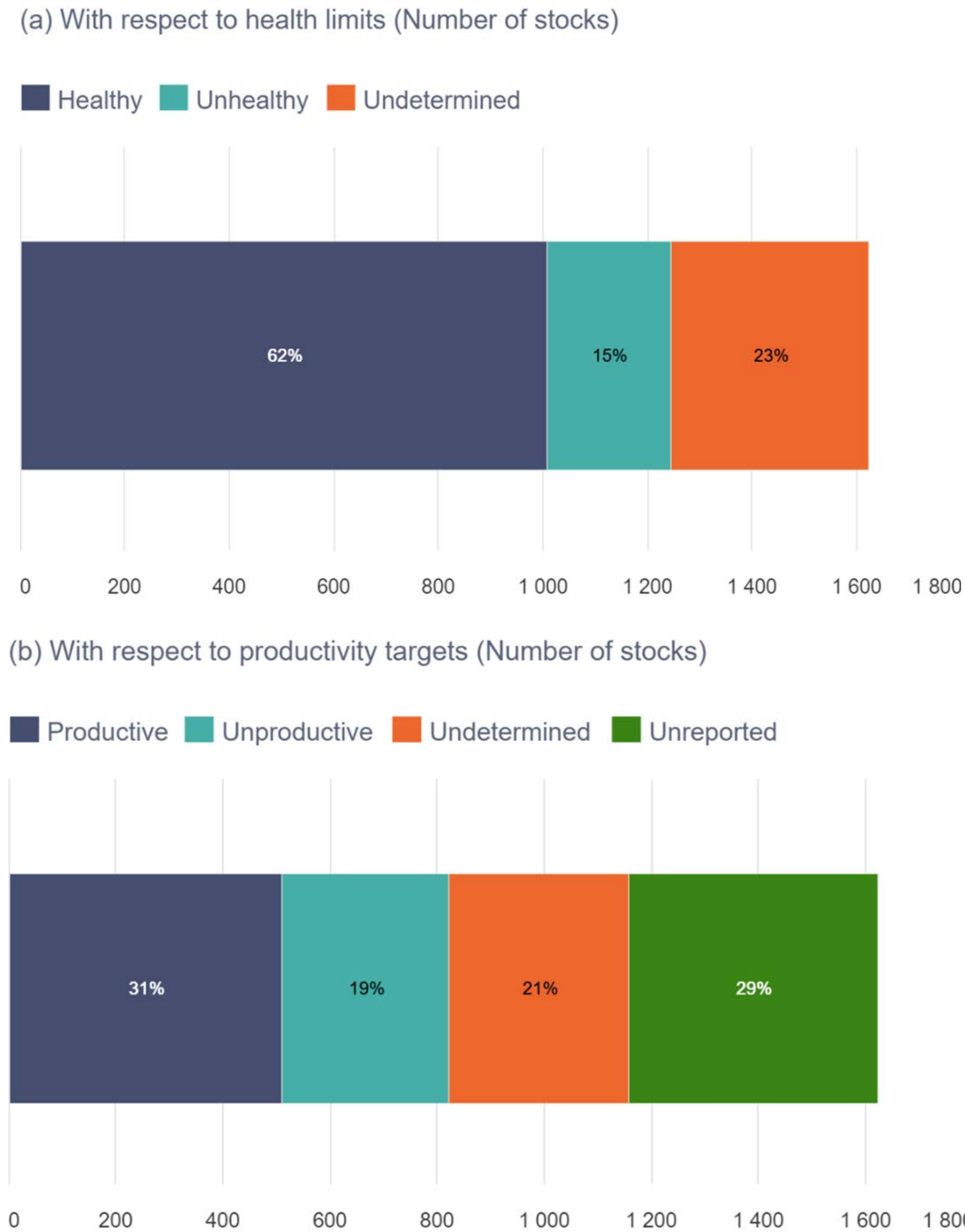
### *3.3.1. The majority of assessed stocks are healthy, but many do not meet productivity targets*

Of the 1 623 assessed stocks reported in the database, 62% were reported to be healthy (i.e. above their limit reference points), 15% were unhealthy and for 23%, the health status was not able to be determined (Figure 3.2a). Moreover, 31% of assessed stocks were reported to be meeting productivity targets (e.g. maximum sustainable yield or maximum economic yield), 19% were reported not to meet such targets, in 21% of the stocks the status was undetermined with respect to productivity and in 29% the assessments did not report status with respect to productivity targets (Figure 3.2b). For 50% of the assessed stocks, the productivity status is thus unknown, which complicates the interpretation of the productivity results. The stocks where the productivity status is unreported largely come from Australia where currently the assessments only report the status with respect to health limits, not productivity targets (Roelofs et al., 2024[5]).

Looking at stocks for which the health status could be determined (henceforth “conclusively assessed” stocks) – i.e. removing stocks with an undetermined health status – shows that 81% of them were healthy and 19% unhealthy. In other words, one in five conclusively assessed stocks is unhealthy.

The majority (73%) of healthy stocks were also meeting productivity targets, where both the health and productivity statuses were known.[4] Thus, applying this ratio to all healthy stocks means that an estimated 59% of conclusively assessed stocks were also meeting productivity targets. Where healthy stocks are below the levels that allow for optimal productivity, fishing can lead to below optimal incomes, or below optimal production volume, and in both cases increased greenhouse gas emissions (Parker et al., 2018[6]). This highlights the importance and the potential of improved fisheries management to optimise food production or fisher incomes and reduce greenhouse gas emissions, even for healthy stocks (Bastardie et al., 2022[7]).

**Figure 3.2. Status of assessed stocks in 2024**




Note: No stock assessments were reported by Denmark, Iceland, Lithuania, Mexico, Portugal, Türkiye, China, Indonesia, India and Viet Nam.
Source: OECD (2025), Stock Status Indicators.

The proportion of conclusively assessed stocks that are healthy (81%) is significantly higher than the global average of 62% of sustainable stocks (i.e. stocks that are underfished or maximally sustainably fished) reported in the FAO *State of Fisheries and Aquaculture 2024*. This is likely driven, in part, by the different stocks included in each data set and the different methodologies applied.[5] Another possible explanation for this difference is that fish stocks are healthier where scientific management is possible thanks to rigorous stock assessments, which highlights the importance of science-based management in maintaining global fisheries resources. Further, OECD Members tend to assess more of their stocks than non-Members (see below). Therefore, the OECD database contains a subset of stocks that is healthier than the global average. Conversely, the 19% of conclusively assessed stocks which are not healthy is likely caused by a combination of inappropriate management (either historic or ongoing), such as setting catch limits above scientific advice, ineffective enforcement and environmental factors which are outside the control of fisheries managers.

However, there are some caveats for interpreting these data. First, the database treats all stocks equally, but their relative contribution to national fisheries landings varies considerably. It is not currently possible to calculate the contribution of each stock to production at the country level, so these numbers do not necessarily indicate the extent to which a country relies on healthy or unhealthy stocks (and productive and unproductive stocks).

Second, the current status of a stock cannot be taken as an indicator of the quality of the effectiveness of fisheries management. The status of a stock in any given year is the outcome of fishing pressure, environmental factors and pollution from other economic activities, the impacts of which can be large (e.g. in the case of marine heatwaves) and difficult to predict. Further, an unhealthy stock may already be subject to management and rebuilding plans. Thus, the data should only be interpreted as representative of the current situation of resources, not of current management effectiveness at a national level.

Finally, some assessments cannot determine the health status of some stocks. Because the size of fish populations is not directly observable, stock assessments rely on mathematical models to estimate the size of the underlying fish population. These models are informed by data collected by fishers and during scientific surveys. An undetermined status occurs when there are insufficient data for the models to accurately estimate population sizes. A lack of data can have several different causes, for example scientific surveys may be delayed due to bad weather or a lack of resources, or in shared stocks, due to problems sharing data between different fisheries authorities. In some cases, the biology of the species or the ecosystem can create issues for effective assessment, for example Norway lobster are notoriously difficult to assess quantitatively (Aguzzi et al., 2022[8]). In these cases, more qualitative stock assessments, combing data from various sources to create an expert assessment, can be used to guide management decisions and can be effective for ensuring stocks are not overfished (Punt, 2023[1]).

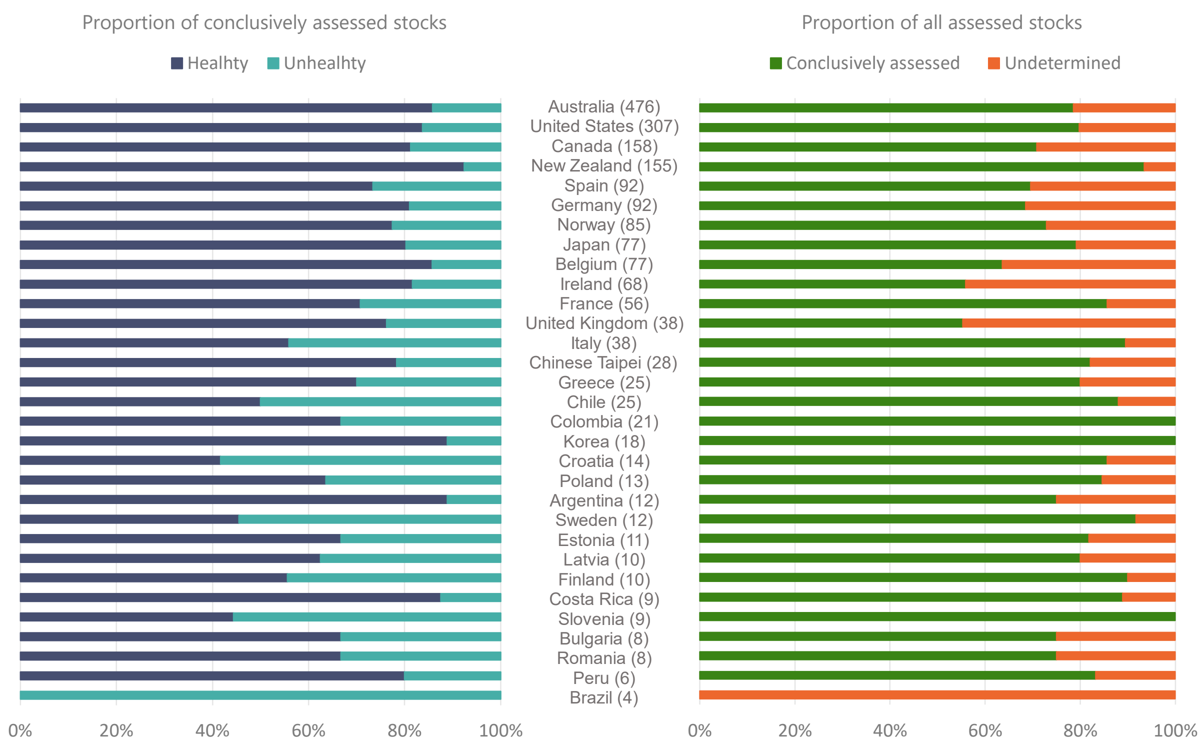
### *3.3.2. There are large differences in both the proportion of healthy and productive stocks and the number of stocks assessed at a country level*

There is considerable variation at the country level in the health status of conclusively assessed stocks (Figure 3.3). New Zealand (92%), Argentina and Korea (89%) have the highest proportion of conclusively assessed healthy stocks. There is also considerable variation in the proportion of assessed stock where health could not be determined, with the highest proportion found in Brazil (100%), United Kingdom (45%) and Ireland (44%). Importantly, stocks with an undetermined health status were found in all countries and territories.

There are also large differences in the number of fish stock assessments across countries (the number of which is reported in Figure 3.3). For example, Australia reports 476 stocks that were assessed at a domestic level and the United States 307 stocks. At the other end of the scale, Brazil only reported four and Peru six.[6] These differences in the number of assessments highlight differences in the structure of the fishing sectors: some countries exploit more stocks and therefore need to conduct more assessments. But it also likely reflects the differing levels of investment in stock assessment capacity (Chapter 7), along with the difficulty and cost of conducting certain assessments. For example, multispecies stock complexes, which are common in warmer waters, can be difficult to assess, in part because established stock assessment methods were designed for single species stocks. In countries where the assessed stocks only account for a small share of production, the reported statistics provide a limited understanding of the status of underlying resources.

Finally, not all stocks are the same size, with some making a much larger contribution to national landings than others. Therefore, how representative the numbers are will only be apparent when stock status and harvest data can be reconciled at the stock level. This will also allow understanding what proportion of landings in a particular country is from healthy stocks – a key element of sector sustainability and resilience.

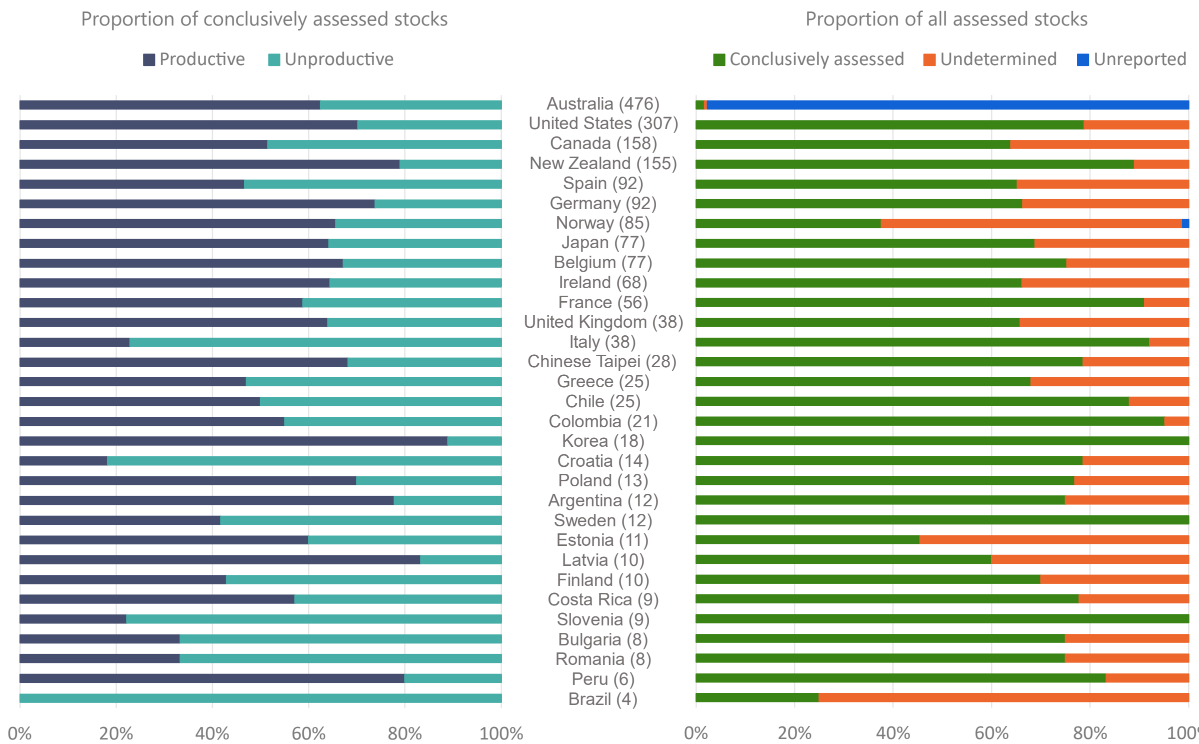
## Figure 3.3. Status of conclusively assessed stocks with respect to health limits (left) and proportion of conclusively assessed stocks in all assessed stocks (right), 2024




Note: The number in brackets represents the number of stocks assessed for each country. No stock assessments were reported by Denmark, Iceland, Lithuania, Mexico, Portugal, Türkiye, China, Indonesia, India and Viet Nam.
Source: OECD (2025). Stock Status Indicators.

With respect to productivity, Korea (89%), Latvia (83%) and Peru (80%) have highest proportions of conclusively assessed stocks meeting productivity targets (Figure 3.4).[7] In total, 21 Members and non-Members have more than 50% of conclusively assessed stocks meeting productivity targets. Generally, conclusively assessed stocks tend to meet productivity targets as well, further highlighting the benefit of basing management decisions on scientific evidence.

**Figure 3.4. Status of conclusively assessed stocks with respect to productivity targets (left) and proportion of conclusively assessed stocks in all assessed stocks (right), 2024**



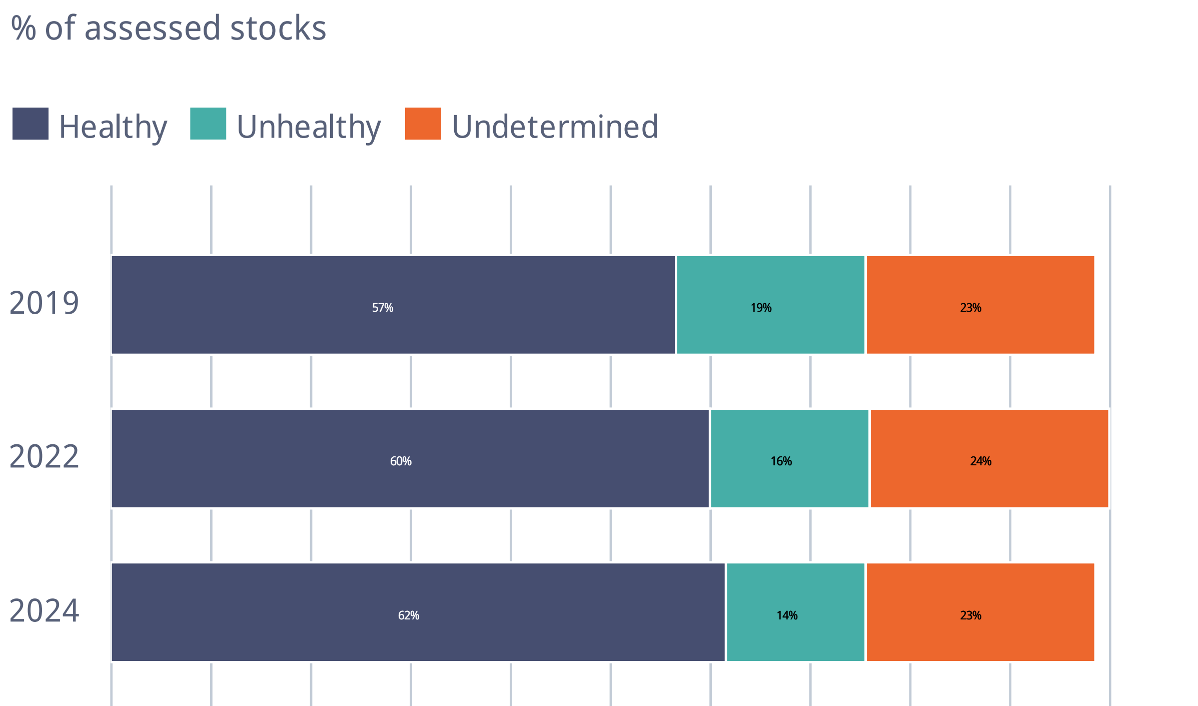

Note: The number in brackets represents the number of stocks assessed for each country. No stock assessments were reported by Denmark, Iceland, Lithuania, Mexico, Portugal, Türkiye, China, Indonesia, India, and Viet Nam.
Source: OECD (2025). Stock status Indicators.

## 3.4. Trends in fish stock health and productivity, 2019-24

### *3.4.1. The health of assessed fish stocks has improved since 2019, but the proportion of stocks meeting productivity targets has remained stable*

The proportion of assessed stocks that are healthy has increased from 57% in 2019 to 62% in 2024 while the proportion of assessed stocks that are unhealthy has declined from 19% to 14% (Figure 3.5). The proportion of stocks with an undetermined status with respect to health remained stable (23%). Hence, considering only conclusively assessed stocks also shows a positive trend, slightly more pronounced: the proportion of conclusively assessed stocks that are healthy increased from 75% to 81% from 2019 to 2024 while the proportion of those that are unhealthy declined from 25% to 19%. While this indicates that the health of assessed fish stocks is likely improving over time, this interpretation must be made with caution given the changes to the stocks in the underlying database between iterations.

**Figure 3.5. Status of assessed stocks with respect to health limits, 2019-24**

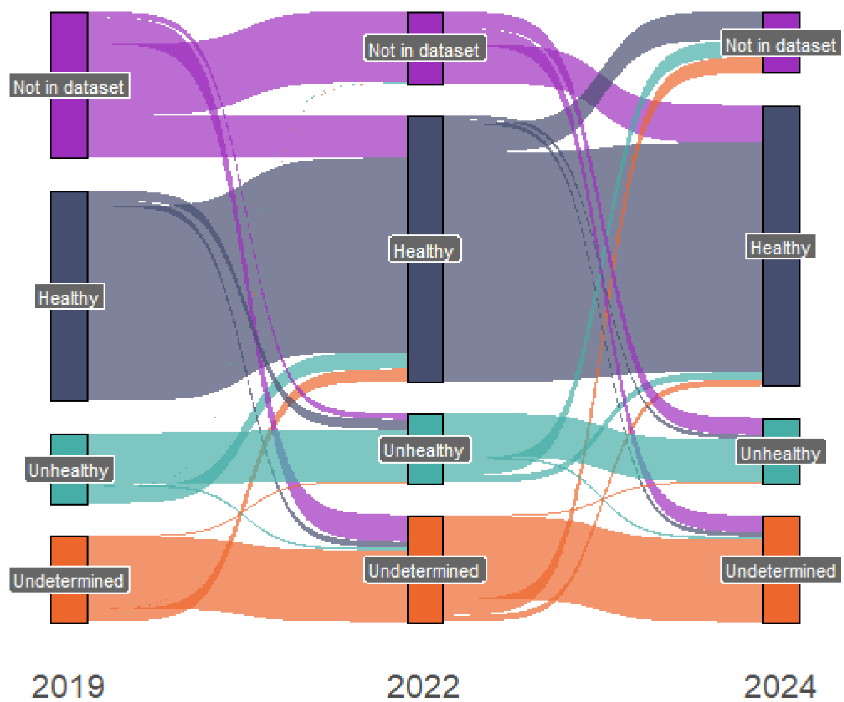



Note: The database contained 1 311 stocks in 2019, 1 578 in 2022 and 1 623 in 2024.
Source: OECD (2025). Stock status Indicators.

The majority of stocks (60%) have been in the database every year since its creation (in 2019). However, there is significant turnover for stocks moving in and out of the database (approximately 23% every iteration) (Figure 3.6). There are three main mechanisms for the turnover of stocks in the database. First, if a stock is assessed that was not previously assessed, it will be added to the database. For example, this can happen if more resources are made available and a country conducts more assessments or if a new stock becomes commercially valuable due to climate change and therefore warrants assessment when it previously did not. Second, the stocks in the database can change if there are changes to what is considered a stock worthy of its own assessment. In these cases, the old stock will not appear in the next iteration of the database and instead a new stock or stocks may be added. Finally, the database is limited to stocks that have been assessed in the previous ten years. If a stock has not been assessed within that time frame, it will be removed from the most recent iteration of the database.

The improving health status of assessed stocks over time is further supported by a closer analysis of the stocks that appear in multiple years of the database. Between 2019 and 2022, the status of 59 stocks changed from unhealthy to healthy and 36 stocks went the other way (healthy to unhealthy) (Figure 3.6). Further, between 2022 and 2024, the health of 26 stocks improved and 14 declined. In both periods, the number of stocks becoming healthy, therefore, dominates. Our understanding of stock health is also improving over time as more stocks move from undetermined to either healthy or unhealthy (51 stocks in 2019-22 and 29 stocks in 2022-24 respectively) than the contrary (30 stocks in 2019-22 and 24 stocks in 2022-24 becoming undetermined). Even accounting for the turnover of stocks in the database, evidence suggests that investing in data collection and stock assessment is paying dividends in the form of improved understanding and improved health of stocks.

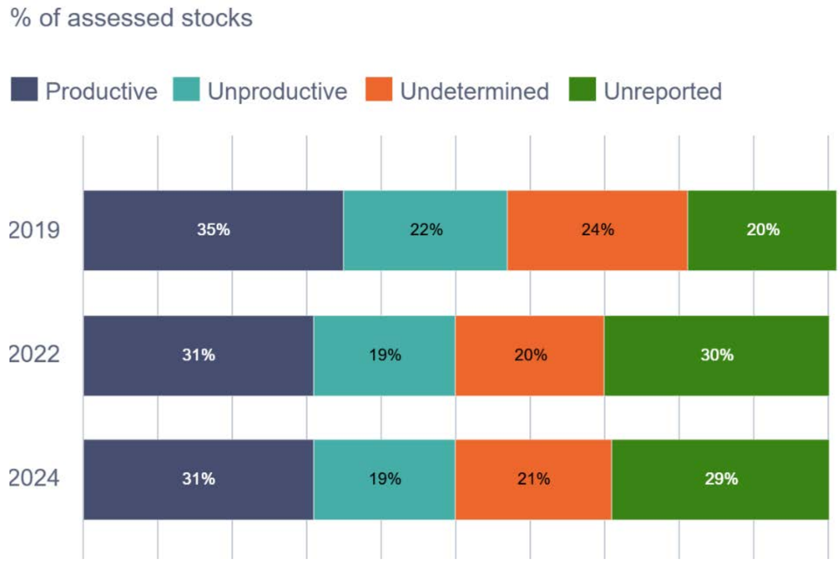
## Figure 3.6. Changes in the composition of the stock status database by health status, 2019-24




Note: The database contained 1 311 stocks in 2019, 1 578 in 2022 and 1 623 in 2024.
Source: OECD (2025). Stock Status Indicators.

The identification of trends with regards to productivity is less clear. The proportion of stocks meeting productivity targets has declined from 35% in 2019 to 31% in 2024 (Figure 3.7). However, the proportion of stocks not meeting productivity targets has also declined, from 22% in 2019 to 19% in 2024. Interpreting productivity status statistics is complicated by the stocks where the status with respect to productivity is not reported (29% in 2024 and largely from Australia). Removing these stocks and limiting the calculation to only stocks where information on productivity targets is reported results in the proportion of stocks meeting productivity targets increasing slightly from 43% in 2019 to 44% in 2024. Therefore, where data are available, there is a slight increase in stocks meeting productivity targets, but more data will be required to understand if this is a lasting trend or an artefact of the data. As with the health status, the turnover of stocks in the database is an important caveat when interpreting these results. The very small improvement in the proportion of stocks meeting productivity targets could indicate that management plans are not sufficiently cautious or simply that total allowable catches have routinely been set at levels in excess of management advice (Carpenter et al., 2016[9]; Winter and Hutchings, 2020[10]).

**Figure 3.7. Stock status with respect to productivity targets, 2019-24**




Note: The database contained 1 311 stocks in 2019, 1 578 in 2022 and 1 623 in 2024.
Source: OECD (2025). Stock Status Indicators.

## 3.5. Further reflections

Analysis of trends from the OECD stock assessment database suggests that the health of assessed stocks is slowly improving and that assessed stocks are healthier than the global average. This aligns with recent research showing the links between accurate assessments and healthy stocks (Edgar et al., 2024[2]). Corresponding evidence for the improving productivity of stocks is still limited, notably because of missing information. However, this should not detract from what is a broadly positive message about the status of assessed stocks, which highlights the key role stock assessments play in effective fisheries management systems.

This chapter highlighted significant data gaps and priorities for research. First, the capacity to analyse the relative importance of assessed stocks should be developed to understand the share of landings volume and value coming from healthy stocks, both at the aggregate and the country level. This would allow for a more nuanced conversation on the status of stocks and what that means for the resilience and the productivity of fisheries sectors in both OECD Members and non-Members. Attempts are being made to improve reporting at a national level in the context of tracking progress towards SDG 14.4.1 (on sustainable fisheries), but reporting is limited.[8]

Second, to better leverage stock assessments to improve the sustainability and productivity of the sector there is a need for increased research and development to better refine existing stock assessment methodologies and develop new assessments for difficult to assess stocks, in particular low-cost and low data methodologies that are applicable to multispecies stock complexes. This could be the focus of development assistance for sustainable fisheries.

Finally, increasing investment in stock assessments and data collection more generally can help ensure, where possible, that all the commercially important stocks are assessed on a regular basis (at a time interval appropriate to the biology of the species), and that stock assessments report against both health (limit reference points) and productivity (targets) status.

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## Notes

[1] The report covers thirty OECD Members (Australia, Belgium, Canada, Chile, Colombia, Costa Rica, Denmark, Estonia, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Korea, Latvia, Lithuania, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Türkiye, the United Kingdom and the United States); and eleven non-Members (Argentina, Brazil, Bulgaria, Chinese Taipei, Croatia, India, Indonesia, China, Peru, Romania, and Viet Nam). See Chapter 1 for more details on the geographical coverage. However, Denmark, Iceland, Lithuania, Mexico, Portugal, Türkiye, China, Indonesia, India and Viet Nam did not report any stock assessments. Additionally, data were included for Finland.

[2] Data were included from the following regional fisheries management organisations/Arrangements: the Commission for the Conservation of Antarctic Marine Living Resources, the Commission for the Conservation of Southern Bluefin Tuna, the General Fisheries Commission for the Mediterranean, the Inter-American Tropical Tuna Commission, the International Commission for the Conservation of Atlantic Tunas, the Indian Ocean Tuna Commission, the International Pacific Halibut Commission, the Northwest Atlantic Fisheries Organization, the North Pacific Fisheries Commission, the South East Atlantic Fisheries Organisation, the Southern Indian Ocean Fisheries Agreement, the South Pacific Regional Fisheries Management Organisation, and the Western and Central Pacific Fisheries Commission.

[3] It must be noted that the OECD does not conduct assessments on fish stocks and does not further interpret the assessments beyond their published results in the majority of cases. In a limited number of cases, the OECD assigns an undetermined status to ensure comparability in the data set. This happens where assessments are conducted at very high species aggregation levels (e.g. stocks simply referred to as “pelagic species”).

[4] This is calculated by removing unreported stocks from the database before estimating the ratio of healthy stocks to productive stocks. If unreported stocks are only removed from the productivity data, the ratio of healthy to productive stocks will contain different subsets of data. This could lead to bias if stocks that are unreported with respect to productivity are more or less healthy than average.

[5] Most notably the FAO global number includes fish stocks which have not been quantitatively assessed as well as stocks where assessment were inconclusive. Further, if there are systematic differences between the threshold for overfished in the FAO data set and unhealthy in the OECD data the results may be biased. However, further research is required to understand if such a bias exists and the extent to which it may impact the comparison.

[6] Within the European Union, stock assessments are largely conducted at a regional level by the International Commission for the Exploration of the Seas and the General Fisheries Commission of the Mediterranean.

[7] Australia is not considered in this ranking as it does not report the results of stock assessments with respect to productivity targets.

[8] See https://www.fao.org/sustainable-development-goals-data-portal/data/indicators/1441-fish-stocks-sustainability/en.

# 4 Climate change and the future of fisheries

This chapter takes stock of the challenges climate change represents for capture fisheries. It discusses how variations in ocean temperatures, changes in currents and acidification, and more frequent extreme weather events are all having significant and growing impacts on fish stocks and the livelihoods of fishers across the globe – creating a need for adaptation strategies. It also discusses how, at the same time, the sector needs to reduce its greenhouse gas emissions to contribute to national and international efforts to move towards net-zero emission economies, calling for mitigation strategies.

## Key messages on climate change and the future of fisheries

- **Climate change presents major challenges for global capture fisheries**. Increasing ocean temperatures, changes in currents and acidification, and more frequent extreme weather events are all having significant and growing impacts on wild fish stocks and the livelihoods of fishers across the globe.
  - Increasing sea surface temperature will lead to changes in where fish are found as well as their size, growth rates and survival: Global fisheries catches are forecast to decrease by between 3.4% and 24.1% by the end of the century.
  - **Climate-driven geographical redistribution of fish stocks will be uneven across the globe**. Higher latitude regions are expected to see an increase in catch potential while tropical regions could see a decrease.
  - By 2030, almost one in four transboundary stocks are expected to move, shifting the distribution of fish stocks across maritime borders.
- **New research is needed to refine our understanding of the relationship between climate, ecosystems and fisheries** as information on changes in local climate conditions and how they affect specific fisheries is still lacking for many stocks and fisheries.
- **Climate impacts, as well as uncertainty on impacts, will need to be factored in sustainable fisheries management** both at domestic and multilateral levels (Chapter 5) and will create adaptation challenges that fisheries support policies may also need to address (Chapter 6)
- **Fish is a relatively low-carbon food**. Fish from capture fisheries or aquaculture generally have a lower greenhouse gas (GHG) emissions intensity of production than other animal food products, both by live weight and by gramme of protein. The lowest emissions-intensive fish, such as small pelagics, are produced with emission intensities comparable to those of plant-based protein (and they are also a source of essential vitamins, minerals and fatty acids).
- The fight against climate change means fisheries need to reduce their GHG emissions and contribute to economy-wide efforts toward net zero emissions.
  - At a global scale, fisheries' GHG emissions are estimated to account for around 4% of all emissions from food production and 0.5% of total emissions.
  - **Fuel use during fishing is the primary source of GHG emissions**: it is estimated to account for between 60% and 90% of the sector's emissions up to the point of landing.
  - **Emissions vary widely both within and between fisheries**, notably depending on the vessel and gear used, as well as the abundance and catchability of the fish species targeted (i.e. how far, deep and "findable" fish are).
- Evidence-based dialogues between fisheries managers, scientists, and stakeholders would help the sector develop adequate adaptation and mitigation strategies. Further, both capture fisheries and aquaculture should feature in discussions around the impact of climate change on food production and low-carbon food systems as shifts in the balance of production across food sub-sectors could be part of both adaptation and mitigation strategies.

## 4.1. What's the issue?

Fisheries are at the forefront of climate change impacts as the resource base on which they rely is directly affected by climate-induced changes to the ocean such as warming and acidification. Understanding how fisheries are and will increasingly be impacted by climate change is fundamental for effective climate adaptation. At the same time, fisheries, like all economic sectors, are under pressure to reduce emissions from production and contribute to efforts to achieve net zero emissions at national and international levels.

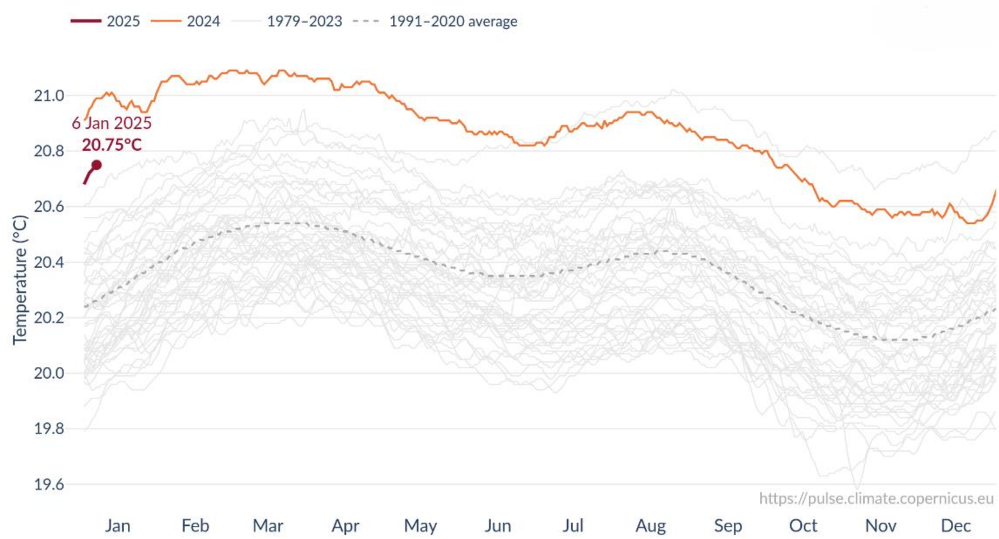
This chapter explores the challenges that climate change adaptation and mitigation pose for the capture fisheries sector. It reviews what is known about the effects of climate change on fish stock health and their location in the ocean, and the climate footprint of the fisheries sector, while also underscoring where information is missing and flagging areas that need more research. This chapter builds on the findings of an expert workshop on climate and fisheries organised by the OECD Fisheries Committee in November 2023.[1] Extending the analysis to fully capture implications on aquaculture will be a priority for future work.

## 4.2. Impacts on fisheries from climate change

Fisheries are already, and will increasingly be, affected by climate change in a number of ways. In 2019, the Intergovernmental Panel on Climate Change (IPCC) forecasted that mean sea surface temperatures will increase by between 0.33°C and 1.29°C by 2050, relative to 1986-2005 averages, under scenarios designed to represent what were seen, at the time, as "best-case and worst-case scenarios" in terms of GHG concentration in the atmosphere (Box 4.1). They also predicted that such increases in sea surface temperatures will be associated with gradual changes in ocean currents and increasing acidification (that is, a decrease of ocean pH), leading to changes in where fish are found as well as their size, growth rates and survival, that is, the productivity of the stocks (IPCC, 2019[1]). In addition, climate change is leading to more frequent and more severe weather events, notably marine heatwaves, which have more immediate impacts on fishers' incomes and the risks they take during fishing activities and pose specific challenges to fisheries managers.

The years 2023 and 2024 were the hottest on record for global sea surface temperatures (Figure 4.1), according to data from the European Union's Copernicus Climate Change Service (Copernicus, 2025[2]), and 2023 was described as unprecedented and extraordinary by the World Meteorological Organization (WMO, 2023[3]).

## Figure 4.1. Average sea surface temperature between 1970 and January 2025




Note: Average daily sea surface temperature between 60° north (latitude of Oslo) and 60° south (edge of Antarctic continent).
Source: Generated using Copernicus Climate Change Service (C3S), implemented by the European Centre for Medium-Range Weather Forecasts (ECMWF) (2025[2]).

### Box 4.1. Intergovernmental Panel on Climate Change's climate change scenarios

Throughout its latest comprehensive report, the Intergovernmental Panel on Climate Change (IPCC) makes use of two main climate projection scenarios: the Representative Concentration Pathways (RCP) 2.6 and 8.5. These representative pathways are examples of emissions trajectories that would lead to a certain amount of change in warming potential in the atmosphere.

RCP 2.6 is the lowest emissions scenario (i.e. best-case scenario) used in the 2019 IPCC report on the oceans and has a two in three chance of limiting global warming to below 2°C by 2100 (Table 4.1). This scenario assumes net zero emissions are achieved by around 2050 and net negative emissions by 2100. RCP 8.5 is the highest emissions scenario (i.e. worst-case scenario) modelled and projects a scenario with no significant policies to combat climate change, leading to continued sustained growth in emissions (IPCC, 2019[1]). The IPCC report also includes two intermediate emissions pathways, RCP 4.5 and RCP 6.0.

#### Table 4.1. Projected global mean surface sea temperature increase relative to 1850-1900

| Scenario | Near term 2031-2050 | | End of century 2081-2100 | |
|---|---|---|---|---|
| | Mean (°C) | Likely range (°C) | Mean (°C) | Likely range (°C) |
| RCP 2.6 | 0.64 | 0.33-0.96 | 0.73 | 0.2-1.27 |
| RCP 8.5 | 0.95 | 0.6-1.29 | 2.58 | 1.64-3.51 |

Source: IPCC (2019[1]).

What follows discusses the impacts from climate change on fisheries starting with two of the main gradual impacts of climate change on fisheries, i.e. changes in the abundance of fish stocks and changes in where fish stocks are found, then turning to marine heatwaves, the aspect of climate change which has had the most noticeable impacts on commercial fisheries to date, and finishing with ocean acidification, which is one of the least documented aspects of climate change impacts.

### 4.2.1. Global abundance of fish stocks will decline on average

Almost all fishing regions are likely to experience reductions in the abundance of fish and sustainable capture fishing potential in the future due to climate change-driven influences, notably increases in ocean temperatures and ocean acidification (Hilmi et al., 2015[4]; IPCC, 2019[1]). The only exception is some higher latitude regions, where the abundance of commercially exploited fish may increase (Lotze et al., 2019[5]; Blanchard et al., 2012[6]). These predictions are notably guided by Cheung et al.'s (2010[7]) model forecasts, which estimate that tropical regions could see a decrease in abundance of around 40% while high latitude regions could see an increase between 30 and 70%. As a result of these trends, the IPCC estimates that global fisheries catches could decrease by between 3.4% and 24.1% by the end of the century under its best- and worst-case emissions scenarios.

The composition of species in capture production is also expected to change, with decreases in cold water species and increases in warm water species, and these trends are expected to be stronger in higher latitude regions (IPCC, 2019[1]). The sum of local species extinctions and expansions is known as species turnover and describes the rate at which species change in an ecosystem. Higher species turnover means ecosystems are changing faster, which may lead to decreased catches and fisheries closures for some species and increased catches and new fisheries for others, complicating the task facing fisheries managers and increasing the need for adaptive management. Under its worst-case emissions scenario, the IPCC predicts species turnover will increase by up to 39% in tropical waters and 48% in higher latitude regions by 2100 relative to 2019.

It remains difficult to predict the timing, magnitude and location of potential changes to fisheries production in the future. All forecast models are characterised by high degrees of uncertainty and there are multiple, sometimes contradictory, forecasts of the potential effects of climate change on fisheries. For example, under the lowest warming scenario, RCP 2.6, there is disagreement between different models as to whether overall catches will increase or decrease in regions that are important to OECD fisheries, such as the Mediterranean, the north-west Atlantic and the Southern Ocean.[2] Under the highest warming scenario, the direction of forecast trends in catches are clearer; however, there is still some uncertainty in the Mediterranean and waters around New Zealand as to whether catches may increase or decrease as oceans warm. It also remains difficult to separate the effects of environmental change from the impacts of fishing pressure on stocks (IPCC, 2019[1]).

Finally, while global scale modelling can provide an overarching picture of trends, information is needed at a local level to inform management decisions for specific fisheries. This information on changes in local climate conditions and how they affect specific fisheries is still lacking for many stocks and fisheries and new research is needed to refine our understanding of the relationship between climate, ecosystems and fisheries.

### 4.2.2. The location of fish stocks will change

Some fish stocks are already moving as a result of climate change. However, as of 2023, most climate-driven range shifts[3] have been small and slow. For example, Poloczanksa et al. (2013[8]) found that the marine species which had undergone range shifts between 1950 and 2009 had on average either expanded 72 km per decade or contracted by 15 km per decade.

Only a few large-scale range shifts have been observed because temperatures have not yet increased to the point of driving large, sustained changes in species ranges but also due to a lack of data on climate-driven shifts (Fiechter et al., 2021[9]; Chang et al., 2021[10]; Palacios-Abrantes et al., 2022[11]; IPCC, 2019[1]). One example of a more significant observed change in range driven by climate change is the expansion in the range of short- and long-finned squid[4] in the North Sea by around 500 km² over the last 35 years due, in part, to warmer waters in winter (Kooij, Engelhard and Righton, 2016[12]).[5]

Mechanisms for monitoring the impacts of changing ocean temperatures on the location of fish are fragmented and unevenly distributed globally. However, regional initiatives are developing. For example, the Distribution Mapping and Analysis Portal (DisMAP) project is a collaboration between the United States National Oceanic and Atmospheric Administration, Rutgers University, and Fisheries and Oceans Canada and aims to track long-term movements in the range and depth profile of species over several decades.[6]

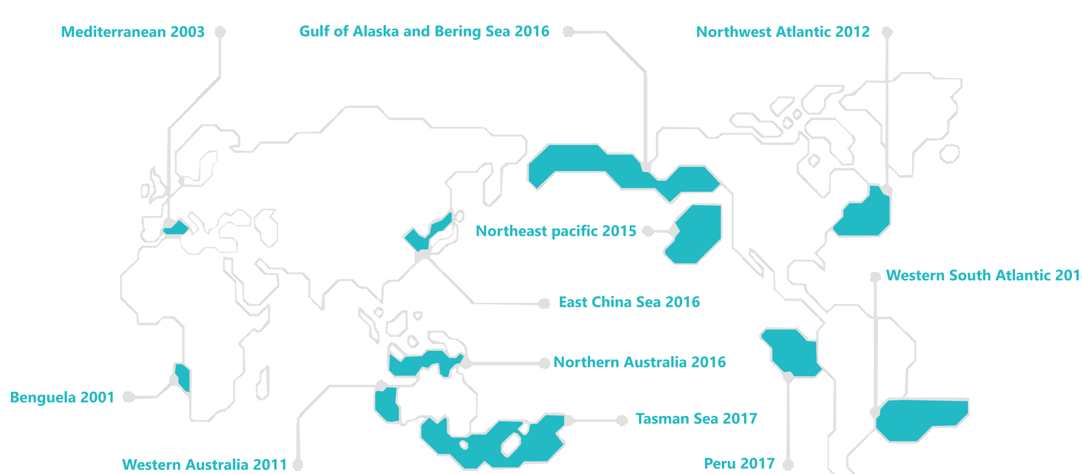
Shifts in the ranges of marine species are expected to continue at a rate of between tens and hundreds of kilometres per decade for affected species, with faster range shifts expected under higher emissions scenarios (Jones and Cheung, 2014[13]; IPCC, 2019[1]). Further, by 2030, 23% of transboundary stocks are expected to shift, impacting 75% of the world's economic exclusive zones (Palacios-Abrantes et al., 2022[11]). This could undermine fisheries' sustainability by reducing the effectiveness of existing management measures and create a need for new co-management arrangements.

Climate-driven shifts in species ranges have, in fact, already led to significant changes to both regional and international management arrangements for the OECD Member fisheries. As commercial species continue to move due to warming waters, fisheries managers will need to ensure they have mechanisms in place to accommodate future changes, as lack of adaptation in co-operation arrangements could lead to overfishing and detrimental impacts on fishing communities (see Chapter 5 for more details).

### *4.2.3. Marine heatwaves will increasingly affect fisheries*

Marine heatwaves, which consist of extreme and short-lived episodes of increased sea temperature, are mostly caused by climate change.[7] Frölicher, Fischer and Gruber (2018[14]) estimate that 87% of heatwaves observed today can be attributed to human-induced climate change. They have occurred in most ocean regions in the last two decades (Figure 4.2) and are expected to become more frequent and longer lasting. Studies estimate that annual marine heatwave days doubled between 1982 and 2016, with increases in both the frequency and duration (Oliver et al., 2018[15]; Frölicher, Fischer and Gruber, 2018[14]). The IPCC forecasts that this trend will continue, with the global average number of marine heatwave days increasing to 4-12 times current levels by 2100. The largest increases are expected in Arctic and tropical waters (IPCC, 2019[1]).

## Figure 4.2. Occurrence of major marine heatwaves between 2000 and 2021




Source: European Union, Copernicus Marine Service Information (2023[16]) adapted from: Oliver et al.. (2021[17]), *Marine Heatwaves.*

Marine heatwaves are already altering ecosystems and impacting fisheries in ways that over a matter of days or weeks can generate significant and long-lasting adverse impacts for the welfare of fishers and dependent communities. Major marine heatwaves have been documented as having led to shifts in species range, destruction of habitat and even the collapse of commercial fisheries in recent years (Smith et al., 2021[18]; Sen Gupta et al., 2020[19]; Oliver et al., 2021[17]). As a result, governments have spent millions supporting those affected (Holbrook et al., 2020[20]; Oliver et al., 2021[17]).

Examples of documented economic losses from marine heatwaves include an estimated loss of USD 3 million linked to the closure of the swimmer crab fishery off the west coast of Australia for 18 months during a 2011 heatwave (Smith et al., 2021[18]); and the USD 141 million in government support to compensate fishers for losses related to the 2014-16 heatwave that hit the west coast of North America (Free et al., 2023[21]). The latter example was extensively studied and provides an illustration of the range impacts marine heatwaves can have on fisheries (Box 4.2).

Marine heatwaves are expected to be one of the main drivers of climate change impacts on fisheries in the short and medium terms. The IPCC (2019[1]), for example, notes that the impacts of marine heatwaves will be more important for fisheries than the slow rise in average sea temperature over the next 10-30 years. Because they can develop quickly and be hard to anticipate, marine heatwaves pose specific challenges for fisheries managers and may require specific policy responses, highlighting the importance of addressing them in climate change adaptation strategies for fisheries.

### Box 4.2. “The Blob” heatwave, North-east Pacific, 2015

Between 2014 and 2016, “the Blob” heatwave developed offshore and spread to coastal waters stretching from Mexico to Alaska. It peaked in 2015/16 and resulted in an increased range for some species and destruction of habitat and the collapse of fisheries for others. The consequences of “the Blob” heatwave for the fishing sector included:

- Increased squid range and a fivefold increase in abundance along the US west coast, persisting after the heatwave. This led to new management arrangements for squid in Oregon, where abundance increased almost 40-fold following the heatwave (Chasco et al., 2022[22]).
- Reduced abundance of salmon in the Gulf of Alaska due to lower recruitment and increased mortality, resulting in USD 56.3 million in disaster relief payments to commercial fishers (Free et al., 2023[21]; NOAA Fisheries, 2023[23]).
- Loss of kelp forests. This reduced red urchin and abalone catches, which have still not entirely recovered. The value of the recreational abalone fishery alone to the local economy in California and Oregon was estimated at around USD 24-44 million annually. This fishery has not recovered and was still closed in 2023 (Free et al., 2023[21]; NOAA Fisheries, 2023[23]).
- Closure of the Californian crab fishery for six months, with catches reduced by 50% for the following season due to algal blooms. The government allocated USD 28.5 million to compensate fishers for lost revenue (Free et al., 2023[21]; NOAA Fisheries, 2023[23]).
- Collapse of Alaskan cod fishery due to increased adult mortality and decreased prey availability. This fishery, which recorded annual catches of around 70 000 tonnes before the heatwave, saw reduced abundance and falling catches, ultimately leading to the full closure of the fishery in 2020. The fishery has since reopened, but catches are still less than one-third of what they were prior to the heatwave. The US government provided USD 17.8 million in compensation to support cod-fishing businesses (Alaska Department of Fish and Game, 2023[24]; 2023[25]; Free et al., 2023[21]; Hulson et al., 2022[26]).

### *4.2.4. Ocean acidification*

As well as increasing in temperature, the ocean is becoming more acidic as it absorbs $CO_2$ from the atmosphere (OECD, 2021[27]), with potentially negative consequences for fisheries. This trend will continue into the future (Table 4.2). The effects of ocean acidification will vary between regions, with ocean currents and local geography leading to faster increases in acidity in some areas than in others. Hilmi et al. (2015[4]) note that increased ocean acidity will negatively impact the ability of certain plankton and molluscs to build their shells and other structures, especially during juvenile stages. This will, in turn, affect finfish through reduced availability of plankton as food. However, the extent of these flow-on impacts remains somewhat uncertain due to difficulties in predicting how organisms and food webs may adapt to any changes. Finfish growth and survival are also likely to be directly affected by the changing water chemistry. Finally, the negative effects of acidification are also exacerbated by other stressors such as increased water temperatures due to climate change. The overall effects of acidification on fisheries remain uncertain and depend on both the capacity of species to adapt to changing pH levels and the role of affected species in the food chain. More research is required to better understand the potential impacts of acidification on fisheries (Hilmi et al., 2015[4]).

**Table 4.2. Projected global mean surface pH change relative to 1850-1900**

| | Near term (2031-50) | | End of century (2081-2100) | |
|---|---|---|---|---|
| Scenario | Mean (units) | Likely range (units) | Mean (units) | Likely range (units) |
| RCP 2.6 | -0.072 | -0.072 to -0.072 | -0.065 | -0.065 to -0.066 |
| RCP 8.5 | -0.108 | -0.106 to -0.110 | -0.315 | -0.313 to -0.317 |

Source: IPCC (2019[1]).

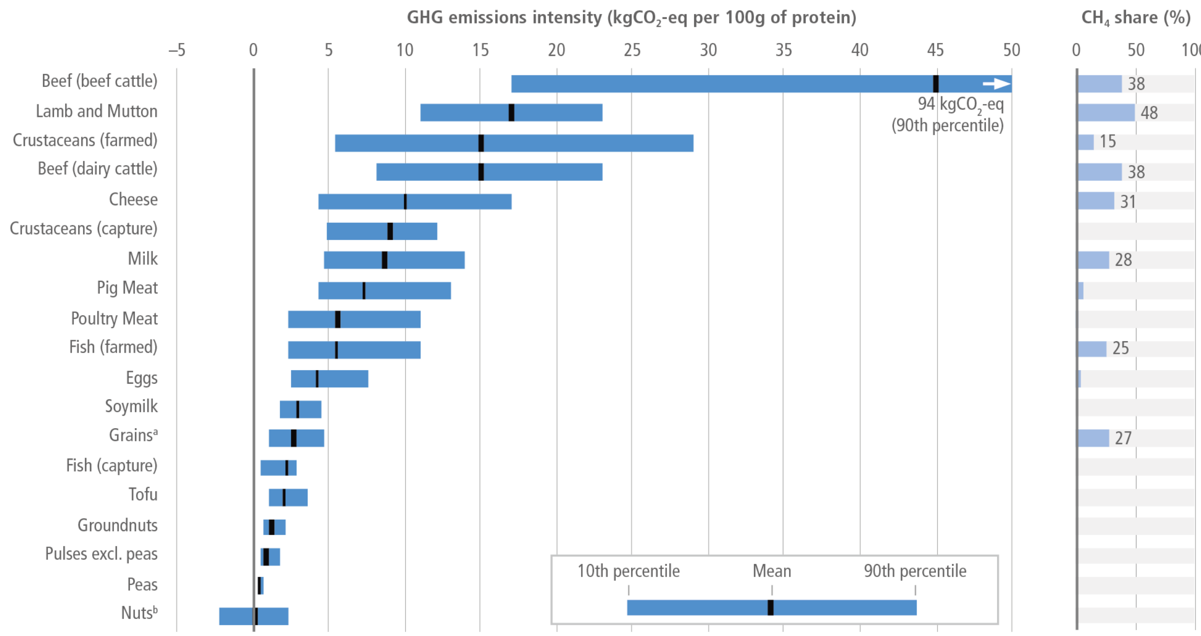
## 4.3. Greenhouse gas emissions in fish production

### *4.3.1. Fish are a relatively low emissions food source*

In general, fish from wild catch or aquaculture have a lower GHG emissions intensity of production than other animal products, both by live weight and by gramme of protein (Figure 4.3). Although there has been a global increase in capture fisheries' emissions intensity in recent decades (the extent of which is detailed below), average emissions from fish production (both from capture fisheries and aquaculture) are lower than for most other animal protein sources (IPCC, 2023[28]).[8]

From a nutritional perspective, while plant-based proteins are less emissions-intensive (in $CO_2$-eq/kg of protein) than almost all animal products, the lowest emissions-intensive fish, such as small pelagics, are comparable to the emissions intensity of plant-based protein. Aside from protein, fish is also an important source of essential vitamins, minerals and fatty acids. Some recent studies – such as Hallström (2019[29]) – compare fisheries emissions based on an overall nutrition rating.[9] This decreases the relative emissions intensity of some highly nutritious species, such as small pelagic fish and oysters, while increasing it for some finfish species with very high salt content. Finally, if emissions are considered on the basis of landed value rather than production weight (e.g. $CO_2$-eq/USD), crustaceans are less emissions-intensive than land-based animal products in most cases (Parker and Tyedmers, 2014[30]; Parker et al., 2015[31]).

## Figure 4.3. Greenhouse gas emissions intensity of protein production




Note: Ranges of greenhouse gas intensities [kgCO2-eq per 100 g protein, 10–90th percentile] in protein-rich foods, quantified via a meta-analysis of attributional lifecycle assessment studies using economic allocation. Aggregation of CO2, CH4, and N2O emissions in Poore and Nemecek (2018[32]) updated to use AR6 100-year GWP. Data for capture fish, crustaceans, and cephalopods from Parker et al. (2018[33]), with post-farm data from Poore and Nemecek (2018[32]), where the ranges represent differences across species groups. CH4 emissions include emissions from manure management, enteric fermentation, and flooded rice only.

a. Grains are not generally classed as protein-rich, but they provide about 41% of global protein intake. Here grains are a weighted average of wheat, maize, oats, and rice by global protein intake.

b. Conversion of annual to perennial crops can lead to carbon sequestration in woody biomass and soil, shown as negative emissions intensity.

GHG = greenhouse gas.

Source: IPCC (2023[28]).

Indicators of GHG emissions intensity and food life-cycle carbon emissions assessments, however, are highly influenced by methodological choices, so standardisations across products compared are needed. For example, Gephart et al. (2021[34]) provide a harmonised comparison of fish and chicken, which confirms that many fed aquaculture groups outperform industrial chicken, the most efficient major terrestrial animal-source food. They find that capture fisheries vary widely in their GHG emissions, with some species having a higher GHG emissions intensity than chicken, notably demersal flatfish and crustaceans, which can have relatively high emissions because of the fuel-intensive fishing methods used (namely bottom trawling and boats using pots and traps) and some lower.

Together, these findings suggest that both capture fisheries and aquaculture should feature in discussions on low-carbon food systems as shifts in the balance of production across food sub-sectors could be part of mitigation strategies by consumers, food actors or governments.

### *4.3.2. Emissions have increased*

Overall, the emissions intensity of capture fisheries has increased in recent decades. Parker et al. (2018[33]) estimated that global fisheries emissions increased by 1.2% annually between 1990 and 2011, while catches remained steady.

The increase in emissions is explained by changes in the nature of fishing activities, notably:

- higher catches in fuel-intensive crustacean fisheries

- increased fuel use per kilogramme (kg) of landed catch in large pelagic fisheries, primarily tuna[10]
- increased fuel use per kg of landed catch in bottom trawl fisheries (Parker et al., 2018[33])[11]
- growing motorisation of the global fleet (Greer et al., 2019[35]).

Despite the overall increase in emissions from fisheries, since 1990 some individual fisheries have experienced a substantial decline in emissions intensity and total emissions, largely due to increased fuel efficiency from improved technology or healthier stocks, highlighting the potential of sustainable management to also reduce emissions intensity. Consequently, fishers have been able to catch the same amount of fish with less fishing effort, and therefore with lower GHG emissions (Parker and Tyedmers, 2014[30]).

### *4.3.3. Fuel use during fishing is the main source of emissions*

Fuel use during fishing is the main source of emissions from capture fisheries. It is estimated to account for 60-90% of emissions up to the point of landing (Parker et al., 2018[33]; Tyedmers, 2004[36]; FAO, 2015[37]).[12] Further, several studies estimate that up to the point of retail sale, fishing activities altogether account for 75-95% of overall GHG emissions, with transport, processing and storage accounting for the rest (Ziegler et al., 2016[38]). Fuel costs are also significant for many fishers, typically accounting for 5-45% of operating costs (STECF, 2022[39]; Parker et al., 2015[31]; Greer et al., 2019[35]).

A number of factors influence fuel-use intensity, measured in litres of fuel used per kilogramme of catch. The most important of these are vessel and gear type; the characteristics of target species, with some fish more "catchable" than others – which itself is influenced by the stock abundance and management system. As a result, emissions intensity varies widely across fisheries. Noting these differences, and understanding how policies can influence them, can help fisheries managers to prioritise policy and management effort to achieve GHG emissions reduction objectives.

Bottom trawl fisheries and pot/trap fisheries have some of the highest emissions intensities (measured by GHG emissions per kg of captured fish). The picture is different if emissions intensity is measured relative to value, not weight. However, even by this measure, higher value trawl-caught flatfish and pot and trawl-caught crustaceans still have the highest emissions intensity, although the difference is smaller (Parker and Tyedmers, 2014[30]). Bottom trawl fishing is emissions-intensive due to the resistance of dragging nets through the water, while pot and trap fishing is highly emissions-intensive due to the long distances travelled between crustacean pots and traps compared to the relatively low weight of catches (Bastardie et al., 2022[40]). These gear types also account for a large share of fishing emissions globally (Parker and Tyedmers, 2014[30]). Together, pot and trawl fisheries for crustaceans are estimated to account for around 6% of global catches but 22% of emissions (Parker et al., 2018[33]). Purse seine, gillnet and pelagic trawl fisheries, on the other hand, are significantly less emissions-intensive. As a comparison, purse seine and pelagic trawl fisheries targeting small pelagics account for around 20% of global catches but only 2% of emissions.

### *4.3.4. Some variation in emissions intensity can be explained by the context in which fishing takes place*

There are important local differences in the emissions intensity of different gear types, even within and between fisheries using the same gear. These differences are driven by a variety of factors, including species characteristics, fishing practices or management measures that influence fishing practices (Table 4.3) (Ziegler and Hornborg, 2014[41]; Waldo and Paulrud, 2016[42]; Driscoll and Tyedmers, 2010[43]; CEFAS, 2022[44]; Parker et al., 2015[31]; Bastardie et al., 2022[40]). As a result, it is possible for the emissions intensity of production for one fisher to be double that of another despite using the same gear and targeting the same species (Table 4.4).[13] Where differences are explained by factors that can be influenced by management measures, such as stock abundance, vessel type or fishing style, fisheries managers have an opportunity to bring down emissions.

### Table 4.3. Factors influencing variations in emissions between similar fisheries

| Factors | Examples |
|---|---|
| Species characteristics | Abundance and catchability can influence the efficiency of fishing operations and their emissions intensity. |
| Fishing practices | Vessel choice, fishing gear and distance to fishing grounds all impact emissions intensity. |
| Management measures | Management measures can decrease efficiency for example by mandating vessel size or fishing days, or it can increase it by improving allocation of fish such as through total allowable catches, reducing inefficient competition for fish between fishers. |

Sources: Ziegler and Hornborg (2014[41]); Waldo and Paulrud (2016[42]); Driscoll and Tyedmers (2010[43]); CEFAS (2022[44]); Parker et al. (2015[31]); Bastardie et al. (2022[40]).

### Table 4.4. Variations in fuel intensity within fisheries

Litres/tonne of catch

| Fishery | Minimum | Mean | Maximum |
|---|---|---|---|
| Crustacean bottom trawls Oceania | 1 165 | 4 125 | 10 886 |
| Crustacean bottom trawls Europe | 377 | 3 083 | 17 300 |
| Crustacean pots and traps Oceania | 846 | 3 803 | 9 474 |
| Crustacean pots and traps Europe | 334 | 834 | 2 156 |
| Flatfish bottom trawls Europe | 631 | 2 851 | 4 062 |
| Flatfish bottom trawls North America | 957 | 1 084 | 1 338 |
| Finfish surrounding nets Europe | 104 | 466 | 659 |
| Finfish surrounding nets Oceania | 62 | 346 | 497 |
| Small pelagics surrounding nets North America | 20 | 42 | 160 |
| Small pelagics surrounding nets Europe | 8 | 84 | 506 |
| Small pelagics surrounding nets Oceania | 29 | 89 | 217 |
| Large pelagics hook and line Oceania | 937 | 1 676 | 3 300 |
| Large pelagics hook and line Europe | 570 | 1 745 | 3 478 |
| Large pelagics hook and line North America | 385 | 1 495 | 2 678 |

Source: Parker and Tyedmers (2014[30]).

In addition to emissions from fuel use, bottom trawling fisheries also release $CO_2$ from sediments on the sea floor (Sala et al., 2021[45]). While some authors have estimated these emissions to be of a similar scale to all other emissions from fishing, further data and research are needed before drawing conclusions. Indeed, the magnitude of these releases, and the fraction released into the atmosphere, remain subject to debate because of uncertainties around the theoretical assumptions underpinning the estimates (Hiddink et al., 2023[46]; Atwood et al., 2023[47]). Epstein et al. (2022[48]) compare various studies on emissions released from sediments during trawling, with some showing emissions increases, others showing decreases, and still others showing no change, depending on the location and study methods.

## 4.4. Further reflections

There is a large body of evidence for the impacts that climate change is having and will have on fisheries globally. However, there is often a gap between the scale at which predictions are made (e.g. regional and global) and the scale at which impacts are felt (e.g. individual fisheries and fishers). Consequently, it is difficult for policymakers to know what specific challenges the sector will face in each fishery, making it difficult to plan for the future. With climate change, fisheries management systems will come under increasing pressure in both the short and long term. It is therefore important to ensure these systems are able to both adapt to the challenges in the short and long terms while supporting the sector as it tries to reduce emissions.

Finally, to further increase the contribution of fisheries and aquaculture to development of low-carbon, sustainable and resilient food systems more investment is required. Specifically, investing in better understanding the implications of climate change on key fisheries, and aquaculture production systems and the relative carbon-efficiency of different fish production systems is important to clarify the role that they can play in climate mitigation strategies.

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## Notes

[1] The OECD Secretariat thanks all experts having participated in the workshop and having provided feedback on the background notes that served as a basis for this chapter.

[2] As fish consumed in the OECD is largely imported, it should be noted that from a consumer and trade perspective, other Ocean areas are also key.

[3] Defined as change in the geographical distribution of species boundaries from previously known boundaries for any or all of the developmental stages, events and/or seasons.

[4] *Loglio forbesii* and *Alloteuthis subulata*.

[5] This range shift coincided with increased catch rates and total landings. However, it is difficult to distinguish the effects of increased abundance from changes in fishing effort (Kooij, Engelhard and Righton, 2016[12]).

[6] The data available through DisMAP show that most species ranges vary over time, and that slow, long-term range shifts have been observed for many species. Currently, most of the range shifts observed by DisMAP are relatively small (NOAA Fisheries, 2023[23]).

[7] A marine heatwave is typically defined as a period during which the local sea surface temperature exceeds the historic 99th percentile from 1982 to 2016, or a period during which the local surface temperature exceeds the 90th percentile for 5 days or more (IPCC, 2019[1]).

[8] For example, Gephart et al. (2021[34]) provide a harmonised comparison of fish and chicken, which confirms that many fed aquaculture groups outperform industrial chicken, the most efficient major terrestrial animal-source food. They find that capture fisheries vary widely in their GHG emissions (with some species having a higher GHG emissions intensity than chicken, and some lower; see Figure 4.5).

[9] The overall nutrition rating can compare positive elements such as vitamins, minerals, proteins and fatty acids against negative elements such as excessive salt and unhealthy fats. Nutrition scores can vary depending on the weightings given to different factors.

[10] Fuel use has increased on average in global tuna fisheries; however, it is unclear what has driven this overall change. It has likely been affected by changes to fishing methods, distance travelled by fleets, types of vessels and abundance of stocks, but these effects will be different across different fisheries (Parker, Vázquez-Rowe and Tyedmers, 2015[49]).

[11] An increase in fuel use in trawl fisheries could be due to decreased abundance; however, other factors such as fishing restrictions to protect stocks can also increase fuel use in the short term (Ziegler and Hornborg, 2014[41]).

[12] This, therefore, does not include emissions from international trade of fish products.

[13] It is important to note that some of these differences may be attributable to different data collection methods or quality.

# Part II Better policies for better fisheries

# 5 Towards sustainable fisheries management

This chapter analyses fisheries management in the countries and territories covered in this report and recommends policy reforms to better adapt to climate change and accelerate the energy transition of the sector. The chapter first discusses how countries use a range of different management tools to control how, where and when fishers catch fish for the most valuable species at a national level. Discussion notably focuses on the use of total allowable catch limits and quota systems, which are important for a sustainable and productive use of resources. Finally, the chapter explores how climate change will impact fisheries management and how policymakers can address the challenges it poses.

## Key messages on fisheries management

- **Sustainable fisheries management is a win-win-win strategy** to increase fisher welfare, preserve ocean health and contribute to climate change mitigation and adaptation. Effective management requires a co-ordinated package of policy tools that limit how much, how and where fish can be caught. This usually includes regulating catch volumes through limits on the total allowable catch (TAC) of specific species in specific fisheries (and sometimes further dividing and distributing the TAC into individual or community quotas); regulating fleets (e.g. vessel size, power and type of gear); and defining where and when fleets can operate.
- **In 2022, the majority (60% by value) of fish production from commercially important fisheries came from species that were fully subject to total allowable catch limits**. However, scope for progress exists, with an overall 28% of the production value still coming from species that are not subject to any catch limit, and another 12% from species that are only partially covered by catch limits.
- **Climate change poses two major challenges for fisheries managers**: 1) understanding how changes in ocean conditions might affect specific fish stocks and fisheries; and 2) translating this knowledge (including uncertainty on the nature and magnitude of impacts) into effective policy responses to ensure fish stocks remain healthy and productive and any negative socio-economic impacts are addressed.
- **To adequately address the impacts of climate change, management institutions at both national and international levels need to be flexible and able to make changes in a timely manner**. For fisheries where stocks shift across borders (i.e. between different exclusive economic zones and high seas jurisdictions), this may mean that regional fisheries bodies, as well as other types of co-operative agreements have to adjust overall catch limits and national quota allocations to prevent the overall pressure on stocks exceeding sustainable levels.
- **Sustainable fisheries management has a key role to play in climate mitigation strategies for fisheries**. Implementing stock management measures to maximise the productivity of stocks under sustainability constraints – that is, ensuring stocks are healthy and productive – will improve the volume and value of catch per unit of fishing effort (CPUE) and thus minimise the emissions per unit of fish (for a given fisheries configuration).

## 5.1. What's the issue?

Good fisheries management is fundamental to every aspect of fisheries sector performance be it economic, social or environmental. Healthy, and productive fish stocks ensure profitability for fishers and play a key role in global food security. Well-managed, abundant fish stocks allow fishers to maximise the food or value produced in a sustainable way (i.e. a productive stock). Improving fish stock health through better fisheries management can also help reduce the sector's greenhouse gas emissions (GHG), as less effort (and fuel) is needed to catch the same volume of fish. However, without effective management, overfishing and illegal, unreported and unregulated (IUU) fishing can reduce fish abundance below levels which allow for optimal productivity (i.e. unproductive stocks), and in extreme cases to levels from which the fish stock cannot recover (i.e. collapsed stocks (Chapter 3 for a more detailed discussion) (Hutchings, 2000[1]).

Evidence suggests that fisheries management works: well-managed fisheries have been shown to be more sustainable, productive and profitable (Hilborn et al., 2020[2]; Costello et al., 2016[3]). To be effective, fisheries management must be science based, context specific and monitored, to ensure not only that the plan is being adhered to, but also that it is working as intended. In this way, stock assessments (Chapter 3) are a vital component of fisheries management because they provide both the scientific basis for taking management decisions and information on whether the management plans are effectively ensuring the sustainability and productivity of the resource base. Feedback stock assessments provide essential information to ensure performance failures can be identified and addressed early.

While ensuring the health and productivity of stocks is the most important objective of management, fisheries management is not limited to managing the biological resources. Fisheries management should also consider the socio-economic context of the fisheries (e.g. the fishers and community that rely on it), to ensure management plans can achieve environmental, social and economic goals. Correspondingly, management plans should be developed in conjunction with the relevant stakeholders so that their views can be adequately represented in the process, thereby contributing to its legitimacy and effective implementation (Pita, Graham and Theodossiou, 2010[4]). Finally, good fisheries management requires effective monitoring and enforcement, otherwise the management plans ability to achieve their goals will be undermined by IUU fishing.

Fisheries are complex ever-changing systems where the impacts of several different pressures on fish stock health and productivity, such as fishing, pollution, environmental conditions, and climate change, can make outcomes hard to predict. Consequently, fisheries management must have built-in mechanisms for understanding how underlying resources change and adapt management actions accordingly, even when the mechanisms driving this change are not fully understood or are hard to measure. This issue will become more complicated under climate change, as changes in ocean temperatures, acidity and marine heatwaves increase both the speed and magnitude of the changes to fish stocks (Barange, 2018[5]) (Chapter 4).

The challenge facing fisheries managers is therefore not only to create an effective system for managing a particular fishery, but also to integrate sufficient flexibility in that system so it can adapt as the fishery changes over time. Data from Chapter 3 show that 81% of conclusively assessed fish stocks are healthy and only 59% are at levels that allow for optimal productivity, so there is clearly room to improve the performance of management systems.

This chapter first explores how the most important commercial fisheries are managed across the 31 countries and territories covered in this report for which management data were available,[1] with a specific focus on the use of total allowable catch limits (TACs) and quota systems. Key statistics on the use of management tools are presented either at the level of "all countries and territories", which refers to the 41 countries and territories covered in the report where management data were provided, or at the level of "the OECD Members" and "the non-Members" among them. The chapter then goes on to explore some of the impacts of climate change on fisheries management, before considering how fisheries management can contribute to both climate change adaptation and mitigation in the sector.

## 5.2. OECD perspective on fisheries management

As part of the *OECD Review of Fisheries*, the OECD regularly collects data on how countries and economies manage their most valuable harvested species. The OECD Fisheries Management Indicators database covers each country's five most valuable species (as per 2020 data), and data are reported at the stock level (i.e. if different stocks of one species are managed differently the information is reported for each stock of that species individually). For each stock, detailed information is provided on the different management tools, covering both:

- Input controls, which regulate fleet and gear characteristics (e.g. vessel size and power, gear type and configuration), along with where and when fishing can take place (e.g. with spatial or temporal restrictions).
- Output controls, which set harvesting limits either at the level of a fishery, with TACs that cap the total quantity of an individual stock that can be harvested, or at the level of individuals or communities, with specific quotas (e.g. individual transferable quotas, individual quotas or community quotas). Specific quota systems usually define the conditions under which quotas can be sold and exchanged (or not). Output controls also include regulations on minimum fish sizes, which regulate catch attributes rather than the overall level of catch.

The OECD Fisheries Management Indicators database contains information from 379 stocks of the most commercially valuable species for the countries and territories included in this chapter. On average, these stocks represented 62% of production by volume and by value across all countries and territories in the database and for more than 50% of the production by value in 21 of them. At the level of individual countries and territories, the relative importance of the most valuable species significantly varies, ranging from a high of 96% of production by value in Finland to a low of 26% in Colombia. This is due to different levels of species diversity in catches.

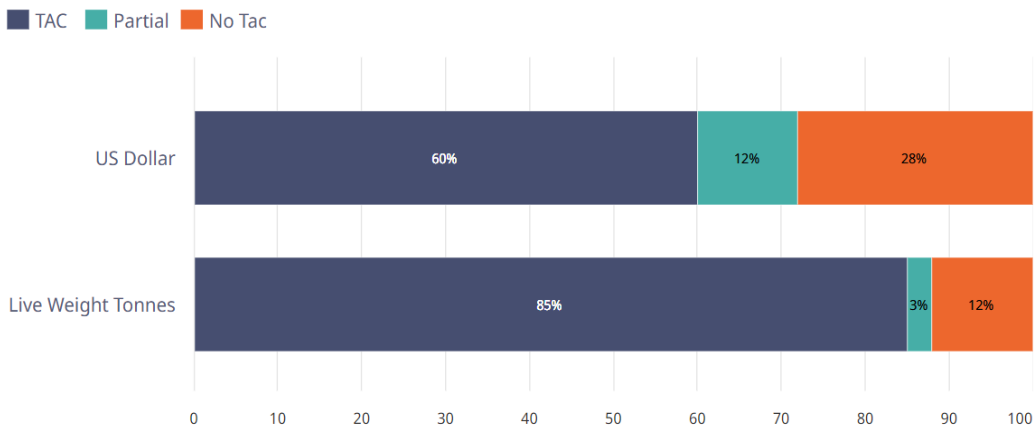
## 5.3. Recent trends in the use of fisheries management tools

### *5.3.1. Total allowable catch limits are used to manage the majority of stocks from the most commercially important species, often in conjunction with other quota systems*

TACs are used to manage the vast majority of stocks (72%) from the most commercially important species. Other quota systems are used much less frequently, with the most commonly applied being individual transferable quota (ITQs) which are used in 37% of stocks. However, in the stocks where TACs are used, other quota systems such as ITQs, non-transferable quotas and community managed quotas are used in the majority (70%) of cases.

Overall, 12.6 million tonnes of landings worth USD 11.4 billion were produced from species fully covered by TACs (i.e. all the stocks of these species were covered by a TAC in 2022). This corresponds to 85% of the production volume and 60% of the production value (Figure 5.1). A further 445 000 tonnes (USD 2.3 billion) came from species where some but not all the stocks were covered by TACs (i.e. a partial TAC). Species not covered by TACs at all accounted for 12% of production of the most commercially important species by volume (1.8 million tonnes) and 28% by value (USD 5.3 billion). Across the OECD Members, the majority of production (83% by volume and 62% by value) came from stocks that were fully subject to a TAC in 2022, while, in the non-Members, these proportions were of 87% of production by volume and 55% by value.[2] The value of production associated with stocks not managed using TACs is substantial, but while the clarity offered by TACs means their use is generally considered the preferred way of avoiding overfishing, in some circumstances they can be difficult to utilise effectively. Overall, the proportion of production covered by TACs is very similar to previous years (it was 80% by volume and 61% by value in 2020).

**Figure 5.1. Proportion of landings from the most commercially valuable species that were covered by total allowable catch limits in 2022**




Note: TAC: Total allowable catch limit.
Source: OECD (2025). Fisheries Management Indicators.

Using a TAC in fisheries allows managers to control the amount of fish caught and ensure it stays below the levels set in the management plan. In theory, further dividing and distributing the TAC into individual or community quotas allows fishers to maximise their profits by removing the 'race to fish' and instead optimise the timing and duration of fishing activity. Where ITQs have been implemented they are generally associated with an increase in abundance of the target species, and removal of excess capital and labour from the fleet (Merayo et al., 2018[6]; Hoshino et al., 2020[7]; Costello, Gaines and Lynham, 2008[8]). However, the implementation of quota systems has been associated with negative social outcomes if the initial quota allocation process was perceived as being inequitable, or fleet concentration leads to a less equal distribution of fisheries profits in coastal communities (Hoshino et al., 2020[7]).

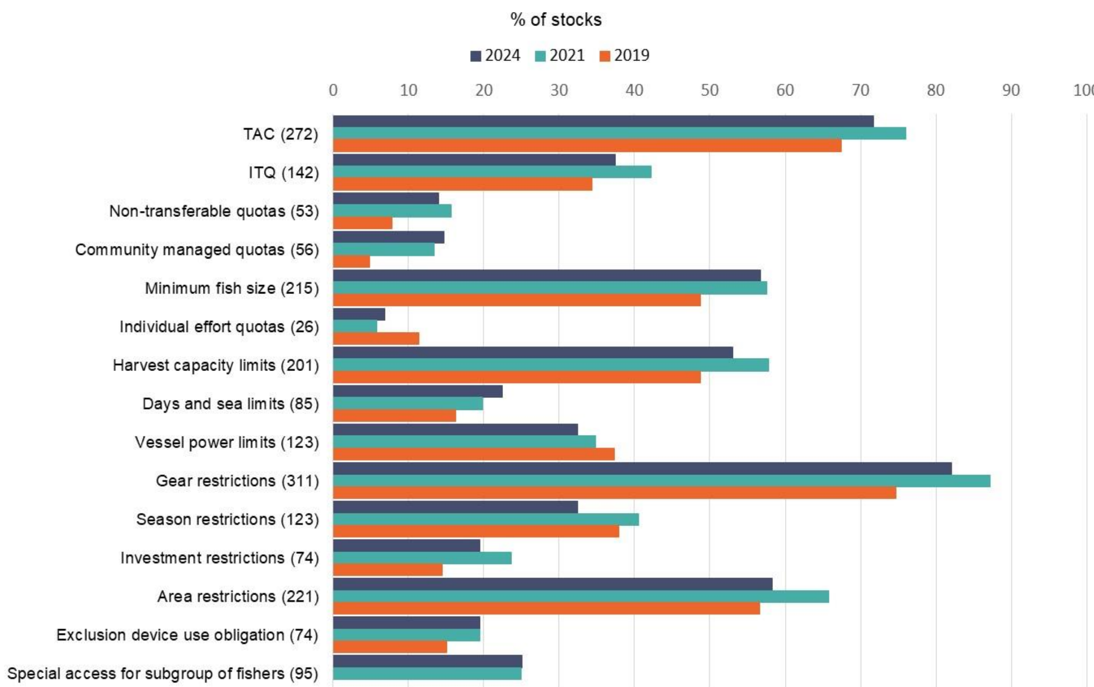
In some fisheries, implementing TACs can be challenging. First, and perhaps most importantly, it is not possible to implement an effective TAC for an unassessed stock, because without a good scientific understanding on the biomass level, fisheries managers do not know how much can be harvested without risking fish stock health and productivity, and hence cannot set a limit, further underlining the importance of regular stock assessments.

Second, TACs and other quota systems can be difficult to implement in multi-species fisheries, i.e. where fishers target more than one species simultaneously, which notably includes many warm water and tropical fisheries. In multispecies fisheries, output controls can create issues if the quota of one species is full before the quotas of the other species. In these cases, fishers could discard the species with a full quota to continue fishing others, but this is problematic for fisheries management as these discards are typically not counted in statistics, meaning real fishing pressure is higher than reported pressure (Dickey-Collas, Pastoors and van Keeken, 2007[9]). However, if fishers instead land everything they catch this then creates the issue of "choke" species, which are relatively rare species with small quotas that fill quickly, preventing fishers from filling other quotas and reducing catches (Rihan, 2018[10]). Consequently, the more diverse the fishery, the more challenging it is to implement TACs. In these fisheries managers can use a mix of input controls to restrict where, when and how fish are caught.

### *5.3.2. Input controls, such as gear restrictions and area restrictions remain fundamental to fisheries management*

On average, 5.5 different tools were used to manage the stocks in the database. But the number or tools used to manage different stocks varies from 0 to 12. Different fisheries require different tools and no two management regimes are identical, thus the variation in the number and type of management tools used across fisheries is expected. It also likely reflects that management capacity can and does vary across countries.

## Figure 5.2. Use of management tools in the stocks of the most commercially valuable species




Note: TAC = Total allowable catch limits, ITQ = Individual transferable quotas, number of stocks in parentheses.
Source: OECD (2025). Fisheries Management Indicators.

Gear restrictions are the most commonly used input control (and the most used management tool overall) in the data set and are applied in 82% (311) of stocks of the most valuable species. This is perhaps unsurprising, given the range of different gear available to fishers, and it’s differing specificity and impacts on the wider marine environment. Gear restrictions, therefore, are not only used to control the impacts of fishing on target species, but also to ensure the gears used do not have an outsized impact on non-target species and other aspects of ocean ecosystems.

Several other management tools are used to manage the majority of stocks in the database: area restrictions (used in 58% of stocks, or 221 stocks), minimum fish sizes (57%, 215 stocks) and harvest capacity limits (53%, 201 stocks). Area restrictions and minimum fish sizes are both tools designed to reduce the impact of fishing on biological processes, for example by protecting spawning areas and juvenile fish, while harvest capacity limits can address issues with the make-up of the fleet and reduce overexploitation more generally.

Generally, the mix of management tools has not changed significantly since 2019, with gear restrictions and TACs remaining the most widely applied by fisheries managers. So, while there is still room for improvement, in many cases this will come from improving the evidence base for management decisions (i.e. better stock assessments) and improved enforcement rather than dramatic changes in the types of management tools. Understanding the links between stock health and productivity, the management tools used and the landings from the stock will be important to help inform fisheries managers about what is working and what is not. Further work to link these sources of data, would be a valuable addition to the evidence available to fisheries managers.

## 5.4. What does climate change mean for sustainable fisheries management?

As discussed in Chapter 4, climate change is already affecting fisheries. This will pose two major challenges for fisheries managers: 1) understanding how changes in ocean conditions might affect specific fish stocks and fisheries; and 2) translating this knowledge (including uncertainty on the nature and magnitude of impacts) into effective policy responses to address the fisheries management and socio-economic challenges they pose (Barange, 2018[5]; IPBES, 2019[11])

Broadly speaking, the measures needed for climate adaptation in fisheries largely align with fisheries management good practices. They include scientific and regulatory measures to ensure healthy and resilient stocks; governance measures to ensure co-operation between different jurisdictions; and socio-economic measures to help fishers, fish industries and dependent communities adjust to changing circumstances. The next section explores some of these challenges as well as the opportunities for fisheries management to contribute to climate change adaption and mitigation.

### *5.4.1. Ensuring healthy, sustainable and resilient stocks is key for adaptation*

Healthy and resilient fish stocks are a pre-condition for addressing the negative effects of climate change on fisheries. While climate change is a significant danger for the health of fish stocks, fishing pressure remains the single largest threat to fisheries sustainability on a global scale (IPBES, 2019[11]). Not only does excessive fishing pressure reduce catches and profits for fishers over the long term, overfished stocks are also more vulnerable to the impacts of climate change. Addressing the impacts of overfishing can therefore be a win-win situation, improving the health of stocks and raising returns for fishers while increasing their resilience to climate change.

Maintaining healthy and productive fish stocks – i.e. not overfished and with biomass at levels that allow for maximising the sustainable harvest – can improve resilience to climate change-related mortality events such as marine heatwaves or disruptions to recruitment (i.e. how many fish successfully enter the fishery each year). Stronger stocks mean that reductions in biomass due to climate related events are less likely to result in stock numbers falling below safe limits and fishing can continue without (or with less) disruption. Stronger stocks with a larger spawning biomass can also recover more quickly from mortality events or recruitment disruption, resulting in quicker returns to higher catches. For example, it has been estimated that in major European Union fisheries, maintaining fish stocks at a level corresponding to maximum sustainable yields (MSY) would improve resilience to climate change in the majority of cases, with less disruption to fishing and faster recoveries from negative shocks (Bastardie, 2022[12]).

Measures to increase the health of stocks not only help to mitigate the negative effects of climate change; implementing best practice fisheries management could also lead to higher biomass for the majority of global fish stocks under all but the most severe climate change scenarios, as shown in Table 5.1 (Gaines et al., 2018[13]).

### Table 5.1. Impact of best practice fisheries management on global fish stocks, under different climate scenarios

| Potential benefits available from better fisheries management | Best to worst-case emissions scenarios | |
|---|---|---|
| | RCP 2.6 | RCP 8.5 |
| % of global fish stocks where biomass and catch per unit effort could increase | 68.6% | 57.3% |
| % of global fish stocks where total catches could increase | 42.2% | 25.7% |
| % of global fish stocks where profit could increase | 55.0% | 32.9% |

Source: (Gaines et al., 2018[13]).

It is important that management measures designed to build or maintain stocks are updated regularly in response to climate-induced and other changes. In the absence of effective measures to constrain catches, reduced productivity in one stock can have a potentially cascading effect on other stocks as fishing effort shifts to new stocks, leading to progressive depletion of multiple stocks (Beckensteiner, Boschetti and Thébaud, 2023[14]). A continued focus on ensuring that fish stocks are managed at healthy and productive levels is the best way to ensure long-term sustainability, improve economic outcomes for fishers and prepare for the impacts of climate change in the future.

*Ecosystem-based fisheries management can help build the resilience of the resource base*

For fisheries, building resilience to climate change not only means ensuring that fish stocks are healthy and productive but also that the ecosystems on which they depend are healthy. Shifting towards ecosystem-based fisheries management systems can help improve the health of the wider environment and further build resilience to climate change. However, significant challenges and research gaps remain.

When ocean conditions vary due to climate change, the parameters used to calibrate the fishing pressure to ensure sustainable harvesting of stocks can become obsolete. The multidimensional nature of how climate change impacts fisheries could also reduce the usefulness of some existing single species stock assessment models, which are based solely on catch or abundance surveys, meaning that more ecosystem influences should be considered (Peterson and Griffis, 2021[15]; Fulton et al., 2018[16]). Indeed, climate change can affect all the aspects of an ecosystem that are typically considered in fisheries management decisions including:

- water temperature
- the abundance of predator and prey species
- the quality of habitats
- the strength of currents
- prevailing winds, rainfall and freshwater flows.

The challenge for fisheries managers when including climate and ecosystem effects in management decisions is to understand the key relationships between climate and outcomes for fish stocks. This can significantly complicate the task facing fisheries managers. For example, attempts to include climate and ecosystem effects quantitatively in stock assessments can have mixed outcomes – improving predictions in some cases, but also increasing the range of uncertainty and error by making models more complicated. Furthermore, ecosystem relationships may not be stable over time, and this has sometimes led to poor estimates in some years (Skern-Mauritzen et al., 2015[17]). Table 5.2 summarises some examples of where including climate change and eco-system considerations in the stock assessment process led to useful lessons for better management.

## Table 5.2. Examples of lessons learned from including climate and ecosystem effects in stock assessments

| Fishery | How ecosystem influences were considered | Lessons |
|---|---|---|
| Sardines – United States | Sardine recruitment was found to be correlated to water temperature readings at a measurement station. Temperature was used for a decade to help set harvest limits. However, after recruitment failures in two separate years, which were not predicted by water temperatures, it was discovered that water temperatures in spawning grounds were not identical to those at the measurement station. It was also shown that sardine population also depends on anchovy stocks. Following this, the temperature measurements were dropped from the harvest rule process. | Sea surface temperature data improved stock assessments, however, the relationship was not fully understood and was not stable over time. |
| Capelin - Norway | Cod are a predator of capelin. Cod numbers in the Barents Sea have been used in stock assessments since the 1990s to contribute to setting harvest limits. Cod stocks are predicted to decline and potentially shift due to changing water temperatures due to climate change. | The understanding of the relationship between predator and prey has adjusted over time but has contributed overall to better assessments. As climate will likely affect cod stocks, stock assessments for both these interlinked species will need to take into account both direct climate effects and species interactions. |
| Anchovies – Peru | A 1970's collapse of the fishery could potentially have been avoided if climate driven reductions in productivity had been recognised. Decadal El Niño cycles are now considered in stock forecasts, along with annual climate conditions and forecasts. | Well-understood climate influences such as El Niño can improve forecasts and avoid events such as stock collapse. |
| Lobster – United States | High water temperatures in 2012 caused the lobster harvest season to start one month earlier than usual, leading to unprepared processors being unable to accept all catches and significant drops in prices. An early warning system is now in place to help predict the start of the season. | Measuring sea surface temperatures helps lobster fishers and processors understand the timing of catches and better manage production and sales. |
| Antarctic fish – Australia | Antarctic fish live on small, isolated sea mounts. Based on long-term climate predictions, Australian fisheries managers project that catches of species such as Patagonian toothfish, mackerel icefish, squid and grenadiers could decrease by 20% by 2040. | Long-term forecasts can help manage total allowable catch limits and investment expectations. |

Sources: Skern-Mauritzen et al. (2015[17]); Tommasi et al. (2017[18]); FAO (2021[19]); CSIRO (2020[20]); Arthun et al. (2018[21]).

Consequently, ecosystem-based fisheries management remains a relatively rare feature of fisheries management systems worldwide, hampering their ability to respond effectively to the challenges posed by climate change. A study of 1 250 global fisheries concluded that only 24, or 2%, included ecosystem factors in the quantitative aspect of their management plans or stock assessments (Skern-Mauritzen et al., 2015[17]). Qualitative consideration of ecosystem effects in stock assessments or management plans is more common. For example, according to Fisheries and Oceans Canada, in 2019, ecosystem factors were included qualitatively in 31% of stock assessments in Canada and quantitatively in 21% (DFO, 2019[22]; DFO, 2019[23]). The International Council for the Exploration of the Sea (ICES) reports that just under 50% of its stock assessments considered ecosystem factors in some way (Trenkel et al., 2023[24]).

### *5.4.2. Managing fisheries for climate adaptation requires flexible governance and effective institutions*

For fisheries management systems to be effective under climate change they need to be able to detect changes in conditions and adapt on an appropriate timescale. These challenges are likely to be further exacerbated as fish stocks move across national boundaries and in and out of the jurisdiction of different institutions. Therefore, to adequately address the impacts of climate change, management institutions at both national and international levels need to be able to make changes in a timely manner.

However, regulatory systems for fisheries tend to lack the flexibility needed to adapt to the changing climate conditions. For example, the ICES does not have a framework for incorporating climate change into its scientific advice on fisheries management (ICES, 2022[25]). Rapid implementation and adjustment of management parameters in response to climate change is essential to avoid unsustainable fishing and minimise losses for those in the fishery. These adjustments could mean altering TACs, the dates for fishing seasons, the delimitations of no-harvest zones, or minimum harvest sizes. Research shows that management intervention within the first five years of recorded stock declines kept populations stable, and avoided, on average, a 40% decline in harvest (Beckensteiner, Boschetti and Thébaud, 2023[14]; Brown et al., 2012[26]) Reforms to institutional and regulatory arrangements may therefore be required where there is insufficient flexibility to respond to climate change, such as in the example of the North East Atlantic mackerel (Box 5.1).

### Box 5.1. Climate induced management issues in North East Atlantic Mackerel stocks

The case of the Icelandic mackerel fishery is a good example of how changes in ocean temperatures and the ensuing changes to fish behaviour can lead to the failure of existing fisheries management systems. Between 1997 and 2016, the range of Atlantic mackerel off the west coast of Norway increased three-fold, likely due to warmer waters. The westward range expansion resulted in the commencement of a direct fishery for mackerel in Icelandic waters in 2007 when it unilaterally set a quota (Østhagen, Spijkers and Totland, 2020[27]; OECD, 2011[28]).

When it started the mackerel fishery, Iceland was not a member of the body responsible for co-ordinating management of the fishery – the North-East Atlantic Fisheries Commission (NEAFC). At that time NEAFC's members were the European Union, Denmark, Norway and the Russian Federation (OECD, 2011[28]). Iceland did, however, join the NEAFC in 2010, but due to several intractable issues, no agreement was reached regarding co-operative management of the stock and harvest levels are consistently above scientific advice and have caused ongoing conflicts between NEAFC members around quota allocation (Spijkers and Boonstra, 2017[29]). As a result, the stock is being overfished leading to a declining biomass in recent years and the latest advice recommends a 22% reduction in catches, the lowest in a decade (ICES, 2024[30]). Despite the declining state of the stock, and its economic importance, the disagreement remains ongoing.

Where stocks straddle exclusive economic zones and high seas jurisdictions, regional fisheries management organisations (RFMOs) and other types of agreements must address any redistribution of fish to areas which not all fishers may be able to access, as well as make adjustments to overall TACs (OECD, 2011[28]). A high-level review of 12 RFMOs' readiness to adapt to climate change noted the biggest challenges are likely to be the sharing of moving fish stocks across political boundaries and enforcing agreements. However, it also found that these organisations were well equipped to adapt as needed (Pentz et al., 2018[31]). Improved mechanisms for taking decisions on access to stocks that cross political boundaries would better prepare RFMOs for the effects of climate change. A review of the effectiveness of RFMO decision making during COVID-19 disruptions noted that RFMOs could benefit from measures such as reviewing decision timelines, establishing efficient voting protocols and objection procedures, or formalising extraordinary processes such as introducing special clauses or frameworks for disruptive events in the future (OECD, 2021[32]).

### *5.4.3. Addressing the socio-economic impacts of climate change may require targeted measures*

Fisheries managers also need to consider the impacts of climate change on the socio-economic performance of the fisheries. The decline in catches driven by climate change will have negative socio-economic impacts on fishers, the downstream industry and the communities which rely on fishing. However, the impacts of climate change on fisheries will not be evenly distributed, with some areas likely to experience larger declines than others, while some regions will see increases. Targeted support programmes can be used to address economic impacts and ensure vulnerable communities do not suffer unduly from climate induced reductions in catches. To efficiently and proactively understand where such support might be needed, several governments have assessed the vulnerability of certain fisheries and their communities to climate change.

Vulnerability assessments for climate impacts, and decadal forecasts of climate change, can provide useful predictions of how climate may affect specific fish stocks and show fisheries managers the priority areas for management and research effort. However, these assessments are generally associated with significant uncertainty. Various national agencies and other organisations have developed vulnerability ratings for fisheries in response to climate change. These include both effects on fish stocks and the economic vulnerability of fishers and communities (FAO, 2021[33]; Barange, 2018[5]). Notable examples include:

- **Australia**: The Commonwealth Scientific and Industrial Research Organisation (CSIRO) has conducted a climate sensitivity and vulnerability assessment of 101 species in 24 fisheries (Fulton et al., 2018[16]). Similar to the results of the NOAA assessments, the most vulnerable species in all regions were those with specific habitat needs and high commercial value. These included abalone, lobster, bêche-de-mer (sea cucumber) and fish and prawns living between salt and freshwater habitats. The assessment process has now been described in a user-friendly format that can be regularly applied to different fisheries. The process begins with a science-based assessment of the potential ecosystem and fisheries impacts of climate change. This is followed by in-depth consultation with fishers and fisheries managers to see how fishers might respond to potential changes. Finally, a suite of policy responses is available which can be tailored to each of the individual situations. The policy handbook is available from CSIRO (CSIRO, 2020[34]).
- **European Union**: There are various studies on vulnerability, including social and economic factors, in European Union fisheries. Most notable are the Climate change and European aquatic RESources (Peck et al., 2020[35]) and Horizon ATLAS projects (Payne et al., 2021[36]; ATLAS, 2020[37]; European Commission, 2020[38]; European Parliament, 2020[39]). Recent studies, such as an investigation of the 17 most important commercial species in the Mediterranean by Hilmi et al. (2023[40]), increasingly take into account not only ecological factors, but also economies' dependence on fishing and their ability to adapt. Another study, as part of the Horizon ATLAS project, conducted a climate risk analysis for 157 species across the European Union, considering lifespan, habitat, species mobility and temperature sensitivity, along with which fishers and regions would then be most vulnerable economically (Payne et al., 2021[36]). The study suggests that three main aspects define fishing regions most at risk from climate change: 1) high dependence on fishing for employment; 2) high dependence on a small number of species; and 3) low profitability of parts of the fishing fleet.
- **Korea**: The Korean Maritime Institute has assessed the climate vulnerability of aquaculture, including social and economic factors (Kim, Brown and Kim, 2019[41]; Lee, Kim and Cho, 2011[42]). Fourteen species were assessed for their vulnerability to sea temperature changes and climate related disasters. The assessment also considered the ability of producers to adapt and the impact on their financial viability. The results showed that species with high temperature sensitivity and where producers have little control over the different growing stages, such as

seaweeds and molluscs, were most vulnerable. Finfish aquaculture was less vulnerable due to their lower temperature sensitivity and the ability of producers to control some aspects of the farming environment.

- **New Zealand**: The national fisheries management agency, Fisheries New Zealand, has used expert assessments of three major species with good data availability to rate them for vulnerability to climate change from low to very high. The vulnerability of the three species – paua (abalone), snapper and hoki – was respectively assessed as very high, moderate and low. The assessment process can be applied to any species where sufficient data are available and considers factors such as stock status; life-cycle and growth; habitat requirements; predator and prey relationships; mobility; and sensitivity to changing water temperature, quality and conditions (Cummings et al., 2021[43]).
- **United States**: The National Oceanic and Atmospheric Administration (NOAA) is undertaking climate vulnerability assessments for major species in six regions, taking into consideration social and economic factors (Peterson and Griffis, 2021[15]). The key goal of these assessments is to better understand the mechanisms by which climate change affects key species, and the flow-on effects to communities.

Policy responses to climate-related fisheries impacts can also occur after an adverse event, such as a marine heatwave, to limit its damage or avoid a repeat. Policy tools employed across OECD Members and non-Members have included financial support for fishers, new regulations to support changing catches and increased monitoring and forecasting. For example, after a heatwave off the coast of Australia in 2011, fisheries managers responded by increasing the network of temperature monitors, due to the success of the original network in revealing the links between the heatwave and impacts on commercial stocks (Pearce, 2011[44]). They also increased monitoring of invasive species known to live in warmer waters, as well as of affected commercial species. This led to changes to management plans and TACs. After the “Blob” heatwave off the west-coast of the United States in 2015, responses included financial support to affected fishers and changed management for affected stocks.

## 5.5. Fisheries management can also help reduce fisheries’ greenhouse gas emissions

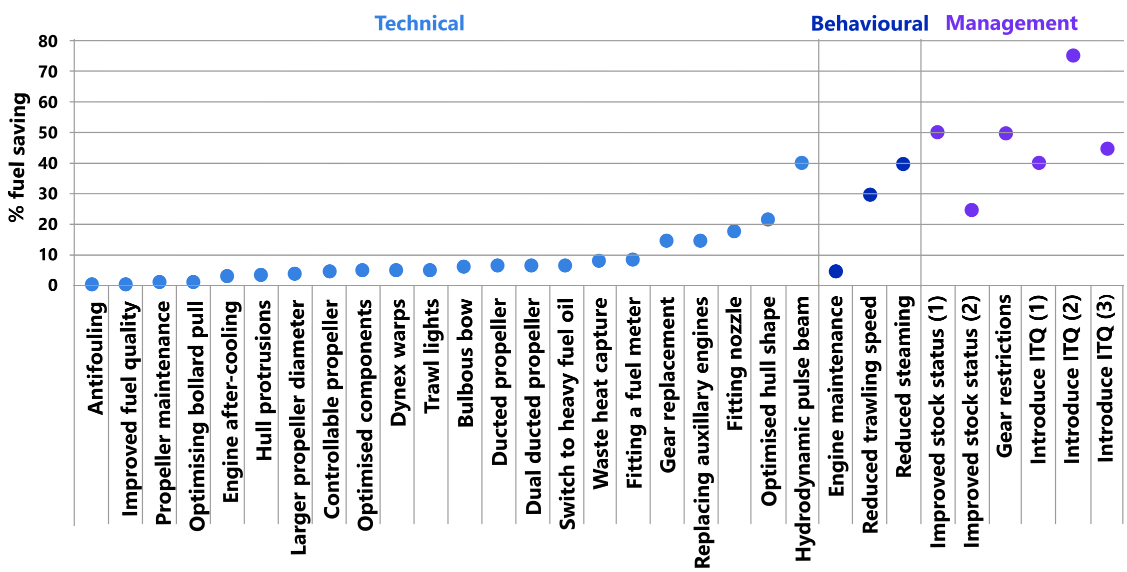
Fisheries will increasingly be required to contribute to the transition to net zero emissions, and fisheries management also has a key role to play in this process.

### *5.5.1. Restoring stocks to optimal levels and encouraging efficient fishing*

Restoring overfished stocks to biomass levels that allow for catches to be maximised sustainably and maintaining all harvested stocks at these levels while encouraging efficient fishing, can be an effective way of reducing emissions, particularly in overfished stocks (Hornborg and Smith, 2020[45]). Management measures to increase biomass can reduce emissions by increasing the catch per unit of fishing effort in fisheries with effective effort limitation and no excess capacity. By increasing the density and/or size of the stocks, search times are reduced and fishers can reduce the effort, and fuel, used to catch the same amount of fish (Bastardie et al., 2022[46]).

An OECD literature review showed that, in many cases, economically optimising management (e.g. the implementation of quotas systems) could be the most effective emissions reduction policy to date (OECD, 2013[47]). For example, Duy et al. (2014[48]) estimated that optimising fisheries management to achieve MSY would reduce fuel consumption by 29% and increase economic returns by 100%. Applying emissions taxes and trading systems to the optimised fishery would result in relatively modest additional reductions to fuel use of between 0.2% and 11.3%.[3] In general, management measures have a higher potential for fuel savings than technical and behavioural interventions (Figure 5.3).

## Figure 5.3. Fuel savings from different efficiency measures




Note: ITQ stands for individual transferrable quotas. References to two different stock status improvement strategies refers to two studies of improved stock status in Swedish and Icelandic fisheries. References to three different ITQ schemes relate to the introduction of widespread ITQs in Iceland, and the introduction of ITQs in Canadian and United States demersal and shellfish fisheries.
Source: (OECD, 2013[47]; Arnason, 2010[49]; Brandt, 1999[50]; IMARES, 2009[51]; Repetto, 2001[52]; Sigler and Lunsford, 2001[53]; Wilson, 1999[54]; Driscoll and Tyedmers, 2010[55]).

There is significant scope to rebuild stocks and implement management plans to increase fishing efficiency and reduce emission (Chapter 3) as only 62% of assessed stocks were healthy and 31% were meeting productivity targets. Stock rebuilding plans are generally successful. In many cases they require fishing effort reductions, usually during the first 12 months, and can see biomass increase or stabilise over the following 4-26 years. The average rebuilding plan shows benefits after approximately a decade (Costello et al., 2012[56]; FAO, 2018[57]; Melnychuk et al., 2021[58]; Sumaila et al., 2012[59]).

A recent example of increased CPUE through stock rebuilding plans is a small area of a scallop fishery around the Isle of Man (United Kingdom), which was closed for three years to allow depleted stocks to recover. On re-opening, a territorial rights management system was introduced to stop competitive fishing and reduce overexploitation. This area of the fishery saw a fourfold increase in CPUE after reopening, with a corresponding 75% drop in fuel intensity. Neighbouring areas of the fishery which did not change management practices saw no change in CPUE or fuel use intensity over this time (Bloor et al., 2021[60]). Another example is the implementation of a transferable quota system in Icelandic fisheries in 1991, which allowed depleted fish stocks to rebuild. Stocks of cod – the most important species in Icelandic fisheries, representing around 45% of total value in 2019 – have consistently increased following the introduction of quota management. A 2021 study showed that fuel use in Icelandic fisheries decreased by 40% between 1997 and 2008, mostly due to higher CPUE from rebuilt fish stocks (Kristofersson, Gunnlaugsson and Valtysson, 2021[61]).

The target for effective stock rebuilding can vary depending on the fishery. While MSY is widely accepted as the minimum biological target for sustainable stocks, a biomass higher than that required to support MSY can also result in higher CPUE, reduced costs and reduced emissions intensity.[4] The extent to which increased biomass will lead to reduced emissions depends on both the biological characteristics of the stock and the economic and technical aspects of individual fishing operations, such as vessel capacity and overall operating costs. In some fisheries, measures reducing the overall fishing effort to rebuild stocks and increase CPUE may lead to fishers leaving the fishery, or catches decreasing, at least in the short term, while other fishers may expand their operations, and change their business structures. For example, in the Nordic fisheries, the transition to optimal fisheries management was accompanied by a 45% decrease in the number of fishing vessels (Duy et al., 2014[48]). The political economy dimension of economically optimal management may thus need to be addressed upfront.

Fisheries managers could consider implementing specific policies to ensure these changes do not have adverse impacts on particular groups of fishers or their communities. Social safety nets, training support to develop alternative activities and adjustment programmes, such as carefully designed licence buyouts, have proven successful in addressing the distributional impacts of changes in fisheries conditions in several COFI Member and Partner fisheries. Such policies may be helpful to address the impacts of climate change mitigation policies, but need to be accompanied by significant and effective management reform addressing the underlying reasons for existing overcapacity, to ensure that effort does not leak back into the fisheries system (Teh, Hotte and Sumaila, 2017[62]; Squires, 2010[63]; Melnychuk et al., 2021[58]; Squires, Joseph and Groves, 2006[64]; FAO, 2018[57]; Graff Zivin and Mullins, 2015[65]). Such programmes could increasingly feature in the support policy mixes (Chapter 6).

It is also important to note that management measures may need to be adapted to take into account new behaviours stemming from increased fuel prices or fuel efficiency. For example, fishers in multi-species fisheries have been observed to change their fishing grounds to fish closer to port and target higher value species in response to higher fuel prices (Abernethy et al., 2010[66]). On the other hand, increased fuel efficiency can lead to increased effort in fisheries where catch is not constrained.

Finally, while improved fisheries management can be an effective method for reducing emissions in many fisheries, there may be some exceptions, as not all stocks will see a strong relationship between CPUE and fuel-use intensity (Bastardie et al., 2022[46]; FAO, 2018[57]; Bastardie et al., 2022[67]). For example, this is the case for species where dense aggregations allow for high rates of catchability even as populations decline. Notable examples include Atlantic cod in Canada (Rose et al., 2000[68]) and orange roughy in Australia and New Zealand (AFMA, 2022[69]). For both these stocks, density and CPUE remain steady, even as stocks grow or decline; reducing emissions would therefore require technological innovation or even a change in fishing practices.[5]

### *5.5.2. Using data to design effective energy transition strategies for specific fisheries*

A fundamental question facing policy makers is the type of policy intervention and the sequence in which they should be applied to most effectively reduce GHG emissions from fisheries while limiting any adverse distributional impacts. However, there is no one-size-fits-all solution and the specific context of individual fisheries will dictate the extent to which a set of energy-saving techniques and practices can reduce emissions. In extreme cases, for which policies may not be able to reduce emissions cost-effectively, managers may also want to consider whether continuing with a specific fishing activity is in line with broader economy-wide climate change objectives.

The ability of different measures to reduce emissions is likely to depend on the initial health and productivity of the harvested stocks, the type of vessels used and the fishing activity taking place, the availability of low emissions technologies, as well as the management and support policies in place. For example, older vessels with less modern equipment are likely to have greater scope to increase efficiency through technical improvements. However, these vessels may have a shorter useful life over which to benefit from investment in fuel savings. The opportunity for quick improvements to reduce emissions may be greater in some fisheries, while in others further innovation will be required. In many cases there are also trade-offs that may limit the adoption of effective measures. For example, the uptake of speed limitation strategies may be limited by increased labour costs due to longer fishing days offsetting any fuel savings (Ziegler and

Hornborg, 2023[70]). Understanding these trade-offs will be important for designing effective incentive policies.

To prioritise policy interventions and measure their effectiveness, it is necessary to accurately measure fuel use in fisheries. Currently, global measures of fuel use are lacking (Parker and Tyedmers, 2014[71]). However, many jurisdictions are making progress on collecting fuel data. A notable example is the European Union, which publishes up-to-date fuel use data by country and type of fishing gear as part of its Blue Economy Observatory (European Commission, 2023[72]).

## 5.6. What can policymakers do?

Fisheries managers face a set of challenges, which will only increase in complexity as climate change increasingly impacts stocks. First and foremost, fisheries management must be based on accurate and timely scientific information. The ability to accurately assess stock status is essential to set harvest limits that do not lead to declines in the resource base, and ideally maximise production volume or value (and minimise emissions). But even when TACs are not applied to fisheries, understanding the impacts of the current management system on the underlying stocks is crucial to ensure fishing impacts are sufficiently constrained. With climate change, the importance of regular accurate stock assessments is going to increase as they will be needed to inform the adaptive management required by the sector. Investing in stock assessments to ensure accurate and timely information is therefore crucial to all aspects of fisheries management. Further, better data collection in general, including on the socio-economic aspects of fisheries will be required to identify and adapt to the broader impacts of climate change on the sector.

At a fishery level, implementing TACs in conjunction with other quota systems more broadly can help address both environmental sustainability and capacity issues in fisheries. Implementing ITQs, in particular has had positive impacts on target species biomass, profitability and capacity in fisheries, but despite this they are not widely used in the stocks of the most commercially valuable species. Investigating where and how TACs and quotas might be applied could have a positive impact on the sector. Although the design and allocation of quotas need to be carefully considered to avoid negative social impacts, and there are some fisheries where TACs will not be practical.

Finally, rebuilding stocks though better management will reduce fishery emissions, but climate change will continue to impact stocks. Therefore, adaptation should be more explicitly considered in fisheries management policy at both domestic and international levels. There are many existing examples of climate adaptation at the domestic level, but the importance of early intervention in averting more pronounced impacts, means there needs to be a continued focus on the early identification of issues. By more explicitly considering the impacts of climate change in fisheries management both domestic and international institutions can identify where reform is required before serious issues occur.

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## Notes

[1]The report covers 30 OECD Members (Australia, Belgium, Canada, Chile, Colombia, Costa Rica, Denmark, Estonia, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Korea, Latvia, Lithuania, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Türkiye, the United Kingdom and the United States); and 11 non-Members (Argentina, Brazil, Bulgaria, China, Croatia, India, Indonesia, Peru, Romania, Chinese Taipei, and Viet Nam). See Chapter 1 for more details on the geographical coverage. However, Denmark, Iceland, Lithuania, Mexico, Portugal, Türkiye, China, Indonesia, India and Viet Nam did not report any stock assessments or management data. Additionally, data were included for Finland.

[2] In non-members 79% of production by volume comes from Peru, where 100% of landings from the most commercially important species are covered by a TAC.

[3] When the model excluded Icelandic fisheries, which were already managed with a relatively high level of efficiency, the reduction in fuel use in the remaining countries was almost 50%.

[4] A biomass that maximises economic yield is one such goal, where higher CPUE and reduced costs and emissions intensity are accompanied by lower overall quantities of landings (yields) and fewer (but potentially more profitable) fishers required in the industry.

[5] Even where CPUE does not increase under a stock rebuilding plan, economic returns can increase as quota are consolidated to improve economies of scale, fishers are required to change their practices to compete, less economically efficient fishers exit the industry or prices increase in response to reduced supply. This can have mixed outcomes for fuel use (Parker and Tyedmers, 2014[71]) (Parker et al., 2015[73]).

# 6 Government support to fisheries in recent years

Understanding how governments support fisheries is key to a productive, equitable and sustainable sector. This chapter measures and describes fisheries support policies across the 41 countries and territories covered in this report and trends since 2010, building on the latest update of the *OECD Fisheries Support Estimate* database. It discusses the evolution in total support but also changes in the nature of support. The chapter tracks how the money was spent over recent years, including on services to the sector such as investment in management and control. Country-level data are discussed as well as general differences seen in average spending patterns across the OECD Members and the non-Members covered in the report.

## Key messages on government support to fisheries

- **Understanding government support to fisheries is key to a productive, equitable and sustainable sector.** To ensure support benefits the fishers who need it and contribute to stated goals, governments need to understand how public money is being spent, where benefits are distributed and how it impacts all dimensions of sector performance.
- **From 2020 to 2022, the 41 countries and territories covered in this report spent USD 10.7 billion** annually of public money supporting their fisheries, or 10.6% of the value of marine capture fisheries production, or an average of USD 552 per fisher per year.
    - **Six economies accounted for 85% of all this support:** the People's Republic of China (hereafter "China") (36.1%), Japan (12.4%), the United States (11.0%), Canada (10.7%), EU Member states (combined; 8.0%) and Brazil (6.4%).
- **Support to fisheries overall has decreased since 2010-12**, but the strong decrease up to 2016-18 was largely reversed by a subsequent increase in support.
- **Among the OECD Members, total support has increased** in absolute terms, as a percentage of the production value and on a per fisher basis, reaching USD 5.5 billion annually in 2020-22 (or 15.2% of the production value or USD 5 722 per fisher), driven by increased spending on support as well as declines in employment and in the value of landings since 2010-12.
- **The OECD Members have expanded their support to fisheries management, monitoring, control and surveillance (MMCS).** Over two-thirds of the OECD Members spent more on MMCS in absolute terms and with respect to the size of their fleets in 2020-22 than in 2010-12. This is good news, as assessing the health of fish stocks and managing fisheries sustainably is vital to ensuring they are profitable in the long term and resilient to climate change.
- **The gap in spending on MMCS between the OECD Members and the non-Members covered in this report has grown**. The intensity of support to MMCS (in USD per gross tonnage of fleet capacity) in the non-Members was 15% of that in the OECD Members in 2020-22, compared to 19.5% in 2010-12. This is notably due to reductions in spending in Brazil, China and Viet Nam.
- **Support to income has almost doubled since 2010-12**, with most of the increase occurring during and after 2020, as governments aimed to mitigate the impacts of the COVID-19 pandemic on fishers.
- **Support policies are increasingly designed with climate change-related objectives**, notably to accelerate fisheries' energy transition or to compensate those affected by climate change. However, it is difficult to assess trends in spending on such policies, as the policy focus is still relatively new. Furthermore, some spending with other stated purposes could also contribute to climate objectives (for example, support designed to increase the abundance of fish stocks).
- **Support to fuel consumption in fisheries has fallen in recent years,** albeit at a slower pace than in the first half of the last decade when the reduction was driven primarily by reforms in China. However, the lack of detailed reporting on how subsidies were allocated in China in recent years as well as insufficient information on support to fuel that is granted to fisheries alongside other sectors (sometimes referred to as "non-specific" support) mean the true scale of fuel support and how it is changing over time remain uncertain.

## 6.1. What's the issue?

Governments support their fisheries sectors with the aim of ensuring the sustainability of fish resources; maintaining competitiveness, incomes, regional employment and food security; and in response to major disruptions that threaten the sector (for example the COVID-19 pandemic). But while government support to fisheries can improve the health of fish stocks and ecosystems, increase fish stock productivity, and build resilience in the fisheries sector, it can also result in undesirable outcomes when it encourages the build-up of excess fishing capacity; overfishing; and illegal, unreported and unregulated (IUU) fishing (Martini and Innes, 2018[1]) and (OECD, 2022[2]). To ensure support benefits the fishers who need it and contributes to stated goals, governments need to understand how public money is being spent, where benefits are distributed and how it impacts all dimensions of the sector's performance.

Transparency is essential to monitor the implementation of international commitments to avoid detrimental impacts of government support on biodiversity and the sustainability of ocean ecosystems. Key commitments in this respect include Target 14.6 of Sustainable Development Goal (SDG) 14, which calls for the phasing out of harmful fisheries subsidies that encourage overfishing, overcapacity and IUU fishing; and Target 18 of the Kunming-Montreal Global Biodiversity Framework, which invites to redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way.

A major step towards implementing those commitments was taken with the adoption, by World Trade Organization (WTO) members, of the WTO Agreement on Fisheries Subsidies (AFS) in June 2022. The agreement has three main prohibitions: it prohibits subsidising vessels or operators engaged in IUU fishing and fishing-related activities, subsidising fishing and fishing-related activities regarding an overfished stock if there are no measures to rebuild that stock and subsidising fishing or fishing-related activities outside of the jurisdiction of a coastal Member or a coastal non-Member and outside the competence of a relevant RFMO/A. The agreement will enter into force once two-thirds of WTO Members have deposited their instrument of acceptance of the Protocol of the WTO AFS (at the end of December 2024, 87 deposits were received and 24 more were needed for entry into force). In addition, since 2022, WTO members have continued discussions to achieve a comprehensive agreement on fisheries subsidies, including through further disciplines on certain forms of fisheries subsidies that contribute to overcapacity and overfishing. Up-to-date information on support policies is necessary to inform these negotiations, but also as a basis for reform prioritisation and implementation.

Understanding support to fisheries is also highly relevant to the objective of "ending hunger and achieving food security by 2030" (as pledged in SDG 2) and achieving resilient food systems that minimise impacts on biodiversity, ecosystems and the climate. It is equally relevant to global discussions on the ocean-climate nexus, including on how to adapt ocean-based sectors to the impacts of climate change and how to support the energy transition of ocean-based sectors, for example through the financing of research on the development of low-carbon vessels. With the urgent need to reduce GHG emissions, which has led to the adoption of both national and international economy-wide emission reduction targets, commitments and strategies (notably under the Paris Agreement and the International Maritime Organization) there is growing focus on how to optimally allocate fisheries support. The key challenge lies in balancing socio-economic policy objectives with emissions reductions and determining how much public investment is needed to accelerate the decarbonisation of the sector.

This chapter provides unique evidence for all these important policy debates by measuring and analysing countries' fisheries support policies building on the latest update of the OECD *Fisheries Support Estimate* (FSE) database. Chapter 7 analyses the potential impact these policies might have, notably on fish stock health, a major dimension of the sector's sustainability and profitability.

## 6.2. Using the OECD FSE database to analyse trends in support to fisheries

This chapter explores trends in support to fisheries over the period 2010-22 for the 41 countries and territories covered by this edition of *the Review of Fisheries*, either at the level of 'all countries and territories', or at the level of 'the OECD Members' and 'the non-Members' among them.[1] It makes use of the OECD FSE database (Box 6.1), reporting values in nominal USD. To reduce any influence of short-term fluctuations in government spending (which can be influenced by budget cycles), three-year rolling averages are used when discussing the data, and the periods 2010-12, 2015-17 and 2020-22 are used as reference periods when the level of detail is too high to present or discuss the entire time series.

This analysis starts with a discussion of the total level of support provided to the capture fisheries sector, along with how this has changed over the last decade. These headline values give an overview of the magnitude of government intervention in the sector and are contextualised by considering them relative to different measures of sector size. Considering support in relation to the value of the industry's output (%), levels of employment (USD per fisher) and total fleet capacity (USD per gross tonnage [GT]) provides comparable measures of the intensity at which support is provided (Figure 6.2). The chapter then discusses in detail what this public money is being used to support, i.e. the policy mix. Chapter 7 explores and discusses the potential impact of this support on the sustainability of resources.

### Box 6.1. The OECD Fisheries Support Estimate database

The OECD *Fisheries Support Estimate* (FSE) database reports the monetary value of government support to the fishing industry (both marine and inland but excluding aquaculture). It compiles and categorises data reported to the OECD by governments and collected by the OECD from official government documentation following a method that makes the data comparable across countries and time.

The FSE provides an inventory of policies that generate a transfer from taxpayers to fishers and, along with the value they annually convey to the industry (in both USD and the national currency of the supporting country) as well as information on their attributes. The FSE database classifies policies into mutually exclusive categories based on what is being supported (for example, support to vessel construction and purchase, income support, or support for fuel consumption).

The FSE database also records information on any policies that charge the fishing sector for services provided by government or access to fish resources. Fees paid by service users may include port infrastructure, fisheries management services, and licence or quota fees as well as taxes on fishing profits (post-corporate tax) or on the value or volume of landings. These payments reduce the extent to which taxpayers finance support to fisheries and sometimes even result in a net contribution from the fishing sector to public finances. The attributes of these policies, along with the value of the payments, are also recorded in the FSE database. Deducting these payments from the total value of support allows the net cost of support to government to be determined.

The latest update of the FSE database covers the period 2010-22 for 41 countries and territories which, together, accounted for 69% of global marine fishing production volume over the period 2020-22 (Chapter 1).

Source: OECD Fisheries Support Estimate Manual.

## 6.3. Total support to fisheries has decreased over the last decade despite recent increases

### *6.3.1. Total support in all countries and territories*

Total support to fisheries was USD 10.7 billion per year on average in 2020-22 for the 41 countries and territories covered in this edition (Table 6.1). It has fluctuated over the last decade, but slowly trended downwards: average total spending in 2020-22 was 3% lower than what it was in 2010-12 (USD 11.1 billion). Over the period considered, total support peaked in 2012-14 (at USD 12.9 billion) and was lowest in 2016-18 (at USD 9.0 billion) (Figure 6.1).

#### Table 6.1. Total support to fisheries: Levels and trends at a glance

| | USD billion | | | % landings value | | | USD per fisher | | | USD per gross tonne of fleet | | | Main support type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2010-12 | 2020-22 | Trend | 2010-12 | 2020-22 | Trend | 2010-12 | 2020-22 | Trend | 2010-12 | 2020-22 | Trend | 2020-22 |
| All countries and economies | 11.1 | 10.7 | | 12.6% | 10.6% | | 612 | 552 | | 577 | 495 | | MMCS |
| OECD Members | 5.2 | 5.5 | | 12.6% | 15.2% | | 4707 | 5722 | | 720 | 703 | | MMCS |
| Non-Members | 5.9 | 5.2 | | 12.5% | 7.6% | | 346 | 283 | | 515 | 418 | | Income |

Note: MMCS: management, monitoring, control and surveillance.
Source: OECD (2025), Fisheries Support Estimate (FSE).

#### Figure 6.1. Total support to fisheries in recent years


Source: OECD (2025), Fisheries Support Estimate (FSE).

Total support also decreased in relative terms. Total support averaged USD 552 per fisher per year in 2020-22, down from USD 612 in 2010-12 and equated to 10.6% of the value of landings in 2020-22, down by 2 percentage points from 12.6% in 2010-12, for the countries and territories covered in this report for which value of landings data was available (Table 6.1).[2] While the reduction in the total value of support contributed to the fall in the share of total support relative to the value of landings, a proportionally larger increase in the value of landings was the main driver. The total value of landings increased from USD 77.7 billion in 2010-12 to USD 88.6 billion in 2020-22 (up 14%).

### *6.3.2. Total support in the OECD Members*

The OECD Members' support totalled USD 5.5 billion per year, on average, in 2020-22. The total declined slightly in the first half of the period, to a low of USD 4.5 billion in 2015-17, but grew afterwards, resulting in an overall trend of increased spending over the last decade (Figure 6.1).

Support reported by the OECD Members equated to 15.2% of their value of landings in 2020-22, an increase of almost 3 percentage points compared to 2010-12 (at 12.6%). This increase is partly due to greater spending on support, but it was mainly the result of a continued decline in the value of landings in the OECD Members (which fell by 12%) over the period considered. On a per fisher basis, total FSE for the OECD Members equated to USD 5 722 per year in 2020-22, up from USD 4 707 in 2010-12 (Table 6.1). The growth was predominantly driven by the 13% reduction in employment over the same period.

### *6.3.3. Total support in the non-Members*

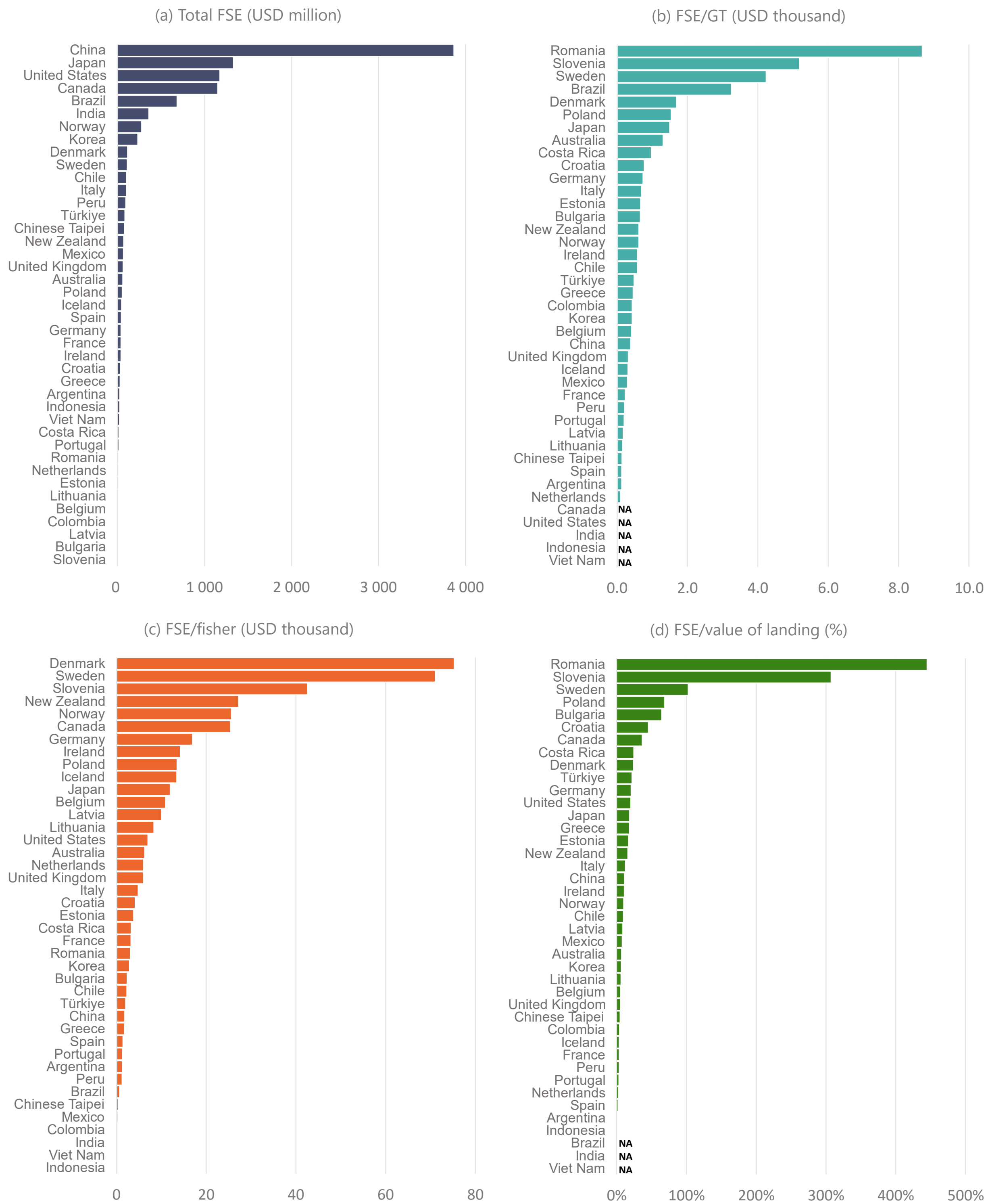
Non-Members provided USD 5.2 billion in total support per year, on average, in 2020-22 (). Their level of support varied over the period but generally trended downwards (from USD 5.9 billion in 2010-12) and fell by a notable 33% compared to its peak in 2012-14 (USD 7.8 billion).

The intensity of support, with respect to both the value of landings and employment in the sector, has also fallen. In the non-Members for which the value of landings is also available, spending on support equated to 7.6% of landing value in 2020-22, down from 14.1% in 2011-13. A decrease in total support contributed to this trend, but the trend was primarily the result of a strong increase in the value of landings in these countries and territories (up 44% between 2010-12 and 2020-22). Support per fisher averaged USD 283 per year in 2020-22, also a notable reduction compared to its peak of USD 468 in 2012-14 (Table 6.1), the result of both reduced levels of support and increased levels of employment in the sector. Employment in this group grew by a total of 8% over the period, 90% of which occurred in India.

### *6.3.4. The geographical distribution of total support*

Six economies accounted for 85% of all support reported in the FSE in 2020-22, and the top four alone for 70% (China, 36.1%; Japan, 12.4%; the United States, 11.0%; Canada, 10.7%; EU Member States [combined], 8.0%; and Brazil, 6.4%). India, Korea and Norway each accounted for 2-4% of total reported support, while Denmark and Sweden (contributors to the EU figure) individually accounted for 1-2% (Figure 6.2). The remaining 14 countries in the FSE each accounted for less than 1% of the total. While the total level of support has varied over time, the six economies providing most support have remained unchanged over the entire data period (2010-22); the proportion of total support they account for has averaged 85% and been relatively stable (with a minimum of 81% and a maximum of 88%).

**Figure 6.2. Total support to fisheries and intensities of provision across countries and territories, 2020-22**




Note: FSE: Fisheries Support Estimate; GT: gross tonnage; NA: not available. Gross tonnage data were unavailable for Canada, India, Indonesia, the United States and Viet Nam. Value of landings data were unavailable for Brazil, India and Viet Nam. Comparisons across countries and territories should take into account both the domestic context and different levels of data reporting completeness (e.g. only 12 countries and territories report support to fuel).

Source: OECD (2025), Fisheries Support Estimate (FSE).

The six economies providing the greatest absolute levels of support are also all among the largest fishing nations in the world in terms of either fleet capacity, level of employment or value of landings. In 2020-22, China ranked highest for both fleet capacity and value of landings, and third for employment. Proportional to the size of their sectors, these six economies are not exceptional in their support intensity (Figure 6.2). However, the overall size of their fishing sector means that they are globally important, as is the mix of policies they use, and the management and enforcement environment under which their supported fisheries operate.[3]

When looking at support intensity, evaluated in proportion to the size of the sector, the group of highest providers of support in 2020-22 differs from the one seen when only absolute spending is considered; in addition, the composition of the group varies to some extent depending on the measure of fishery size being used (Figure 6.2). As a share of the value of landings, Romania, Slovenia, Sweden, Poland, Bulgaria and Croatia provided the greatest intensities of support. Per fisher, support was greatest in Denmark, Sweden, Slovenia, New Zealand, Norway and Canada while per gross tonnage of fleet capacity, the highest levels of support were provided by Romania, Slovenia, Sweden, Brazil, Denmark and Poland. Any interpretation and cross-comparison of total support and intensity measures should however consider that figures are impacted both by different levels of data reporting completeness (e.g. only 12 countries and territories report support to fuel – see Figure 6.6) and by the domestic context (e.g. processes of fleet consolidation and sectoral transformation).

## 6.4. The overall policy mix continues to evolve away from fuel support, with marked differences across countries and territories in how the money is spent

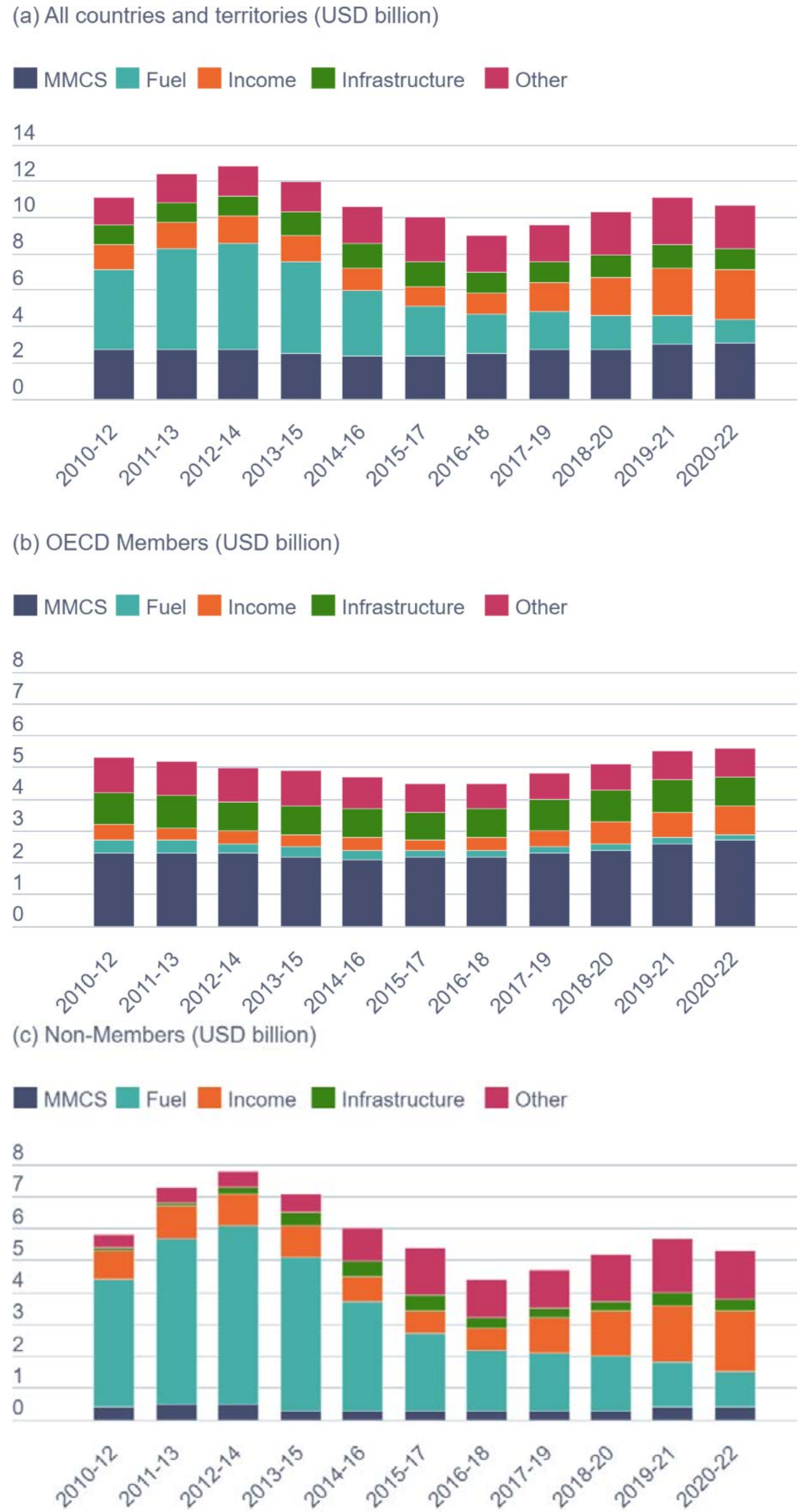
### *6.4.1. The overall policy mix*

In addition to a general decline in the total level of support being provided, the mix of policies used to deliver that support has changed over time (Figure 6.3). Support to fuel, once the predominant form of support provided to the industry, accounted for 12% of total support in 2020-22, down from a high of 46% in 2012-14 (falling from USD 5.9 billion to USD 1.3 billion in the same period). Of the countries that report support to fuel, almost all have substantially reduced absolute levels of spending on fuel. However, the lack of information on support to fuel that is granted to fisheries alongside other sectors (sometimes referred to as “non-specific” support) means the true scale of fuel support and how it is changing over time remain uncertain are not completely understood (see below, the detailed discussion of trends in spending on fuel support).

Support to MMCS, in contrast, increased in both in absolute terms (from USD 2.7 billion in 2010-12 to USD 3.1 billion in 2020-22), and in relative terms (as it accounted for 29% of total support in 2020-22, more than at any point in the last decade). The increase in MMCS was driven by the OECD Members, as support in this area by non-Members actually decreased between 2010-12 and 2020-22 (Figure 6.3c).

The proportion of support allocated to infrastructure was relatively stable over the period, while income support declined initially before doubling by the end of the period. These trends, and what underlies them, are discussed in more detail below.

**Figure 6.3. Support policy mix in recent years**




Note: MMCS: management, monitoring, control and surveillance.
Source: OECD (2025), Fisheries Support Estimate (FSE).

### 6.4.2. The policy mix in the OECD Members

When the policy mix in the OECD Members is compared with that in non-Members, some pronounced differences in how support is delivered can be observed (Figure 6.3). In the OECD Members, overall, the level and composition of support has been relatively stable over the last decade (Figure 6.3b). MMCS has consistently been the main form of support provided and accounted for 49% of total support in 2020-22, having increased slightly over the last decade (from USD 2.3 billion to USD 2.7 billion between 2010-12 and 2020-22).

Second to this are support to infrastructure and to income (both at 16% in 2020-22). Support to income showed the greatest proportional change, almost doubling over the data period (from USD 0.5 billion to USD 0.9 billion), with most of the increase occurring during and after 2020, as governments used support policies to mitigate the impact of the COVID-19 pandemic on fishers. As the direct impacts of the COVID-19 pandemic appear to have now passed, it is uncertain how trends in support to income will develop going forward. Further, as climate drives shifts in resources and changes in abundance (Chapter 4), supporting adaptation by affected communities could increasingly start to influence the support policy mix – for example, increased income support and education and training for fishers changing gears or leaving the sector. Faced with climate change, governments will need to find ways to do more with existing forms of support (e.g. management, income, training) and with greater flexibility.

Reported support to fuel accounted for 3% of the OECD mix in the 2020-22 period, having fallen by 55% since 2010-12 (from USD 371.9 million to USD 166.9 million).

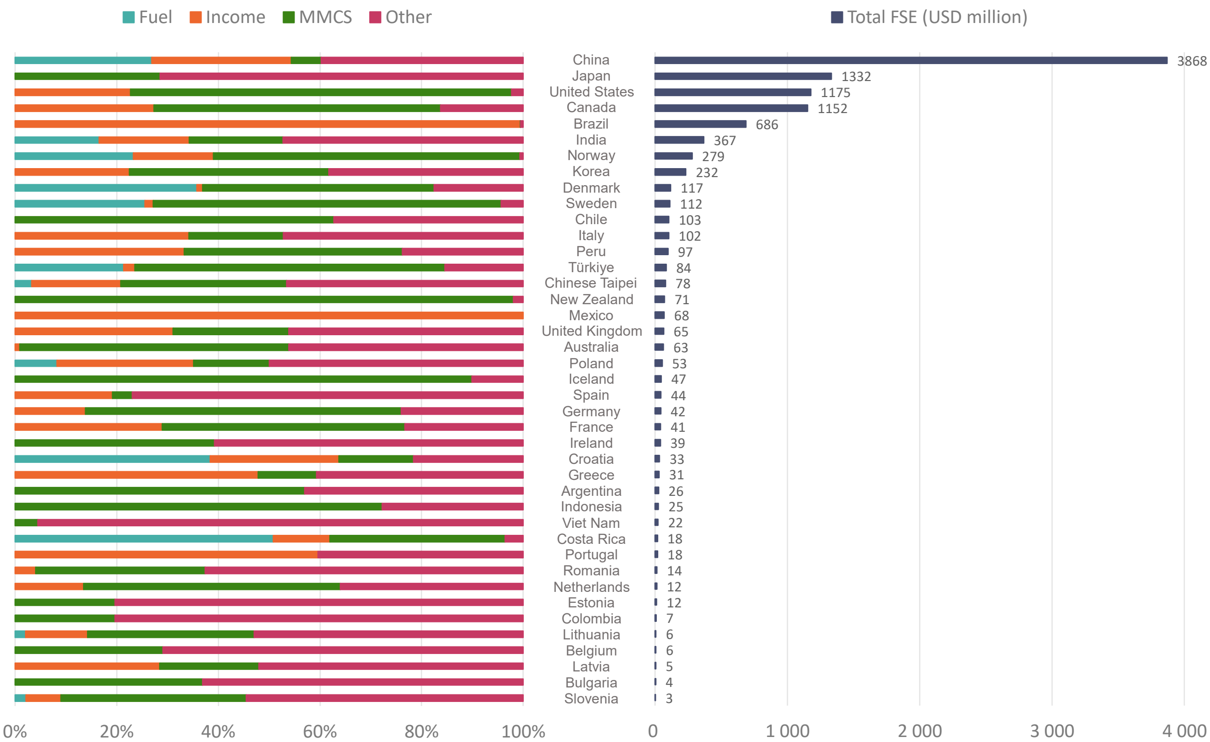
### 6.4.3. The policy mix in the non-Members

In non-Members, overall, the policy support mix has changed significantly since 2010-12 (Figure 6.3c). In 2020-22, support to income (36%) was the largest form of support provided, followed by support to fuel (21%), support to MMCS (8%) and support to infrastructure (7%). In addition to a major decline in support to fuel, which has been occurring for most of the time period, support to income began to increase from 2017-19, and in 2019-21 overtook fuel to become the main form of support in this group. Contrary to what was seen in the OECD, the driving force in this case appears to not have been COVID-related income support, but support provided to assist Chinese fishers through fishery closures in China.

### 6.4.4. The policy mix across countries and territories

Policy mixes also vary across individual countries and territories, with large differences seen in some cases in the 2020-22 period (Figure 6.4). Looking at the absolute levels of support provided in 2020-22 highlights how the choice of policy mix in the largest fisheries supporters can influence the overall composition of support to fisheries (Figure 6.4). For example, while most non-Members increased spending on MMCS between 2010-12 and 2020-22, the trend in this group has fallen due to reductions in spending by China and Brazil. The size of China's fisheries, and the support they receive, strongly influence the totals and trends of any aggregate of which it is part.

**Figure 6.4. Support policy mix (left) and the total value of support (right), across countries and territories, 2020-22**




Note: MMCS: management, monitoring, control and surveillance. Comparisons across countries and territories should take into account both the domestic context and different levels of data reporting completeness (e.g. only 12 countries and territories report support to fuel).
Source: OECD (2025). Fisheries Support Estimate (FSE).

## 6.5. The gap in support to management, monitoring, control and surveillance has widened between the OECD Members and the non-Members

Support to MMCS – composed of support to management, monitoring, control and surveillance (MCS), and stock assessment research – has been increasing, accounting for close to half of all support in the OECD in 2020-22, compared to less than 10% of support in non-member countries on average. Overall, between 2020 and 2022, an annual average of USD 3.1 billion was spent on MMCS, the majority of which was used for fisheries management (USD 2.38 billion). The remainder contributed to the MCS of fishing activities (USD 0.53 billion). In addition, an average of USD 181.1 million annually was spent on stock assessment research. With respect to fleet size, USD 87 was spent on MMCS per gross tonnage (GT) (management accounting for USD 66/GT and MCS for USD 21/GT).

Overall, spending on MMCS has increased in recent years, with over two-thirds of the countries in the FSE database spending more in absolute terms and with respect to their fleet size in 2020-22 than in 2010-12 (when total spending was of USD 2.7 billion). However, the allocation of spending in that category also varied. While spending on management increased by a third between 2010-12 and 2020-22, spending on MCS fell by a comparable proportion (-30%). The overall increase in total MMCS (+14%) was due to the larger initial size of spending on management.

Across the OECD Members, spending on MMCS accounted for 49% of the total FSE in the period 2020-22. Support for management was USD 2.0 billion, a 24% increase compared to 2010-12. While spending increased in most OECD Members, the overall growth observed was primarily due to increased spending by Canada and the United States.[4] On other hand, support for MCS fell by 2% across the OECD Members. Substantial reductions in spending on MCS by Australia, Ireland, Norway and Türkiye were offset by increased spending in most other countries. The largest absolute increases in spending on MCS occurred in Sweden, Chile and the United States, while the greatest proportional increases took place in Latvia, Sweden, Lithuania and Iceland. The intensity of spending in the OECD Members followed the same trends as absolute spending, increasing to USD 179/GT for management (up 25%), and remaining at USD 70/GT for MCS (unchanged, due to a concurrent 8% reduction in OECD GT). Reductions in MCS can be driven by changes in threats or circumstances. Investment in MCS remains a priority for many OECD members.

In non-Members, spending on MMCS accounted for 8% of the total FSE in 2020-22. Support for management was USD 0.35 billion in 2020-22, twice the level reported for 2010-12, driven by a 702% increase in China (from USD 28.2 million to USD 226.4 million between 2010-12 and 2020-22). Management spending increased in all but three of the non-Members covered in this report (Brazil, Peru, and Viet Nam). At the same time, support for MCS in non-Members fell by 81% over the decade, mostly due to China reducing support to MCS (from USD 258.1 million to USD 0.5 million). However, support to MCS also fell in Brazil (by 94%) and Viet Nam (with no value identified for 2020-22). Intensities of spending followed the same trends, reflecting these changes, and in 2020-22 were USD 24/GT for management (up by 129%) and USD 2.7/GT for MCS (down 89%).

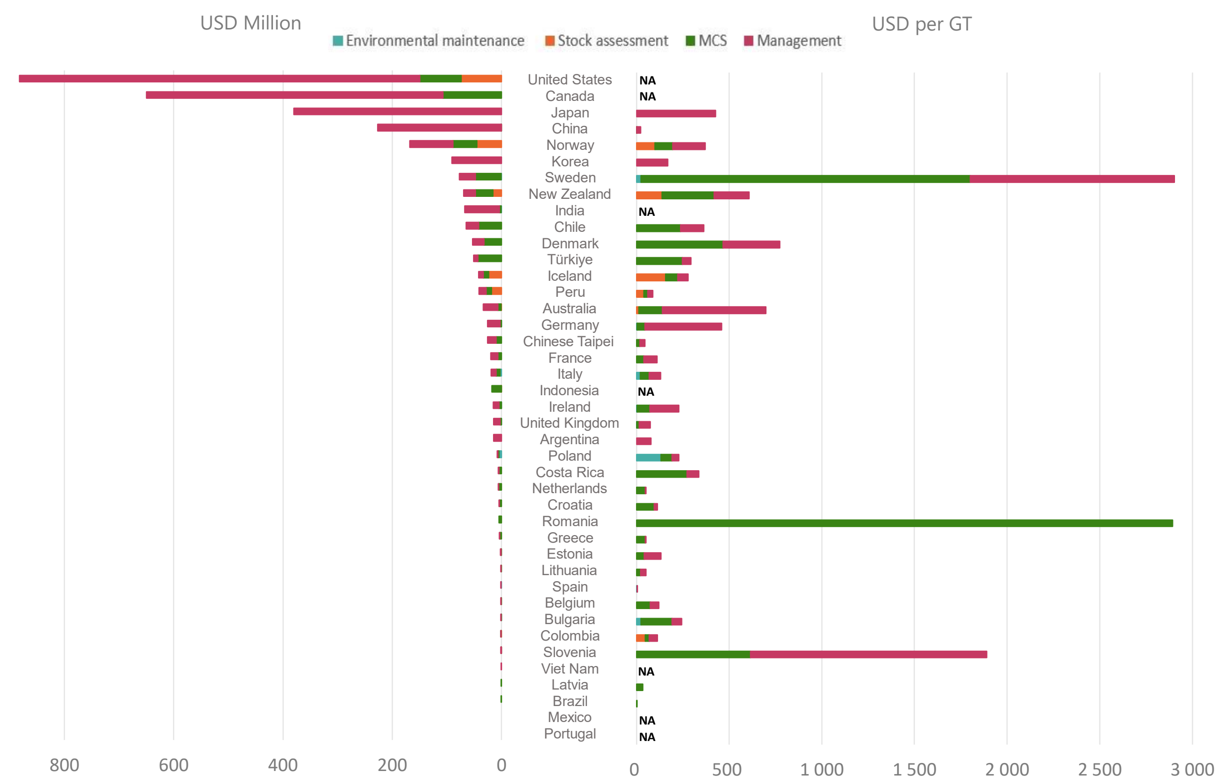
The observed increases in spending on management are encouraging, but the intensity of spending on management remains well below the overall average in all but one of the non-Members. Moreover, in the absence of additional information, reductions in support for MCS may signal challenges for sustainable fisheries management in these countries. This is especially the case for China, where the value of support for MCS in 2020-22 was by far the lowest in terms of intensity (USD 0.05/GT, which is less than 1% of the OECD Members' average) (Figure 6.5).

MMCS are all key elements of ensuring sustainable and profitable fisheries. What constitutes an adequate level of spending on either management or MCS is context-specific and beyond the scope of this report, but where the intensity of spending is low compared to the majority of other countries, there could be limited and low-quality stock assessments (Chapter 5), which may be undermining fisheries management, resulting in overfishing, and suboptimal outcomes in terms of food production, fisheries profitability, the sector's ability to generate tax income for the government. The sector's ability to generate tax revenue relates to the sometimes-overlooked fact that the fish resource is a national capital resource that should be managed to be sustainable and productive for society as a whole. It should be noted, however, that the values of support reported for MMCS and stock assessment are potentially underestimates in some cases. Funding for these activities can be provided by multiple agencies, or agencies tasked with broad sets of responsibilities. Sufficiently detailed records of how budgets are ultimately dispersed are not always available, sometimes making identifying exact numbers difficult. The amount spent on stock assessment research could also be underestimated due to the additional difficulty of identifying this specific component in the overall amounts reported on MMCS.

Of the 41 countries and territories covered in this review, six did not report any values for support to management for the years 2020-22 (three OECD Members and three non-Members) and seven did not report any support to MCS (five OECD Members and two non-Members). Given that all countries perform at least some level of MMCS, and these activities are rarely directly and entirely funded by the industry, no expenditure in these areas is unlikely.[5]

In addition to possible reporting difficulties, there are some situations where elements of services such as MMCS or stock assessment may be at least partially funded directly by the industry itself. Any such private transactions should not be reported to the FSE and could represent a further complication for determining the true extent of spending on services such as MMCS. However, in most cases, it is expected that MMCS is largely funded by the government in the first place, with recovery of costs though payments by the sector, that would appear as such in the FSE, counterbalancing spending on MMCS when computing net total support.

### Figure 6.5. Support to management, monitoring, control and surveillance (left) and the intensity at which this is provided relative to fleet size (right), 2020-22




Note: MMCS: management, monitoring, control and surveillance; GT: gross tonnage; GT data were unavailable for Canada, India, Indonesia, the United States and Viet Nam.
Source: OECD (2025), Fisheries Support Estimate (FSE).

## 6.6. Fisheries-specific support to fuel is falling but still represents a significant share of spending, while the magnitude of non-specific fuel support remains largely unknown

Of the 41 countries and territories covered in the FSE, 15 reported having polices that supported fuel consumption at some point between 2010-12 and 2020-22. In 2020-22, 12 countries and territories reported providing fuel support, totalling an average of USD 1.3 billion per year (12% of the total FSE); eight of these were OECD Members (with a total of USD 0.17 billion from Costa Rica, Denmark, Lithuania, Norway, Poland, Slovenia, Sweden and Türkiye); four were non-Members (with a total of USD 1.1 billion from China, Croatia, India and Chinese Taipei).

The intensity of fuel support is the highest in the OECD Members, which together provided a combined average of USD 174 per fisher in fuel support in 2020-22 (down from USD 337 per fisher in 2010-12). In non-Members, fuel support per fisher averaged USD 54 (down from USD 208 in 2010-12).

Support to fuel fell by 71% between 2010-12 and 2020-22. The vast majority (96%) of the fall in fuel support comes from an almost USD 4.5 billion reduction in China's support to fuel (from annual spending of

USD 5.50 billion in 2012-14 to USD 1.04 billion in 2020-22). However, despite this substantial reduction, Chinese support to fuel still accounted for 81% of the combined support to fuel consumption from all countries and territories in 2020-22, and for 10% of the total FSE. Over a decade, the magnitude of fuel support policies in China has thus driven the levels and trends in fuel support seen for all countries and territories.

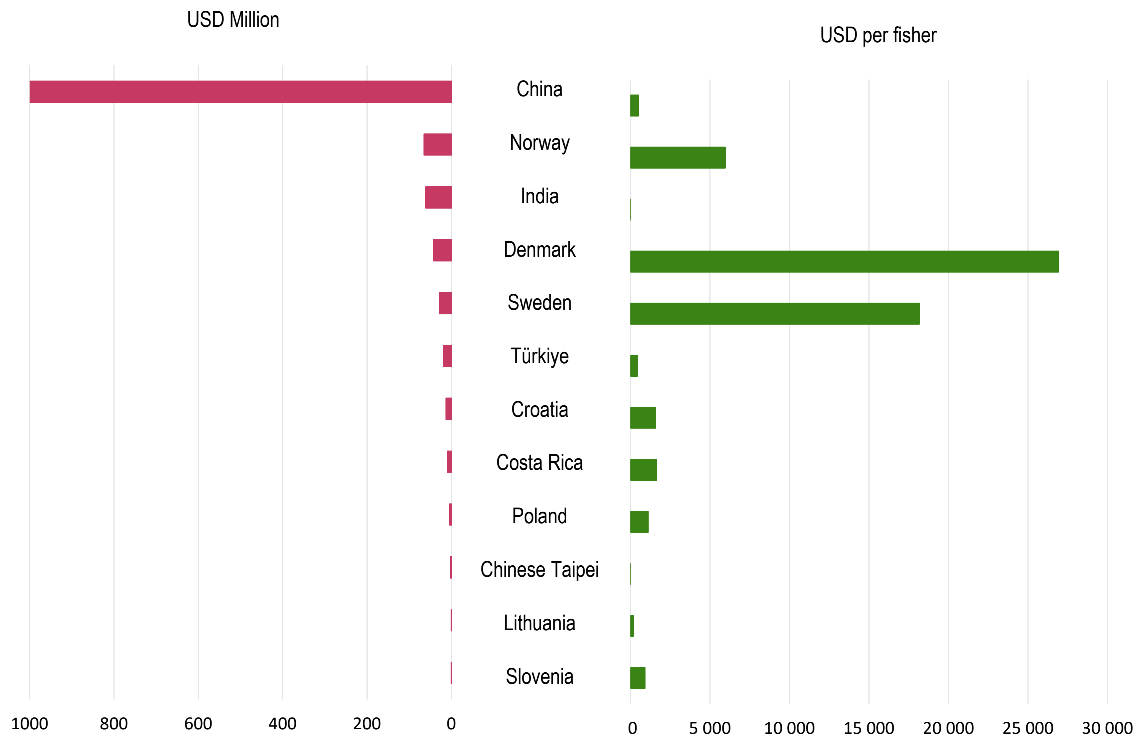
The value of support to fuel also fell in all but three of the countries and territories that reported it between 2010-12 and 2020-22. The only substantial increase occurred in India, where the absolute level of support to fuel more than doubled over the period (from USD 24.9 million to USD 60.8 million).

While support to fuel can help maintain fishers' profitability in the short term by reducing one of their major costs, it can be problematic. For example, reducing the cost of fuel reduces the incentive to use it more efficiently, with potential adverse effects on the sector's productivity and investment in emission-reducing technologies. Most countries have made commitments at the national and international levels to reduce $CO_2$ emissions and move towards a carbon-neutral future. Reducing the cost of consuming fuel directly undermines these commitments. Support to fuel can also result in higher levels of fishing effort than would otherwise be the case, with potentially detrimental effects on fish stock health if fishing pressure is not well controlled (Chapter 5). Support that lowers the cost of fuel has also been shown to be inequitable, by disproportionately benefiting fuel-intensive operations, thereby reducing the competitiveness of smaller scale fishers and making them worse off (Martini and Innes, 2018[1]). The overall fall in support to fuel specifically benefiting fisheries is thus positive news.

However, support to fuel is inconsistently recorded in the FSE database and country-level data and caution should be taken when making comparisons. Fishing sectors often also benefit from fuel-related policies not solely directed at fisheries (often referred to as non-specific support). These non-specific policies can benefit a range of economic sectors in addition to fisheries, such as forestry, shipping and off-road vehicles, often by providing tax exemptions or rebates of excise duties. A review of the OECD Inventory of Support Measures for Fossil Fuels found at least one non-specific policy that benefited the fisheries sector for most of the countries covered in this report, suggesting they are a common form of support to fisheries (OECD, 2024[3]). Recording the support provided by non-specific policies to the FSE is recommended, but not mandatory, and in many cases, it is not reported, in part due to methodological difficulties related to quantifying the value of fuel tax concessions in comparable ways across countries, sectors and time. If non-specific support to fuel was reported by all the countries and territories that provide it, Figure 6.6 would look considerably different.

When considering only countries reporting fuel support to the FSE for 2020-22 (Figure 6.6), the intensity of fuel support was USD 95 per fisher. For the OECD Members reporting fuel support, the intensity was USD 2 542 per fisher; that for non-Members reporting fuel support was USD 83 per fisher.

### Figure 6.6. Support to fuel (left) and the intensity at which this is provided (right), 2020-22




Note: No fuel support value was recorded for Argentina, Australia, Belgium, Brazil, Bulgaria, Canada, Chile, Colombia, Estonia, France, Germany, Greece, Iceland, Indonesia, Ireland, Italy, Japan, Korea, Latvia, Mexico, the Netherlands, New Zealand, Peru, Portugal, Romania, Spain, the United Kingdom, the United States or Viet Nam.
Source: OECD(2025). Fisheries Support Estimate (FSE).

## 6.7. Fewer countries use fishing vessel and licence buyback schemes to reduce overcapacity but together spend more on buyback

Support for the buyback of vessels and licenses, typically used to reduce overall capacity was, at different times between 2010-12 and 2020-22, used by more than half the countries in the FSE database. The number of countries reporting support for the buyback of vessels and licenses has, however, more than halved since 2010-12.

In 2020-22, only eight countries and territories continued to use such policies: Australia, China, Germany, Korea, Latvia, Lithuania, Italy and Chinese Taipei. In the most recent period, altogether, they spent USD 912.5 million on vessel and license buybacks, with the vast majority of spending originating outside the OECD (USD 817.4 million by the non-Members vs. USD 95.2 million by the OECD Members).

However, total spending has increased by 231% compared to 2010-12, notably in recent years, and largely due to increased spending on vessel buyback in China (close to 90% of total vessel or licence buybacks in 2020-22), as well as, to a lesser extent, in Germany, Korea and Latvia. Changing policy priorities in China, oriented towards improving sustainability in domestic waters, resulted in an increase in policies providing support for capacity reduction through the buyback of vessels or licenses, most notably from 2016 onwards. Such policies peaked in 2020 with the Yangtze River Fishing Ban, a policy prohibiting fishing in key parts of the Yangtze River Basin, that provided funding for decommissioning over the period 2018-20, peaking at USD 1.7 billion in 2020.

## 6.8. Most support for vessels goes towards vessel modernisation and the purchase of gear

In 2020-22, support for the construction and modernisation of vessels was USD 389 million, a small increase compared to 2010-12 (USD 347.9 million) but a substantial reduction from its peak of USD 782 million in 2015-17. In the FSE database, vessel-related support is categorised as either support for vessel construction and purchase or support for vessel modernisation and the purchase of gear. In general, the majority of the countries in the database have provided some level of support for vessel modernisation and the purchase of gear, presumably at least in part due to the constant and ongoing need for vessels to be repaired or improved. While improvements may be to increase performance (such as energy efficiency), this support may also help fishers meet safety requirements and ensure a satisfactory level of safety. Fewer countries provide support for vessel construction and purchase and, in general, when they do it is more sporadic, potentially due to the recognised risk that this type of support can more directly contribute to overcapacity.

Among the OECD Members, at least 90% of total spending on vessels has been consistently allocated to vessel modernisation and gear purchase. In 2020-22, support for modernisation and gear purchase was USD 68.4 million per year on average (USD 71.1 per fisher or USD 8.9/GT), whereas support for construction and vessel purchase was USD 3.9 million per year (USD 4.1 per fisher or USD 0.7/GT). Most of the support for vessel purchase was directed towards assisting young fishers to enter the industry.

Non-Members also allocated most vessel support for modernisation and gear purchase at the beginning of the period (2010-14), but this was overtaken by support to construction and purchase in the middle of the time series, as China introduced a programme funding primarily the construction of new vessels for its distant water fisheries (which, at its peak in 2015-17, allocated more than USD 500 million per year). In 2020-22, non-Members allocated a total of USD 145.1 million for vessel construction and purchase (USD 7.1 per fisher, or USD 12/GT) and USD 171.6 million for modernisation and purchase of gear (USD 8.4 per fisher, or USD 14.1/GT).

Climate change mitigation and decarbonisation objectives are potential motivators for increased future spending on vessel modernisation and gear purchase. A number of countries have policies to support the purchase of more fuel-efficient gears and engines or other fuel-saving technology. Of the 84 policies that provided support for modernisation in the period 2020-22, 25 explicitly mention climate change. Prior to 2016, no modernisation and gear policies referred to climate change. The growth in the number of policies that explicitly consider climate change is a potentially positive development and an area to follow as it is not risk-free in terms of the incentives it can create for increasing total fishing effort. Support directed at technical innovation to reduce fuel consumption also has the potential to reduce fishing costs, and must be carefully implemented as, without effective management controls, increased harvesting efficiency can result in overfishing and overcapacity (Box 6.2).

### Box 6.2. Support to emissions-reducing technologies and practices

Careful and targeted support to emission-reduction technologies and practices can contribute to climate mitigation strategies for fisheries. Regulation and government support can promote the adoption of technical measures that improve vessels and gear emissions-intensity, and behavioural measures through which fishers change the way they use their vessels and gear to reduce emissions. Such fuel efficiency measures can generate significant savings, which can be realised immediately. Increases in fuel prices have already been seen to result in behavioural changes. However, fuel-efficiency measures may not be sufficient to meet emissions reductions targets in all fisheries, meaning more drastic changes in practices may be required (Chapter 4).

Further, facilitating the access to or take-up of fishing technologies and practices that reduce emissions can also result in reduced fuel costs – and reduced fishing costs overall. In such cases, capping the fishing pressure at sustainable levels is essential to avoid unintentionally encouraging increases in fishing effort (and thus catches), beyond sustainable limits, which would be detrimental to fish stock health and undermine the improvement in emissions intensity as a result of declining fish abundance (Chapter 7). Promoting new technologies should thus be backed by strong management and well targeted to sustainably managed fisheries (that are regularly scientifically assessed) to ensure additional profits due to fuel savings do not result in over-capacity and unsustainable fishing (OECD, 2022[2]).

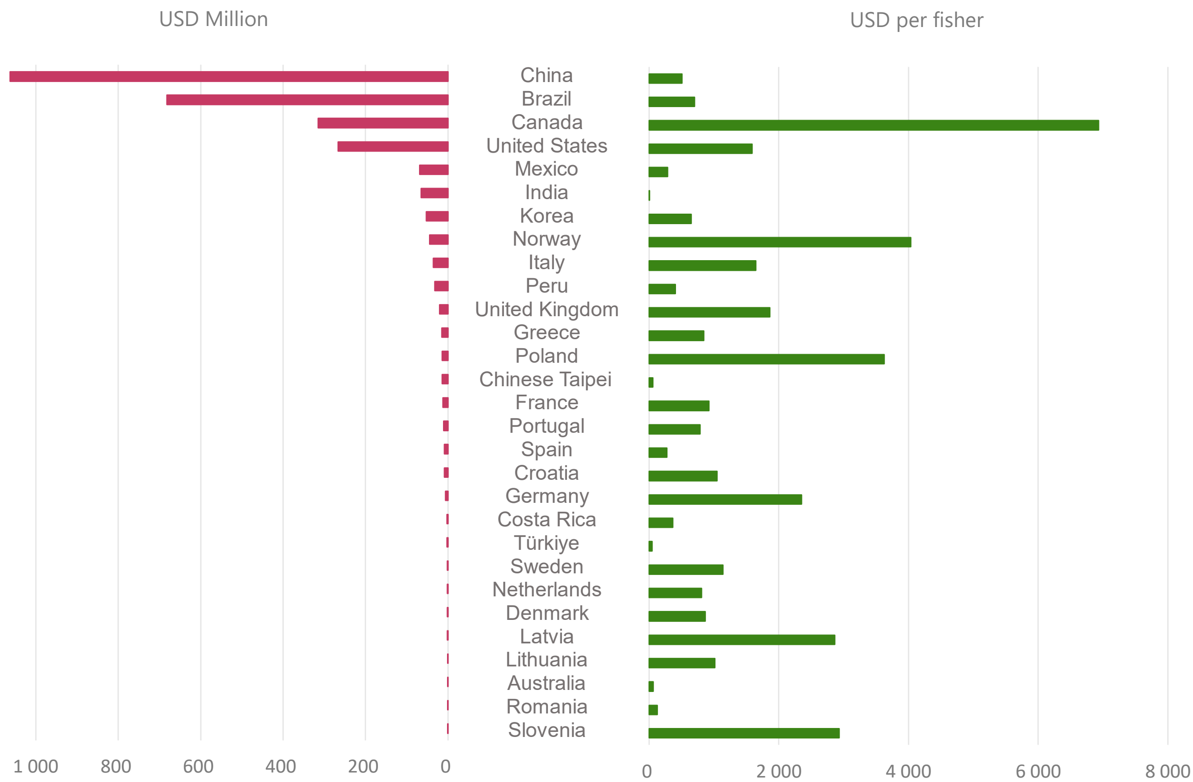
## 6.9. Income support has doubled over a decade

In 2020-22, support to fisher income totalled USD 2.7 billion. In the OECD Members, spending on income support totalled USD 0.88 billion, while non-Members together spent USD 1.89 billion. Income support has doubled in magnitude in both groups since 2010-12, with the strongest period of growth occurring over the second half of the decade.

The overall intensity of income support, measured in relation to the number of fishers, was ten times higher for OECD group (USD 912 per fisher) than that of non-Members (USD 91 per fisher) in 2020-22 (Figure 6.7). This is predominantly a reflection of higher levels of employment in non-Members (India alone accounted for more than 50% of all fishers in the 41 countries and territories covered in this report in 2020-22). However, this gap in income support intensity may also partly reflect general differences in budget constraints, average living costs and minimum wages between the two groups. Country-level variation in the intensity of income support is also high within the OECD Members (Figure 6.7).

Income support is provided to the fishing sector in a diverse manner of ways and may be open-ended in duration, such as to compensate fishers in the event of intermittent but ongoing incidents of catch depredation, or fixed, in response to specific events, such as fleet restructuring or disaster relief. Examples of recurrent income support include the “Defeso” programme in Brazil, a support policy which compensates artisanal fishers for foregone revenue during the closed seasons, when fishing is forbidden for sustainable management purposes (FAO and UNDP, 2023[4]). Examples of disaster relief can be found in how governments responded to the effects of the COVID-19 pandemic, and their attempts to mitigate the impacts this had on fisher incomes. In the OECD group, the year-on-year increase between the average for 2017-19 and 2018-20 was 2.5 times that seen between 2016-18 and 2017-19, as COVID-related policies were introduced in 2020.

**Figure 6.7. Support to income (left) and the intensity at which this is provided (right), 2020-22**




Note: No income support value was recorded for Argentina, Belgium, Bulgaria, Chile, Colombia, Estonia, Iceland, Indonesia, Ireland, Japan, New Zealand, or Viet Nam.
Source: OECD (2025), Fisheries Support Estimate (FSE).

Examples of these policies include commercial fisheries business fee waivers (Australia); a seafood disruption support scheme (United Kingdom); payments for the temporary cessation of fishing activities (Greece); and the CARES Act COVID-19 fisheries assistance (United States), which provided funds for direct or indirect fishery-related losses as well as subsistence, cultural or ceremonial impacts related to the COVID-19. Whether this support persists going forward remains to be seen and should be followed, as best practice advocates that support such as this should be time-bound in nature and does not become a permanent entitlement, which could result in increased fishing pressure and unfair competition (OECD, 2020[5]).

While income support may most commonly be thought of as direct payments to ensure a minimum level of income, such as through fixed payments, it is also seen to have been provided by less direct means. These include the waiver of management fees (in response to the COVID-19 pandemic), adjustment payments as a result of new management measures, or income and import tax concessions. China has used import tax concessions for the benefit of its distant water fisheries, where two polices alone provided USD 1.06 billion in support per year on average in 2020-22 (39% of all recorded income support in that period). Income support policies have also been seen to ensure the income of fishers involved in exploratory fishing, given the potentially uncertain returns associated with such activities.

## 6.10. Support to infrastructure is mainly provided for construction and modernisation

Infrastructure plays an important role for capture fisheries, notably through specific ports, cooled storage and ice provision facilities. Government support can facilitate the use of such infrastructure by the fishing sector through two main types of policy support for the construction or modernisation of infrastructure and support for access to infrastructure. In 2020-22, the majority of countries reported support for the construction and modernisation of infrastructure (USD 1.22 billion), whereas only seven countries reported support for access to infrastructure (for a total of USD 25.9 million). Total support for infrastructure was USD 1.24 billion.

The OECD Members provided the greatest part of infrastructure funding in 2020-22, for a total of USD 0.88 billion, down slightly since 2010-12 (when it was USD 0.97 billion). The non-Members spent a total of USD 0.37 billion in the most recent time period, twice the amount reported in 2010-12 (USD 0.15 billion), resulting in a slight overall increase in support for infrastructure. Measured in relation to fleet size, the overall intensity of support for infrastructure was USD 64/GT in 2020-22, (USD 172/GT in the OECD Members and USD 24/GT in the non-Members covered in this report), a slight increase when compared to the USD 58/GT seen for 2010-12 (USD 175/GT in the OECD Members and USD 8/GT in the non-Members).

Japan uses support for infrastructure construction relatively more than other types of support; both its level and intensity of support to infrastructure construction have been consistently substantially higher than levels seen in other countries and territories in the database (USD 753/GT and total support of USD 0.67 billion in 2020-22). Canada and China are the two other countries that provide relatively high amounts of support for the construction of infrastructure (China at USD 206.9 million and Canada at USD 141.9 million in 2020-22).

In some of the countries and territories included in the database, foreign aid to infrastructure could be an additional area of government support, which is not within the scope of the FSE, but from which spending on fish landing and processing areas could be significant.

## 6.11. Support for access to foreign waters is only recorded for the European Union and China, highlighting a need for greater transparency

Support for access to foreign waters is currently only recorded in the FSE database for the European Union (EU) as a group, and for China, in the form of government-to-government payments for the right of access to fish resources in the exclusive economic zone of a third country (therefore not considered a subsidy at the WTO). Support for access to foreign waters, which can also consist in preferential finance granted to fishing companies for the purpose of paying for the right to access to fish resources in the EEZ of a third country, is, however, known to exist in other countries, highlighting the need for greater transparency on such payments.

The payments in China start in the period 2017-19, when they were an average of USD 15.6 million per annum. By 2020-22 they averaged USD 48.1 million per year. These government payments are provided to offset the fisheries access fees charged to their distant water fishing enterprises to fish in waters under the jurisdiction of other countries. These payments equate to less than 1% of China's total FSE in the same period.

For the European Union, support for access to foreign waters averaged USD 163.9 million per year in 2020-22, a 15% reduction compared to the USD 192.9 million reported for 2010-12.[6] Overall, they represented 19% of the sum of total support in the EU countries covered in 2020-22 (it was 18% in 2010-12).These payments however include both a financial compensation for access to resources in the exclusive economic zone of third countries (which accounted for about three-quarters of the payments on average) and a financial contribution to promote the sustainable management of fisheries in these countries, for example though the reinforcement of control and surveillance capacities, and support to local fishing communities. In addition, these payments, which are made under the EU Sustainable fisheries partnership agreements, are subject to a number of conditions. They notably aim to target the surplus of the total allowable catch (that is, the annual potential catch at sustainable levels, minus the potential catch of the national fleet according to its capacity to harvest the entire allowable catch). [7] Payments by the sector are reported by less than half of countries and territories, but sometimes have a significant impact on net FSE.

Knowing how much the fishing sector contributes to the cost of fisheries services, or to governments' budgets more generally, is helpful to investigate the net cost of fisheries policies to the public budget. In certain rare cases, contributions by the sector are greater than support for the sector, making the sector a net contributor to public finances.

The FSE database records payments by the fisheries sector under three distinct categories: 1) payments for access to resources; 2) payments for access to government-owned infrastructure; and 3) other fisheries-specific payments. Only payments for fisheries-specific purposes are included, so general taxes levied across the economy are outside the scope of the FSE, as are fines and penalties related to IUU fishing practices.

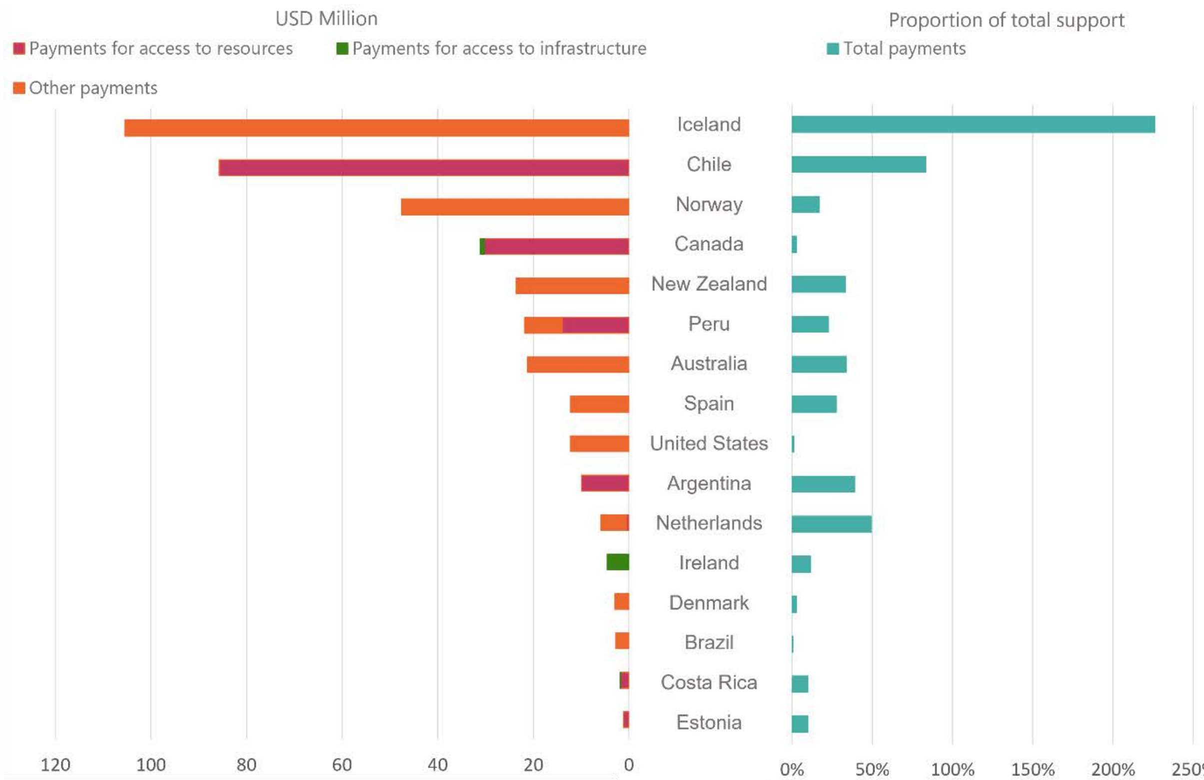
The sector's total reported payments were USD 389.9 million in 2020-22 (3.6% of total FSE), making the net total FSE USD 10.3 billion. Payments in the OECD Members were USD 355.4 million, or 6.5% of total FSE in the same period (net FSE USD 5.15 billion). They were USD 34.5 million, or 0.7% of total FSE (net FSE USD 5.19 billion) in the non-Members. These differences highlight that most recorded payments by fishers occurred in the OECD in 2020-22. Since 2010-12, the absolute value of payments by the sector has increased in the OECD and fallen in the non-Members. In both cases, the changes are in line with and of a similar magnitude to the overall changes in their total FSE.

In 2020-22, payments for access to resources were the largest explicit form of payment (USD 143.3 million), followed by payments for access to infrastructure (USD 5.3 million). Other payments were largest overall (USD 241.3 million), and mostly relate to general fisheries management. For example, these include payments by fishers for the administration of commercial fishing licences, cost recovery for management, and research and enforcement. They also include payments for levies to finance the education and training of employees in the fisheries sector.

At the country level, payments by the sector as a proportion of total support in countries reporting these payments are much higher than the overall average, due to a large number of countries not reporting any payments by fishers. Countries that do not report any payment probably include a mix of countries where no payments are required, and countries where such payments are not recorded in the FSE database.

Where reported, payments by the fishing sector do in some cases make a substantial contribution to the cost of supporting the industry (Figure 6.8). For example, in Chile, payments by the industry accounted for 83% of total support in 2020-22 (net total support of USD 17.5 million) and were made up of a combination of auction payments for fixed duration rights (typically 10-20 years) to fish and then specific annual taxes levied against these. In Iceland, payments were more than double the value of support (net total support of USD 58.8 million), recovered via a general fishing fee. Thus, in addition to any associated tax on profits, these payments can make the fishing sector a net contributor to government finances in some cases.

### Figure 6.8. Payments by the sector (left) and as a proportion of total support (right), 2020-22




Note: The Figure focuses on the countries and territories that reported payments by the sector to the *Fisheries Support Estimate* database.
Source: OECD (2025), Fisheries Support Estimate (FSE).

## 6.12. What can governments do?

Transparency on government support to fisheries is key to a productive, equitable and sustainable sector. To ensure support benefits the fishers who need it and contributes to stated goals, governments need to understand how public money is being spent, where benefits are distributed and how it impacts all dimensions of sector performance.

As climate change hits the fisheries sector, with shifts in resources and changes in fish stock abundance, government support will also be needed to ease the adaptation of adversely affected groups, such as through changes in management, but also potentially with income support, support for training and even for transitioning fishers to different species or sectors. At the same time, support is likely to also be allocated to the energy transition of the sector, to ensure that economy-wide objectives to reduce greenhouse gas emissions are also met by fisheries. This will require existing forms of support to do more and with greater flexibility, calling for even greater scrutiny and effective allocation of public spending.

Effective evidence-based policy advice depends on data being comprehensive and correct. Incomplete reporting of time series results in data gaps and an incomplete and potentially unbalanced understanding of government support to fisheries. This calls for continued refinement of the FSE database, to ensure the data it contains is complete and sufficiently detailed to answer emerging policy questions (such as those concerning climate change). This also calls for the identification and use of other data sources to complement the FSE on the magnitude of transfers to fisheries originating from policies that are not specific to fisheries. Publicly available information on tax policies suggests substantial levels of fuel support are provided economy-wide or for several sectors, in many OECD Members and non-Members (OECD, 2022).

Greater transparency on how such policies benefit fisheries would help provide a more complete picture of policy-driven incentives in the fisheries sector.

Further, the fact that aquaculture has become increasingly important to food systems raises questions on how government policies can support the sustainable development of the sector and how support to different food sectors can be best articulated. Addressing such policy questions requires a comprehensive understanding of government support to aquaculture. However, data on support to aquaculture are not readily available from any source in a way that would allow comparisons over time and across countries. As a first step towards potentially developing a database of Aquaculture Support Estimate, the OECD is initiating work exploring what a suitable framework to monitor support to aquaculture might look like (Box 6.3).

### Box 6.3. Shedding light on support to aquaculture

**Aquaculture is increasingly important to global food systems.** More than half of the fish consumed by people comes from aquaculture and aquaculture production is expected to continue growing for the foreseeable future (OECD/FAO, 2023[6]), unlike capture fisheries, where total production growth is limited by the productivity of marine ecosystems.

From a geographical perspective, production is even more concentrated than capture fisheries. Most aquaculture production originates in Asia, but the majority of trade goes to OECD Members (Chapter 2).

**This raises questions on how government policies can support the sustainable and equitable development of the sector** – notably in the many OECD Members where it remains limited in scope – while addressing any potential adverse environmental externalities, including greenhouse gas emissions, and avoiding unfair trade distortions.

Addressing these policy questions requires a comprehensive understanding of government support to the sector: knowledge of how much is invested where, and for what purpose is a fundamental first step for analysing the impacts of government action to support the sustainable development of aquaculture. However, the necessary data are not currently available.

**The OECD is initiating work to explore what a suitable framework to monitor support to aquaculture might look like** as a first step towards potentially developing a database of Aquaculture Support Estimate, building on the methods it uses to monitor support to fisheries (the *Fisheries Support Estimate database*) and support to agriculture (with the *Producer Support Estimate database*).

Data on support to aquaculture could inform a range of policy questions on:

- *Sustainable aquaculture development strategies*. As countries strive to develop strategies to address all three dimensions of aquaculture sustainability – economic, social and environmental – understanding the potential of different support policies to achieve sustainability requires research on policy impact. Data on support could also help analyse trends in performance and profitability and the role of public policy.
- *Growth projections*. Forecast modelling could be enriched with scenarios reflecting different aquaculture policy options, and the baseline projections could be fine-tuned by taking into consideration past trends in support to aquaculture.
- *Food policies*. Collecting comprehensive data on support to aquaculture policies could aid in understanding the role that aquaculture policy can play in addressing the triple challenge facing food systems of providing food security and nutrition for a growing population, contributing to the livelihoods for those working in the sector while doing so in an environmentally sustainable way (OECD, 2021[7]). Being able to compare the potential implications of investing in support

for different food production sectors – including in agriculture, capture fisheries and aquaculture – could help maximise the benefits of public spending on the environment and in terms of food security, nutrition, and livelihoods.

- *Climate change adaptation and resilience*. Improving the resilience of food systems to various shocks, and particularly those related to climate change, is also key to meet global food security challenges. Support for the adaptation of food systems could also be better targeted with comprehensive information on support to all food sectors, including aquaculture.
- *Climate mitigation strategies*. As some types of aquaculture production processes can offer relatively low-carbon food production options, especially with the seaweed industry, which has been shown to also offer potential for carbon sequestration, data on support to the sector could also contribute to informing climate strategies.
- *Socio-economic policy in coastal and rural areas*. For example, the potential role of aquaculture could be explored as an alternative source of livelihood for fishers having to transition out of their sector due to excessive pressure on resources or to agricultural activities in rural areas, and how policy can help make the most of this potential.
- *Trade policy*. Aquaculture support data could also be used to analyse the impacts of support to aquaculture on trade, an issue that could become increasingly important as the sector grows. For example, data can be used to better understand how support to aquaculture can help address market failures while ensuring that support does not create trade distortions and a level playing field is maintained (Guillen et al., 2019[8]; Anderson, 1992[9]; Keithly and Poudel, 2008[10]; Xie and Zhang, 2014[11]; OECD, 2024[3]). Data on support to aquaculture is, in fact, critical to any work on trade in fish products, in general. Indeed, given it is complicated to distinguish between products from aquaculture and capture fisheries in data on international trade flows, analysis of support impact would need to be based on total support to fish production.

Finally, increased transparency on support to aquaculture can also help build trust in the sector, manage business expectations, and enable countries to learn from each other’s experiences to make the best use of public funds (OECD, 2020).

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## Notes

[1] The report covers thirty OECD Members (Australia, Belgium, Canada, Chile, Colombia, Costa Rica, Denmark, Estonia, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Korea, Latvia, Lithuania, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Türkiye, the United Kingdom and the United States); and eleven non-Members (Argentina, Brazil, Bulgaria, Chinese Taipei, Croatia, India, Indonesia, China, Peru, Romania, and Viet Nam). See Chapter 1 for more details on the overall geographical coverage of the report.

[2] The value of landings was not available for Brazil, India or Viet Nam.

[3] The gross tonnage of China and Japan alone account for just under 50% of reported capacity. However, the total upon which this is based does not account for the gross tonnage of Canada, India, Indonesia, the United States and Viet Nam.

[4] In addition, Korea does not have reported values for management prior to 2015-17 and Germany does not report values for MCS prior to 2014-16.

[5] Accounting for the above, the average intensities of support for management and MCS, when only countries reporting either are included, are USD 25/GT for all countries, USD 136/GT for the OECD Members and USD 2.7/GT for the non-Members. Average intensities of support to management are USD 68/GT for all countries, USD 194/GT for the OECD Members and USD 24/GT for the non-Members.

[6] Support for access to foreign waters given at EU level is not included in figures showing support across countries and territories.

[7] More information about the Sustainable fisheries partnership agreements can be found on the European Commission website: Sustainable fisheries partnership agreements (SFPAs) - European Commission

# 7 The sustainability impact of government support to fisheries

This chapter introduces the framework developed by the OECD Fisheries Committee to help governments assess the risk that their support policies may present for fish stock health and productivity and identify reform priorities to mitigate this risk. It then analyses the support policies recorded in the latest Fisheries Support Estimate database within that framework to assess the progress made in moving away from potentially harmful fisheries support. The chapter concludes with recommendations to accelerate reform in view of achieving key internationally agreed-upon targets.

## Key messages on the sustainability impact of government support to fisheries

- **The OECD has developed a framework to identify the policies that may present a risk of encouraging unsustainable fishing** if recipient fishers operate in fisheries that are not sustainably managed and subject to effective enforcement and control. This framework can be used to identify instances when re-allocating spending and/or better targeting and designing fisheries support will:
    - **Avoid detrimental outcomes on fish stock health** and fulfil the commitments countries have taken to eliminate environmentally harmful fisheries support.
    - **Maximise the socio-economic benefits of government spending**. When it results in above-optimal fishing effort, support also harms the fishers governments seek to help and undermines other policy objectives such as reducing greenhouse gas emissions.
- **Across all 41 countries and territories covered in this report, in 2020-22**:
    - **Almost two-thirds (65%) of total support to fisheries presented a risk** (moderate or high) of encouraging unsustainable fishing. Support with a high risk of encouraging unsustainable fishing declined by 57% between 2010-12 and 2020-22, while moderate-risk support grew by 77% in the same period.
    - **Support that poses no risk accounted for 29% of the policy mix** and was largely made up of spending on management, monitoring, control and surveillance.
- **In the OECD Members, almost half (49%) of total support presented no risk in 2020-22**. However, scope for reform remains: 8% of support still presented a high risk of encouraging unsustainable fishing and 34% a moderate risk.
- **In the non-Members covered in this report, 90% of fisheries support in 2020-22 presented a risk** (moderate or high) of encouraging unsustainable fishing and support that carried no risk only accounted for 8%.
- **Ensuring fisheries sustainability calls for policy reform along three priorities**:
    - **Favouring support policy types that do not present a risk of encouraging unsustainable fishing.** Support policies can only be unambiguously beneficial to fishers and society when they help ensure fishing is sustainable and safeguards resources and ecosystems. This is the case of investment in stock assessment, management and enforcement. Conversely, support risks encouraging unsustainable and illegal fishing when it distorts the economic environment within which fishers operate. Fuel and vessel subsidies are among the policies that present a high risk of encouraging unsustainable fishing.
    - **Designing support policies carefully to target the provision of support to sustainable fisheries and fishing practices**. The policy context and eligibility conditions matter: the risks of support-driven unsustainable fishing can be limited if support recipient fishers only operate in fisheries that are sustainably managed and subject to effective enforcement and control.
    - **Mitigating any risk inherent in the support policy mix** by allocating adequate and sufficient funding to fisheries management, enforcement and control, to ensure all fisheries are sustainably and productively harvested.

## 7.1. What's the issue?

Fisheries support can impact the health and productivity of fish stocks thereby affecting the environmental and socio-economic performance of fisheries. Fish stocks are a renewable, shared and mobile resource, and are central to all the potential benefits fisheries can deliver to society. Healthy and productive fish stocks can provide nutritious food, livelihoods, trade opportunities and income for public coffers as well as support the provision of ecosystem services and help fight climate change.

When stocks are overexploited, they require greater levels of fishing effort to harvest a given quantity of fish – hence more fuel and more vessel and fishers' time, reducing profitability and increasing the emissions intensity of fishing (see, for example, (Kristofersson, Gunnlaugsson and Valtysson, 2021[1]; Driscoll and Tyedmers, 2010[2]; Parker et al., 2015[3]; Waldo and Paulrud, 2016[4])). Similarly, more fishing effort per unit of catch would also increase the potential for bycatch of untargeted species, pollution and ecosystem damage through abandoned, lost or otherwise discarded gear. Hence, the impacts of support policies on fish stocks also largely drive their impact on fishing profitability, on greenhouse gas (GHG) emissions and on biodiversity and ecosystems more generally. As a result, reforming support policies to reduce the risk of encouraging unsustainable fishing can also improve the health of the ocean, fishing profitability, and its resilience to climate change and other risks.

For all these reasons, reforming fisheries support has been a strong focus of the international community, including the OECD Fisheries Committee. The consensus for prioritising such reform can be seen in the international commitments to reform fisheries subsidies made in SDG 14.6, and in the WTO Agreement on Fisheries Subsidies (AFS) as well as in and in relation to Kunming-Montreal Biodiversity Framework Target 18 (see Box 1.1 in Chapter 1). And, increasingly, the potential of reforming support to also reduce fishing emission intensity is discussed in relation to decarbonisation commitments. To underpin all these commitments, it is essential to understand how and why fisheries support policies can pose risks to fisheries sustainability and socio-economic outcomes.

This chapter presents a framework developed by the OECD Fisheries Committee to help governments assess the risk that their support policies may present for fish stock health and productivity and identify reform priorities. It then analyses the support policies recorded in the *Fisheries Support Estimate* (FSE) database (discussed in Chapter 6) within that framework to assess the progress made in moving away from potentially harmful fisheries support. The chapter concludes with recommendations to accelerate reform in view of achieving key internationally agreed-upon targets.

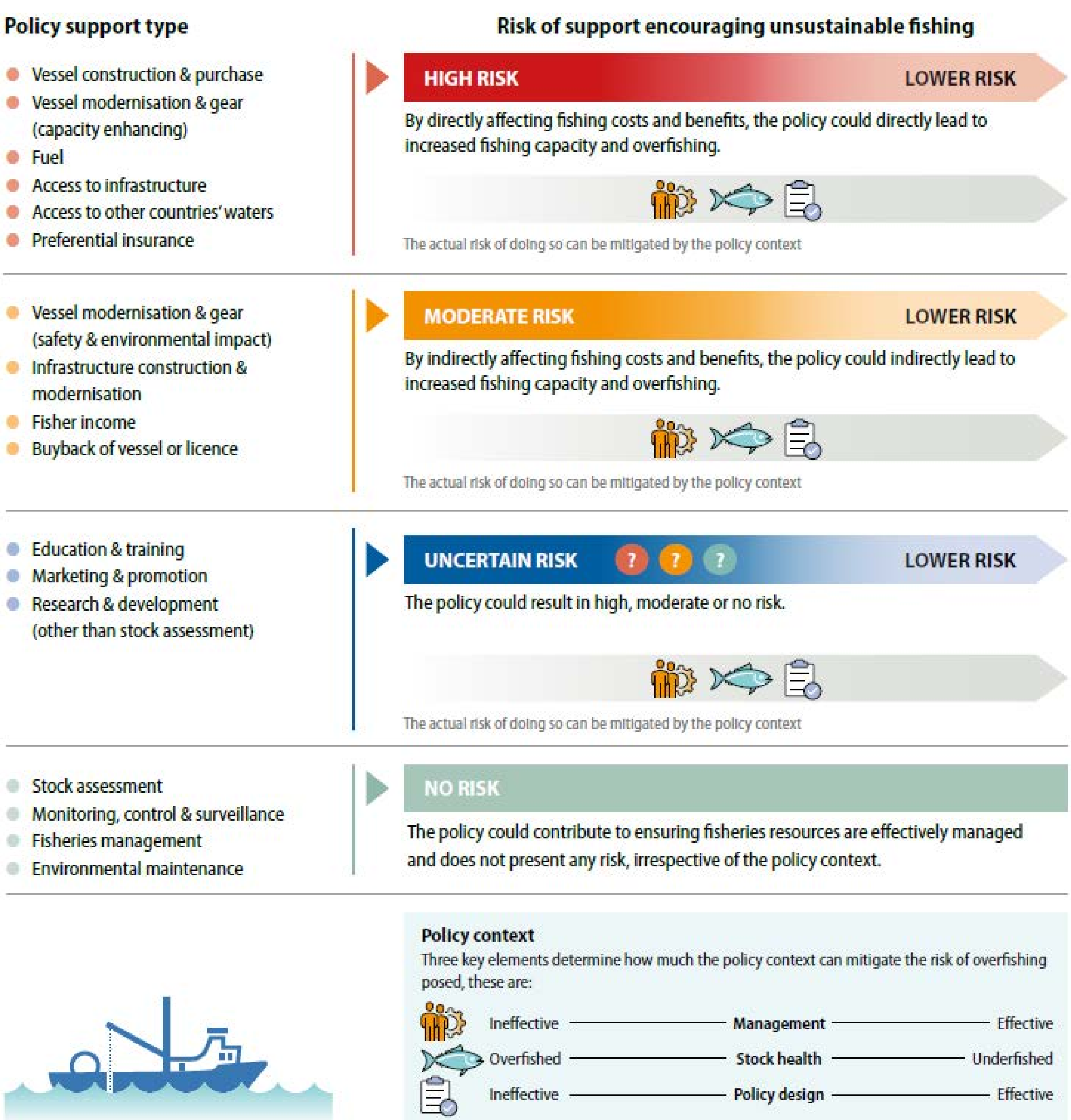
## 7.2. How and when does government support to fisheries risk encouraging unsustainable fishing?

Some forms of government support contribute towards ensuring the health of fish stocks, and thereby the productivity and resilience of fisheries to various shocks, including climate change. Other policies, such as those that focus on short-term socio-economic objectives – for example fuel or vessel subsidies – can have unintended detrimental effects on stocks if they end up encouraging unsustainable fishing.

### *7.2.1. The OECD framework to assess the risk that support may encourage unsustainable fishing*

The OECD has developed a framework to assess the risks of unsustainable fishing posed by different types of support policy while accounting for the context in which support is granted (Figure 7.1). The framework sets out the inherent level of risk posed by different types of support policies based on how directly a type of support policy can affect the incentives for fishers (this is detailed in the next section, and summarised in the left column of Figure 7.1). This is then combined with additional information about the broader policy context, including the effectiveness of management systems, the status of fish stock health and the design of the support policy, which can mitigate the actual risk that one specific policy encourages unsustainable fishing (this is also further discussed in the next section and summarised in the right column of Figure 7.1). The framework, therefore, provides a pragmatic method for assessing support policies and identifying reform priorities.

### Figure 7.1. Risks of encouraging unsustainable fishing associated with different support policy types, depending on the policy context




Source: OECD (2022[5]).

### *7.2.2. The level of risk depends on how directly a policy affects incentives to fish and the policy context*

The framework defines risk in this instance as the risk support policies can have of encouraging unsustainable fishing in the absence of effective management, when stocks are not underfished and the design of support does not significantly restrict eligibility (hereafter "risk of unsustainable fishing"). The risk of encouraging unsustainable fishing is then classified into different levels based on how directly different policies create incentives to invest in fishing capacity, intensify fishing effort or engage in illegal, unreported and unregulated fishing (IUU) according to the findings of previous OECD analyses and the extensive body of research in this area (Box 7.1). The framework classifies fisheries support policies into four categories based on these criteria: high risk, moderate risk, uncertain risk and no risk.

However, the actual level of risk presented by any given support policy also depends on the policy context, which accounts for case-specific conditions with respect to management (i.e. how effectively regulations and enforcement control catch, effort and capacity), stock health (status of target stocks at the time a policy is implemented) and policy design (including eligible recipients and conditions for receipt), as each influences the ultimate performance and sustainability impact of a support policy. First, effective management and enforcement systems reduce the risk posed by policies by ensuring catch and effort are at an appropriate level and cannot increase beyond this, even where support may incentivise increases in effort and capacity.

Second, stock health at the time a support policy is implemented determines whether an increase in fishing effort is likely to be sustainable. Stocks that are already fully or over exploited cannot support increases in catch, while underfished stocks have the potential to produce higher levels of value and catch as effort increases to the optimal points, such as maximum sustainable yield or maximum economic yield. As long as the stocks remain underfished, support that increases capacity will not result in overfishing.

Finally, policies that target support to specific groups of fishers can also reduce the risk posed by support if they limit who is eligible to receive support and under what conditions. For example, if policy design restricts eligibility for support to vessels operating in effectively managed fisheries, or fisheries that only target underfished stocks, the risk of encouraging unsustainable fishing will be reduced, at least in the short to medium term. A comprehensive discussion of the framework and the work upon which it is based is available in the 2022 edition of the *OECD Review of Fisheries* (OECD, 2022[5]).Differences in policy context can mean that the level of risk posed by apparently similar policies differs considerably. Where there are differences in policy context between countries, for example significant differences in how much governments invest in sustainably managing and controlling their fisheries, similar policy mixes will result in different overall risks. For example, countries may report similar amounts of potentially high-risk support but if the policy context differs significantly between the two in terms of the effectiveness of management, the status of fish stocks or policy targeting, then the outcomes of the support will differ substantially. Hence, cross-country comparisons of policy mixes must always be interpreted with these nuances in mind.[1]

## Box 7.1. Four risk categories based on how directly different types of policies create incentives for unsustainable fishing

***High risk***

By directly reducing operating costs, support to vessel construction and purchase, vessel modernisation, and gear that enhance capacity, fuel, access to infrastructure, access to other countries' waters and preferential insurance all allow for greater use of inputs, making it possible for more vessels to fish more intensively and at longer distances. If management is ineffective, such support can increase (or maintain) levels of capacity above what is required to sustainably exploit the resource.

***Moderate risk***

Support for vessel modernisation and gear that only affects their safety or environmental characteristics, infrastructure construction and modernisation, fisher income, or the buyback of vessels or licences has an indirect and potentially less distorting impact on the economic incentives facing the sector. As a result, these types of support present a more moderate risk of encouraging unsustainable fishing in the absence of effective management but still have the potential to increase fishing effort and capacity in ways that could harm fish stocks.

***Uncertain risk***

The implications of some forms of support are not clear as they can be designed and applied in various ways with very different impacts, and are, therefore, context-dependent. These types of support, with the potential to either reduce or increase capacity and effort, resulting in positive or negative impacts on fish stock health, are classified under the "uncertain risk" category. For example, education and training can potentially reduce fishing pressure if it provides new skills for fishers and creates opportunities outside the sector. It can also reduce fishing pressure if it promotes the uptake of more sustainable fishing practices (Roberson and Wilcox, 2022[6]). However, education and training could also increase the fishing pressure if the training focused, for example, on improved efficiency in the use of vessels and gears.

***No risk***

The only types of support that do not present any risk of encouraging unsustainable fishing are those that contribute to ensuring that fish resources are appropriately managed and regulations are enforced. Where effectively implemented, they are instrumental in improving stock status (Hilborn et al., 2020[7]) by providing a better understanding of the state of fisheries resources, better aligning capacity and effort with the resources available, monitoring and controlling fishing activities, and ensuring that catches are controlled. Management, including research on fish stock health, and enforcement are essential components for effective and sustainable fisheries management and need to be provided, or at least overseen, by some level of government.

Source: (OECD, 2022[5]).

Unfortunately, in many cases, information on the policy context at the level of granularity required to determine the likely impact of specific support policies on fish stocks is not available. The OECD's risk-based approach addresses the lack of policy-level context information by highlighting the risks of a policy when there is no effective fisheries management, for stocks that are not underfished, and which do not target sustainable and sustainably managed fisheries. This approach should be considered a worst-case scenario based on the inherent risk of a specific form of support.

This approach is useful to bring policymakers' attention both to the policies that bear risks as well as to the elements of policy context they can put in place to reduce them. The approach is also justified by the general context in which fisheries are supported globally. According to the Food and Agriculture Organization's statistics, the proportion of underfished fish stocks has followed a declining trend over the last half decade, accounting for only 11.8% in 2021 (FAO, 2024[8]).

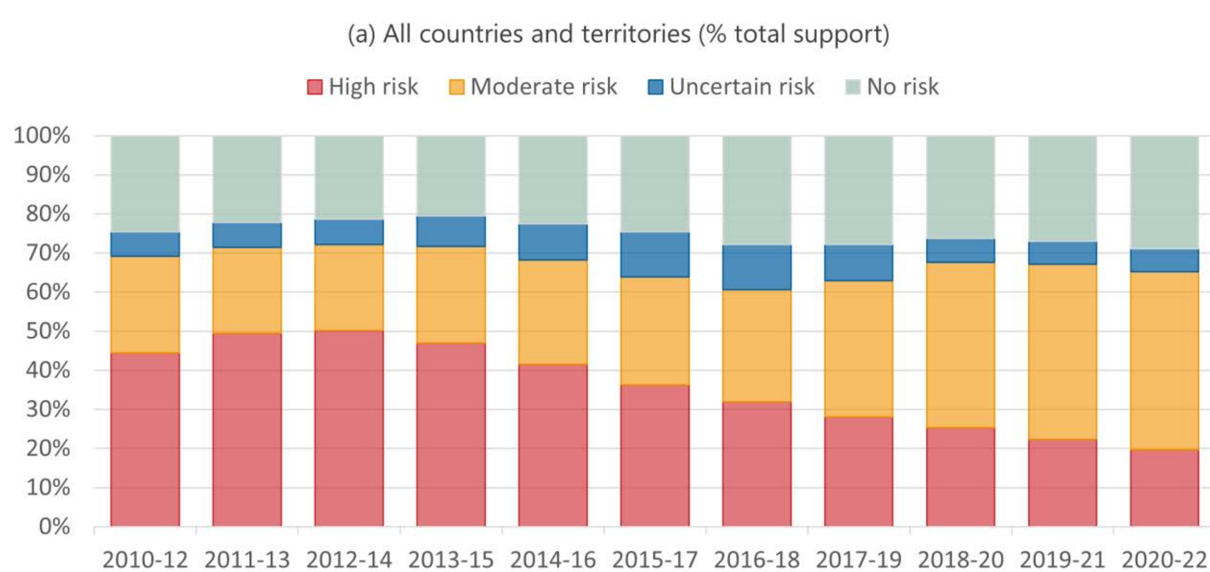
## 7.3. How has the fisheries support policy mix evolved in terms of the risks it may present to fish stock health?

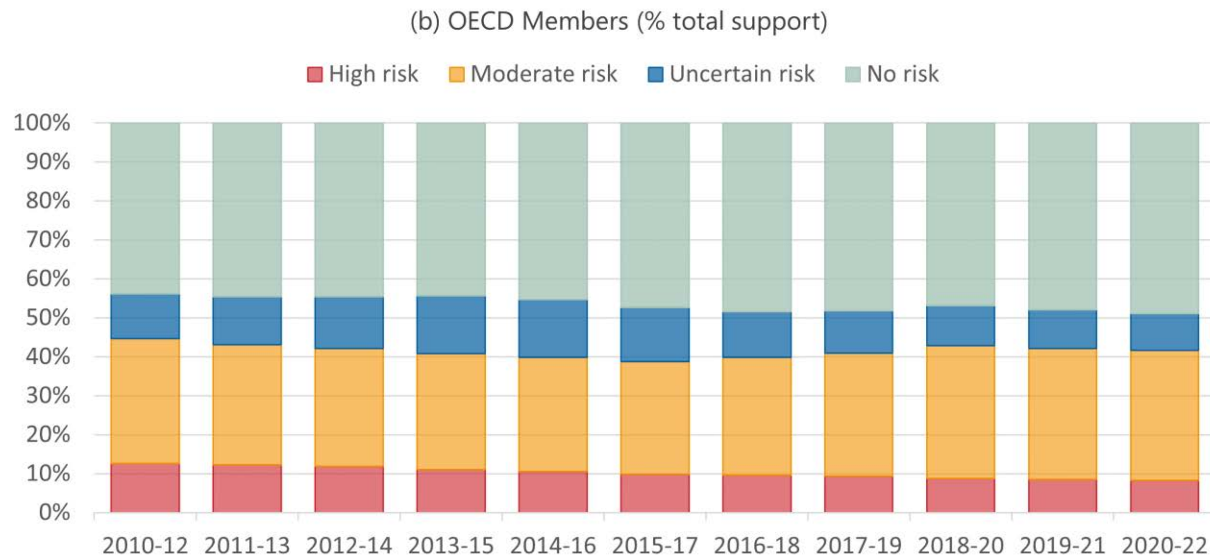
### *7.3.1. Support that presents a high risk of encouraging unsustainable fishing has declined*

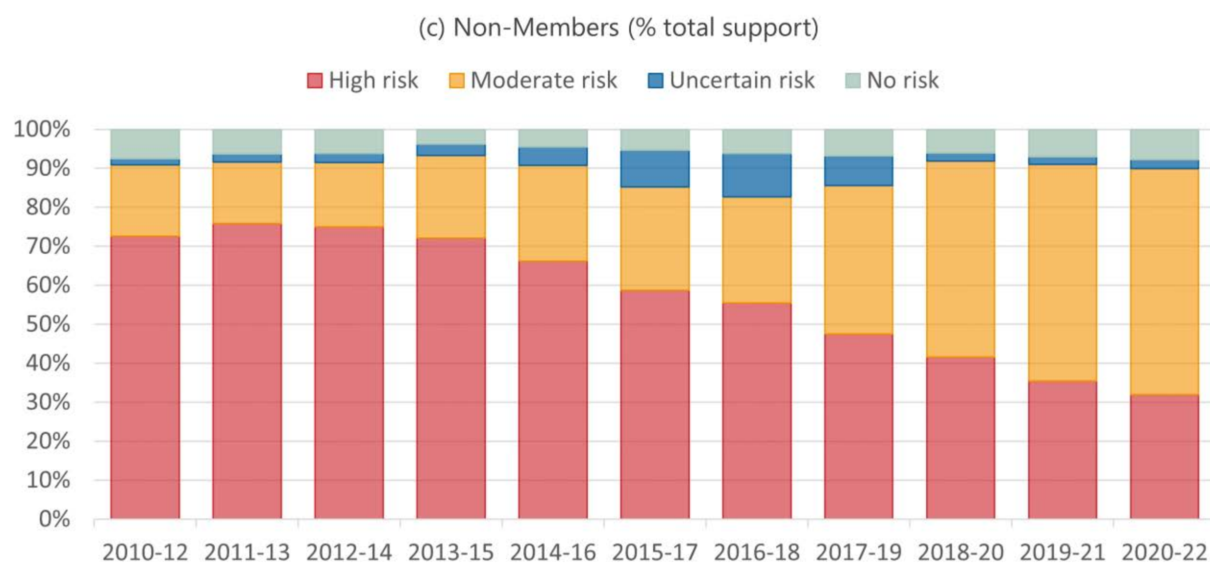
When considered through the lens of the framework, almost half of support in the FSE database for the 41 countries and territories covered in this report presents a moderate risk of encouraging unsustainable fishing (45% of total FSE, or USD 4.87 billion) over the period 2020-22 (Figure 7.2).This is followed by support that presents no risk of encouraging unsustainable fishing, which accounted for 29% of total FSE (or USD 3.10 billion) and support with a high risk of encouraging unsustainable fishing which accounted for 20% (or USD 2.12 billion, in 2020-22). A minority of support was categorised as having an uncertain level of risk (6% of total FSE, or USD 0.63 billion).

Overall, the data paints a substantially different, and improved, picture from 2010-12, when most support was categorised as presenting a high risk of encouraging unsustainable fishing (44%, USD 4.93 billion, in 2010-12), and the proportion of support with no potential risk was 4 percentage points lower (25%, USD 2.73 billion, in 2010-12). However, while the proportion of high-risk support has fallen over the last decade, moderate risk support has grown at a comparable rate. This means that in 2020-22, at least 65% of support in the FSE database still presented some risk of encouraging unsustainable fishing. This is a step in a better direction but indicates that substantial scope for policy reform remains.

**Figure 7.2. Support to fisheries by risk of encouraging unsustainable fishing in the absence of effective management, 2010-22**






Note: A lack of detailed information on policies has resulted in all spending on all support to vessels and gear being assigned to the "high-risk" category. The FSE indicators do not currently distinguish between support to vessels and gear (capacity-enhancing) and support to gear (safety and environmental impact). Across the whole data set, where information was available in the metadata, a large share of this support was capacity-enhancing (e.g. support to vessel construction in the People's Republic of China). Following the risk-based approach taken to analyse support in this section, all support to vessels and gear has been assigned to the "high-risk" category. Future revisions of the FSE structure and reporting requirements could allow for these allocations to be refined.
Source: OECD (2025). Fisheries Support Estimate (FSE).

In the OECD Members, support presenting no risk of encouraging unsustainable fishing accounted for the greatest proportion of support over the entire period and in the most recent years (49% of total FSE, or USD 2.69 billion, in 2020-22). The mix of support has been relatively stable over the last decade. The main changes between 2010-12 and 2020-22 have been a 5 percentage point reduction in the proportion of support that can present a high risk of encouraging unsustainable fishing (to 8% of total FSE, USD 0.45 billion, in 2020-22) and a 5 percentage point increase in the proportion of support categorised as presenting no risk of encouraging unsustainable fishing, driven by spending on management. Support categorised as presenting a moderate risk of encouraging unsustainable fishing has consistently been the second highest in the mix for the OECD Members (34% of total FSE, USD 1.84 billion, in 2020-22), followed by uncertain (9%, USD 0.51 billion, in 2020-22) and then high risk.

In the non-Members, the risk profile has been largely dominated by a combination of support considered to have either a high or moderate risk of encouraging unsustainable fishing (representing a total of 90% of total FSE in 2020-22, almost equal to the 91% of total FSE seen in 2010-12). However, that total proportion of high and moderate risk support evolved from being skewed towards the high-risk side in 2010-12 (high at 73%, or USD 4.28 billion, and moderate at 18%, USD 1.10 billion) to one skewed towards the moderate risk side in 2020-22 (moderate at 58%, USD 3.03 billion, and high at 32%, USD 1.67 billion). Support assessed as presenting either no risk or an uncertain level of risk continued to account for low proportions of the total (no risk 8%, USD 0.41 billion, and uncertain 2%, USD 0.12 billion, in 2020-22).

The reduction in the proportion of support that is high risk is positive for the progression towards sustainable fisheries; however, the large growth in the proportion of policies that present a moderate risk is less so. The proportion of support categorised as having no risk of encouraging unsustainable fishing has remained low and has fallen in absolute terms (from USD 0.45 billion in 2010-12). Investment in management, monitoring, control and surveillance (MMCS) and stock assessment, i.e. no-risk support, to ensure that fisheries are effectively managed is critical for reducing the risk posed by forms of support that, in its absence, pose a high or moderate risk of encouraging unsustainable fishing.

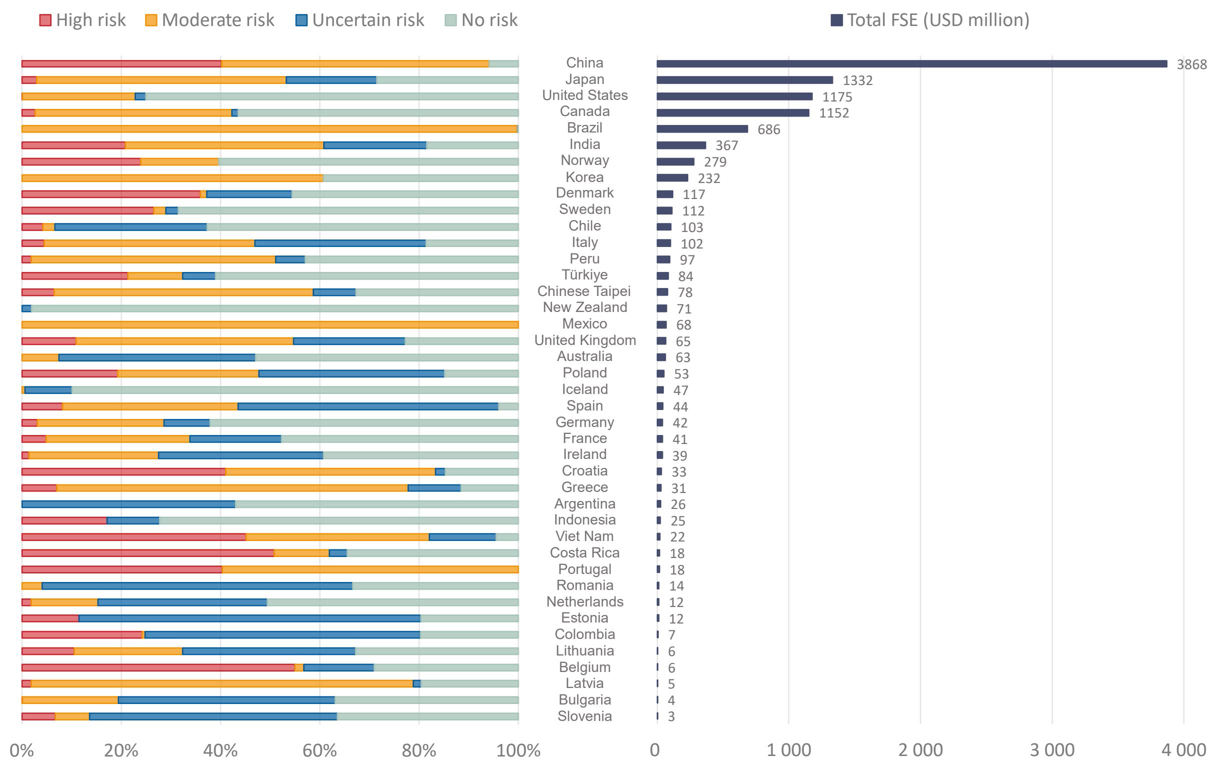
### *7.3.2. Risk profiles vary considerably at the country level*

Risk profiles vary greatly at the country level. Some countries and territories can be seen to have relatively low (or zero) levels of potentially high-risk support combined with high levels of no-risk support, while, in others, potentially high-risk support accounts for more than a third of all the support provided to their industry (Figure 7.3). In some cases, high proportions of potentially high-risk support are combined with very low levels of no-risk support, which indicates low public investment in the provision of activities such as MMCS, all essential for effective management and sustainable fisheries, and for reducing the risk that high-risk policies might effectively lead to unsustainable fishing.

Support that poses either a high or a moderate risk of encouraging unsustainable levels of fishing accounted for more than 50% of support in 15 countries and territories in 2020-22 (which together accounted for 66% of total FSE during the period). Progressing towards sustainable fisheries objectives implies a need to transition away from these forms of support, considering the case-specific policy context.

However, a considerable amount of high-risk support is being granted in the form of non-specific support to fuel that this chapter does not take into account as much of it is unreported to the FSE (OECD, 2022[5]). It should be highlighted that Croatia and Denmark voluntarily report non-specific support to fuel, something that is not done by many other countries and territories (Chapter 6). The inclusion of this information would improve transparency around the risks posed by fisheries support while also levelling the playing field for the countries that already report it.

**Figure 7.3. Support to fisheries by risk of encouraging unsustainable fishing in the absence of effective management (left) and total support (right), across countries and territories, 2020-22**




Source: OECD (2025). Fisheries Support Estimate (FSE).

## 7.4. What can governments do?

This chapter provided an overview of the fisheries support policy mix across countries and time and identified policies that would benefit from a closer examination and potentially reform to avoid detrimental environmental impact. It shows there is significant potential for eliminating potentially harmful support and redirecting public spending to services that are key to ensure the sustainability of global fisheries, with added longer terms benefits for profitability and resilience to shocks. Specifically, governments are encouraged to:

- Invest in fisheries management and enforcement. Given the critical role effective fisheries management plays in preventing unsustainable fishing, particularly where support policies can create incentives to overfish, effective fisheries management is necessary for ensuring fisheries remain sustainable and productive. MMCS and scientific research that can benefit the overall sustainability of the sector and its resilience to shocks will be increasingly important in the context of the challenges climate change will pose to fisheries worldwide. What is more, in effectively managed fisheries, that are profitable and sustainable, the need for risky forms of support from government should be minimal.
- Move away from the most risky types of support policies. As no management system is perfect, all forms of support that are known to present a potentially high risk of encouraging unsustainable fishing should be actively avoided. Even in the presence of effective management, support such as for fuel, vessels and access to infrastructure increases incentives to undermine the system by lowering costs and facilitating the ability to fish at levels above what is ideal. In addition, fuel support

has a low transfer efficiency, making it a highly ineffective method for supporting fisheries, in particular small-scale fishers (Martini and Innes, 2018[9]).2 Put simply, more of each dollar spent by governments would benefit fishers (higher transfer efficiency) and have a lower chance of acting against the sustainability of fish stocks, and fisheries, if lower or no risk forms of support were used instead of fuel support. The priority is thus to determine which policies potentially present a high risk and reassign support away from them towards lower risk support (such as management and enforcement or even income support targeted to fishers who need it most, with defined time frames to avoid expectations that it will become an ongoing form of income).

- Target support through the use of eligibility criteria to fisheries that harvest stocks demonstrated to be well managed, i.e. healthy, and fleets that are not over capacity. Such conditional provision of support is rarely, if ever, seen, but targeting support has two potential advantages. First, providing support to effectively managed fisheries (and forms of fishing) immediately reduces the risk posed by all forms of support. Second, it can create incentives for better management, enforcement and stewardship of resources, along with the climate benefits associated with reduced levels of effort.
- Begin linking data on support recipients, their fishing activities, and the sustainability of the fisheries they engage with for particular support programmes, where possible. While detailed data on the status of the stocks harvested by recipient fisheries and the management situation in each case are not readily available across all countries and territories, examining this kind of information would be beneficial to reform the programmes that might present the most risk and could also help fine-tune targeting while developing new schemes. The WTO AFS calls for greater transparency on recipients of support and the conditions in which they receive it, mandating countries to report information to the WTO at a granular level (Box 7.2). Compiling such information to comply with the WTO AFS reporting requirements would provide excellent input to support sustainability assessments.
- Increase transparency on policy design, notably for the support policies that fall under the uncertain risk category, would help better anticipate the risks they may pose to fish stock health and productivity and inform any need for reform.

### Box 7.2. Reporting requirements with regards to subsidy specifics in the WTO Agreement on Fisheries Subsidies

According to Article 8.1 of the World Trade Organization's Agreement on Fisheries Subsidies, as part of their regular notification of fisheries subsidies, Members should specify the type or kind of fishing activity for which each subsidy is provided. In addition, to the extent possible, they should also specify:

- the status of the fish stocks in the fishery for which the subsidy is provided (and the underlying science)
- the conservation and management measures in place for the relevant fish stocks
- the fleet capacity in the fishery for which the subsidy is provided
- the name and identification number of the fishing vessel or vessels benefiting from the subsidy
- catch data by species or group of species in the fishery for which the subsidy is provided.

Source: World Trade Organization's Fisheries Subsidies Agreement.

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## Notes

[1] An example of two countries that would have comparable risk profiles is Indonesia and Norway. Both countries report similar proportions of potentially high- and low-risk support. However, their policy contexts differ significantly in terms of the effectiveness of management, enforcement, control and the status of fish stocks, which means their overall risk profile is very different.

[2] Transfer efficiency can be defined as the net income gain to fishers arising from a one unit of gross transfer cost to taxpayers. As such, if fisher household incomes go up by one USD for each one USD increase in the taxpayer costs of supporting fishers, the "transfer efficiency" would be 100%.

# 8 Gender equality and equity in capture fisheries and aquaculture

This chapter reviews available evidence of women's participation in capture fisheries and aquaculture; of the persistent and long-standing barriers and systemic disadvantages women face in the sector; and of how they are affecting its socio-economic performance and sustainability. It also provides an overview of some of the policies being used to promote gender equality and equity in the sector and recommends gender mainstreaming in the analysis of sector performance as a basis for informed policymaking.

## Key messages on gender equality and equity in capture fisheries and aquaculture

- **Gender equality and equity is a fundamental human right, and it is proved to support economic performance and sustainability**. However, throughout the world, women and girls continue to face persistent and long-standing barriers and systemic disadvantages in most domains of social and economic life.
- **Evidence suggests gender inequality and inequity persist in fisheries and aquaculture**. Sex-disaggregated information and data suggest that females make up 39% of the workers in aquaculture, 37% in capture fisheries and 51% in processing. In the OECD, equivalent shares are even lower. However, these statistics should be viewed with caution, as disaggregated data are missing in many cases.
- **Lack of data is a major barrier to better understanding gender issues in fisheries and aquaculture**, making it difficult to identify solutions to promote equality and equity. Sex-disaggregated data on employment in the sector, for example, are not available for 38% of fish farmers, 66% of fishers and 63% of fish processors in the OECD Members covered in this report. This data gap is even greater at the global level.
- **Evidence from case-studies suggests that women's contribution to the sector is multifaceted** and goes well beyond their representation in officially recorded jobs, both because they are estimated to be over-represented in informal (unrecorded) jobs and because their involvement has been shown to positively impact the well-being of communities beyond the fulfilment of their work duties.
- **Women in fisheries and aquaculture face gender-based barriers** like biases, hostile work environments and unpaid household labour, limiting their participation and opportunities. Despite some progress, significant cultural and social obstacles remain, necessitating targeted, gender-specific solutions.
- **In addition, the sector presents health hazards that affect women in particular ways**, including exposure to pollutants, health risks in seafood processing, and safety issues in male-dominated environments. Addressing these gender-specific vulnerabilities is essential for protecting the well-being of women in these industries.
- **A systematic effort to research and better understand gender issues in fisheries and aquaculture in the OECD Members is needed** to complement existing research, which focuses on developing country case studies and help understand how solutions can be transferred to different contexts. Such research would benefit from a cross-sectoral perspective as policy initiatives to promote gender equality and equity are seen to come at a horizontal level.

## 8.1. What's the issue?

### *8.1.1. Gender equality and equity are key to socio-economic well-being*

Gender equality and equity[1] are fundamental human rights that contribute positively to the economy (OECD, 2024[1]). Promoting women's engagement in the economy fosters economic empowerment and enhances equality spurring economic growth, productivity and overall development (IMF, 2018[2]). Ending gender inequality can also promote the sustainability of economies and can accelerate action on climate, environmental protection and conservation (Deininger et al., 2023[3]; OECD, 2021[4]). Evidence suggests that closing gaps in labour force participation could boost the gross domestic product of OECD Members by 9.2% by 2060, which is equivalent to adding approximately 0.23 percentage points to average annual growth (OECD, 2023[5]). Studies of women's participation in agriculture have also shown that it can increase an industry's technical efficiency, meaning the effectiveness of inputs to produce outputs is maximised (Bozoğlu and Ceyhan, 2007[6]; Aung et al., 2021[7]; Sell et al., 2018[8]; Seymour, 2017[9]). Reaching gender equality is thus not just a moral imperative, but a key endeavour to move towards better socio-economic and environmental outcomes for all.

Accordingly, gender equality and equity are key international and horizontal policy objectives (Box 8.1). However, despite the increasing international attention, gender inequality continues to remain an issue throughout the world, as women continue to face persistent and long-standing barriers and systemic disadvantages in most domains of social and economic life (OECD, 2024[1]; OECD, 2023[10]).

#### Box 8.1. Key international and regional policy objectives and commitments in favour of gender equality and equity

High-level international commitments include the Convention on the Elimination of All Forms of Discrimination Against Women (UN General Assembly, 1979[11]); the Beijing Declaration and Platform for Action (adopted in 1995 (UN General Assembly, 1995[12]), which calls for specific commitments from governments on women's rights; and the United Nations Sustainable Development Goal 5, which aims to achieve gender equality and empower all women and girls by 2030 (UN General Assembly, 2015[13]).

These international commitments are also supplemented by regional level commitments and the inclusion of gender issues in other fora such as the United Nations Framework Convention on Climate Change (UNFCCC, 2024[14]). Gender equality is also a core value and a strategic priority for the OECD, as highlighted in the OECD's Contribution to Promoting Gender Equality (OECD, 2023[5]) as well as with the adoption of the OECD Recommendations on Gender Equality in Education, Employment Entrepreneurship, on Gender Equality in Public Life, and on improving the Gender Balance in the Nuclear Sector as well as the Development Assistance Committee Recommendation on Gender Equality and the Empowerment of All Women and Girls in Development Co-Operation and Humanitarian Assistance (OECD, 2013[15]; OECD, 2015[16]; OECD, 2024[17]; OECD, 2023[18]). The 2021 OECD Survey on Gender Mainstreaming and Governance showed that a number of OECD Members have reported integrating gender mainstreaming requirements and policies into strategic documentation and growing leadership commitment to gender equality commitments (OECD, 2023[5]; OECD, 2019[19]).

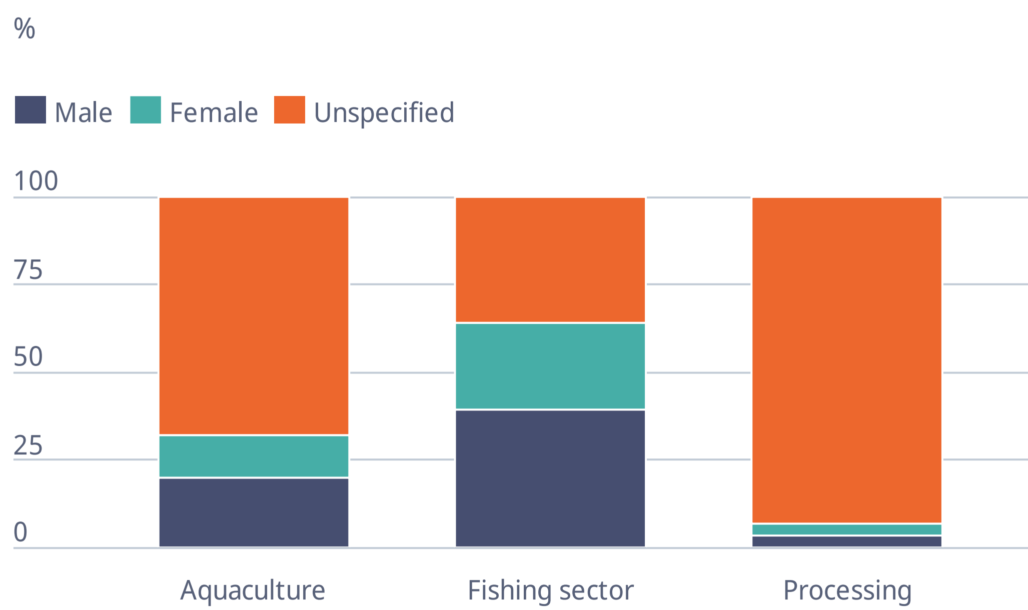
This chapter builds on discussion held during a thematic session of the OECD Fisheries Committee on gender issues in fisheries and aquaculture organised in May 2024. These discussions highlighted that new research was needed to better understand gender issues in fisheries and aquaculture in the OECD Members to complement existing research, which focuses on developing country case studies and help understand how solutions can be transferred to different contexts. The OECD Fisheries Committee has thus committed to hold regular discussion of gender issues in its plenary meetings, covering policy options that promote gender equality in fisheries and aquaculture to achieve biological, economic and social sustainability in the sector. What follows summarises what was learned in the process of documenting issues for that discussion and from the discussions themselves.

## 8.2. What do we know about the role of women and the challenges they face in fisheries, aquaculture and the seafood value chain?

### *8.2.1. Women's participation in the sector*

When information was available for the 41 countries and territories covered in this report, women represented 37% of total workers in commercial fishing, 39% in aquaculture and 51% in processing (Figure 8.1). However, these statistics should be viewed with caution, as disaggregated data are missing in many cases.[2]

**Figure 8.1. Sex disaggregation in the OECD-FAO Employment data set, 2022**




Note: The number of fish processors is not available for Australia, Belgium, Brazil, Colombia, Greece, Iceland, India, Japan, Mexico, Spain, Chinese Taipei and the United Kingdom.
Source: OECD-FAO, Employment in fisheries, aquaculture and processing.

The lack of disaggregated data is underlined in much of the literature, spanning both academic research and publications from international organisations (Elias et al., 2024[20]; Giakoumi et al., 2021[21]; Lu and Zou, 2023[22]) and is often cited as a barrier to better understanding fisheries and aquaculture through a gender lens (Elias et al., 2024[20]; Lu and Zou, 2023[22]; Kleiber, Harris and Vincent, 2014[23]; FAO, 2024[24]). Further, disaggregated data are even scarcer in small-scale fisheries than in industrial sectors (FAO; Duke University; WorldFish, 2023[25]). At the level of the OECD Members, equivalent statistics show that females make up 20% of the workers in aquaculture, 12% in fisheries and 51% in processing, although data issues remain a problem.[3]

Aggregate employment numbers mask further inequality in access to jobs and incomes for women in the sector. One key issue is the tendency for women to be over-represented in lower skilled and lower paid roles. This disparity reflects broader patterns of gender inequality and highlights the need for targeted efforts to address these imbalances (Syddall and Grant, 2023[26]; Mangubhai et al., 2022[27]; Elias et al., 2024[20]).

On the other hand, it is believed that female representation in the fisheries and aquaculture sector is underestimated in official statistics as they are often disproportionally engaged in the informal sector (UN Women, 2018[28]; FAO, 2022[29]). For example, it is estimated that women make up about half of the workforce in the value chain of the small-scale fisheries sector (UN Women, 2018[28]; FAO, 2022[29]). For the most part, women are said to be particularly present in pre-harvest activities such as net-mending (FAO, 2022[29]; FAO, 2024[24]) and post-harvest activities such as processing and subsistence activities (Merayo, Vakhitova and Carlson, 2024[30]). This work is generally unpaid or informal and often not considered to be work but the domestic role of women.

Further, the degree to which women are involved in the fishing and aquaculture sectors varies depending on the region and socio-cultural context (UN Women, 2018[28]; FAO, 2022[29]). As in other sectors, the dynamics of women's involvement can be influenced by factors such as access to resources, cultural norms and economic opportunity (Njuki et al., 2022[31]). Women also play a larger role in specific subsections of the sector. For example, reports indicate that in some regions, women often bear sole responsibility for aquaculture production due to male migration to urban areas, a pattern notably observed in some regions of Thailand and the People's Republic of China (Kusakabe, 2003[32]). Further, women have been recognised as crucial contributors in emerging sectors such as the production of seaweed, where they currently make up more than half of the workforce in both production and processing in some countries. This has made the seaweed industry an important source of livelihoods for many women. A recent report by UNCTAD (UNCTAD, 2024[33]) recognised the seaweed sector as having many promising opportunities for women's participation.

Women also play a key role in research (Merayo, Vakhitova and Carlson, 2024[30]). In fact, it is estimated that the gender gap in ocean science where women would comprise 38% of the field is smaller than the overall gender gap in science (OECD, 2021[4]). A study looking at women's participation in the ocean sciences in the European Union found that there is a relative gender balance in the early career path (PhD students and graduates); however, this gap widens in senior positions, where the proportion of female directors in marine laboratories was as low as 24% (Giakoumi et al., 2021[21]).

A number of publications report that women play an increasingly important role in ocean governance and management in various capacities, including decision making; however, overall statistics are not available for these roles (Gissi, Portman and Hornidge, 2018[34]; DFAT, 2022[35]). As society shifts and as fisheries and aquaculture policy and management become more complex, women are increasingly part of the human dimensions of these systems and are continuing to be integrated in a way that has not always been visible in the past (Calhoun, Conway and Russell, 2016[36]). This is crucial as governance regimes need to be socially inclusive to be effective and sustainable, which includes involving women in ocean governance (Gissi, Portman and Hornidge, 2018[34]; DFAT, 2022[35]).

Finally, beyond employment statistics, adopting a gender lens for analysis is changing the perceptions around women's contribution to the sector, highlighting their important roles in decision making, management and marketing, along with the multidirectional impact of their participation (Williams, 2008[37]) (Williams, 2008[37]; FAO, 2012[38])).[4] For example, women's participation in production has been found to positively impact both the physical and emotional well-being of fishing communities and their participation efforts have also found to not only contribute to environmental conservation but also strengthen community bonds and resilience to external challenges (Szaboova, Gustavsson and Turner, 2022[39]) . Another example from Oregon, United States, shows how women, often the wives of fishermen, are increasingly participating and taking more active roles at fisheries management meetings, often acting as the "ear" and "voice" while their husbands are at sea (Calhoun, Conway and Russell, 2016[36]).

Women's participation in fisheries and aquaculture has also been found to increase technical efficiency. For example, a study of small-scale aquaculture in Myanmar found that women's participation in decision making was correlated with improved technical efficiency (Aung et al., 2021[7]). Likewise, a study in Cambodia found that, in general, aquaculture ponds managed by women tended to generate higher yields (Kusakabe, 2003[32]).

Shedding light on women's participation in fisheries may even have implications for fisheries science and marine conservation. An analysis of 106 case studies of small-scale fisheries found that there is a quantitative data gap in the characterisation of gender of small-scale fisheries. Reasons for this may include such factors as limiting the definition of "fishers" and "fishing" when collecting data, where women in some instances may practice fishing activities for the home or as a supplementary income activity. It also found that qualitative data by gender (such as catch) was not recorded, or even included in data sets. This suggested that when data are not disaggregated by gender, a full picture of the fishery cannot be obtained, potentially leading to an underestimation of catch and diversity of species caught, restricting both social and ecological understanding of fisheries (Kleiber, Harris and Vincent, 2014[23]).

### *8.2.2. Gender-specific barriers to entry into the fisheries and aquaculture sector*

Women often face gender-based constraints and barriers to participation, which require gender-specific solutions (FAO, 2024[24]). The root cause of constraints and barriers for women lies in gender inequality, stemming from gender bias and entrenched social norms. These norms are intertwined with various intersecting dimensions of society, including class, age, ethnicity, religion and others. The compounding effect of these intersecting factors exacerbates inequalities (Shang, 2022[40]; FAO, 2022[29]).

More specifically, barriers to women participating in fishing and aquaculture activities can manifest as prejudices favouring men, such as when handing down family fishing businesses, a real and perceived hostile environment for women in parts of the sector, and incompatibility of fishing employment with the domestic unpaid labour expected of women in some societies (Giner, Hobeika and Fischetti, 2022[41]). Additionally, 45% of the global population believes that men should have priority for employment opportunities over women, which further reduces women's employment in the industry, particularly as many fisheries sector jobs are located in areas with relatively high unemployment (WVS, 2022[42]).

Even for the women who do participate in the sector, barriers exist that limit their earnings and opportunities to grow their businesses. For example, in most small-scale fisheries, men typically own the boats and fishing gear necessary to catch commercial species. This ownership often gives men control over household income and, as a result, access to special initiatives where ownership is a requirement, such as subsidies and fishing co-operatives (Uc-Espadas et al., 2018[43]). As a result, women are often prevented from receiving benefits such as government payments to fishers, fair pay, the ability to take decisions in fishing businesses and access to credit to grow their operations (Giner, Hobeika and Fischetti, 2022[41]; OECD, 2021[4]).

In the OECD, instances of constraints and obstacles women face are sometimes well-documented and progress is being made. For example, in 2021, several women in the Norwegian fisheries industry reported their experiences of harassment (sexual and non-sexual) in the sector. In response, the Norwegian Maritime Authority and the Norwegian Equality and Anti-Discrimination Ombud signed an agreement to intensify efforts to prevent harassment in the fisheries sector. The primary goal of this agreement is to raise awareness about harassment and provide strategies to prevent and combat it. The initiative focuses on training and educating leaders, safety representatives and union representatives within the industry (Norwegian Maritime Authority, 2024[44]).

In the aquaculture sector, barriers to entry also persist, often contingent upon cultural, social and practical norms dictating the extent of women's involvement. For instance, research has identified various factors such as religious beliefs, cultural traditions and societal expectations influencing women's participation levels. Additionally, challenges such as lack of support from family or community, feelings of inferiority, limited decision-making power, and inadequate government support have been reported in countries like Cambodia, India, Indonesia, Malaysia and the Philippines (Bosma et al., 2018[45]).

### *8.2.3. Gender-specific safety concerns*

Discussions surrounding gender issues in fisheries and aquaculture often focus on economic and social aspects, yet it is vital to recognise the potential hazards these sectors pose to women – especially when considering potential mitigation policies (OECD, 2021[4]). Marine environments are increasingly contaminated with pollutants such as marine debris, microplastics and various chemicals, all of which pose significant health risks. Pregnant women and children are especially vulnerable, as certain toxins like mercury, commonly found in fish, can have adverse effects on their health. Moreover, microplastics have been documented to traverse the placental barrier, potentially impacting the health of unborn children (Lloyd-Smith and Immig, 2018[46]).

In poor coastal communities and along shorelines, where women often work as supplementary fishers or other roles (e.g. net mending), they are at heightened risk of exposure to harmful chemicals and waste that bioaccumulate along shorelines (OECD, 2021[4]). Furthermore, women employed in seafood processing, a sector often staffed by women, frequently experience health issues, including musculoskeletal problems, due to the demanding nature of their work (S.M. Shaikh et al., 2016[47]; Tran et al., 2016[48]).

In addition, a lack of safety for women in the industry can prevent them from effectively performing their jobs, with issues ranging from male-dominated environments onboard ships to a lack of appropriate safety wear and equipment in women's uniforms/clothing sizing in some cases (AMSA, 2024[49]; MTS, 2024[50]). Acknowledging and addressing these gender-specific vulnerabilities is essential for effectively managing risks and ensuring the well-being of women who work across fisheries and aquaculture.

## 8.3. What do we know about gender mainstreaming policies and initiatives in fisheries and aquaculture?

Governments play a major role in ensuring that gender-inclusive outcomes are achieved across sectors through mechanisms such as laws, regulations, strategy setting and gender-targeted budgeting. To tackle gender imbalances in fisheries and aquaculture, policymakers are increasingly turning to gender mainstreaming, along with additional frameworks and tools that address the root causes of inequality and drive change (OECD, 2024[1]; OECD, 2019[19]).[5]

### *8.3.1. Examples of policy making for fisheries and aquaculture with gendered considerations*

The FAO database of information on national laws and regulations on food, agriculture and natural resource management, which covers fisheries and aquaculture (FAOLEX) was searched using the keywords "gender," "woman" or "women". The FAOLEX database spans 24 years (2000-24) and includes various text types: constitutions, policies, legislation, regulations and miscellaneous documents. The search identified 264 relevant policies.[6] The vast majority (97%) of policies identified originate from non-Members. While unclear, one potential reason for this may be because the vast majority of literature on women's role in the fisheries and aquaculture sectors is focused on issues of visibility in emerging economies and that research is often conducted from a development perspective (Calhoun et al., 2016; Kleiber et al., 2015).

An interesting point about the nature of policies related to fisheries and aquaculture with gendered considerations is that, from the examples listed in Table 8.1, many of the policies are not specific to fisheries and aquaculture. Instead, many of the policies in the examples below are part of broader policies, such as those aimed at gender equality more broadly or general food and agricultural policies. This highlights the potential for horizontal conversations across policy communities. It should however be noted that the FAOLEX database does not contain information on gender policies when they are legally treated at a higher (cross-sectoral) level, with no reference to food, agriculture or natural resource management.

Table 8.1 includes a selection of policies to serve as illustrative examples of the types of policies and initiatives that exist in relation to gender-related issues in activities including fisheries and aquaculture in the countries and territories covered in this report.

## Table 8.1. Examples of gender, fisheries and aquaculture policies and initiatives

| Country | Policy objective |
|---|---|
| Colombia | Law 731, effective from January 2002, aims to improve the quality of life for rural women, especially those with low incomes, by promoting gender equity. It covers a wide range of rural activities, including traditional sectors like agriculture, forestry, fishing and mining, as well as non-traditional areas such as agro-industries, microenterprises, rural tourism and handicrafts. The law seeks to empower rural women and ensure their active participation in these sectors, enhancing equality and opportunities in rural communities (Government of Colombia, 2002[51]). |
| Costa Rica | The Equality Policy for Inclusive Development in the Agricultural, Fishing, and Rural Sectors 2020-2030 Action Plan seeks to ensure that rural women have access to the necessary resources, services and opportunities for social mobility and business development. This includes equitable access to productive resources, comprehensive financial services, infrastructure, technology and innovation. The plan aims to reduce gender gaps and inequalities while promoting institutional modernisation that addresses the diverse needs of women (UNDP, 2020[52]). |
| France | Since 2013, the Cluster Maritime France has had a dedicated programme called Cap sur l'Égalité Professionnelle, which focuses on creating equality in France's maritime sectors and on encouraging more women to participate in the sector by sharing best practices; breaking down barriers; and fighting gender-based and sexual violence in the sector. The three main actions include: 1) detailed surveys; 2) producing good practice information for the sector; and 3) the promotion of the sector through programmes such as Les Elles de l'Océan, an annual event aimed at raising awareness among young girls about careers in seafaring (Cluster Maritime Francais, 2024[53]). |
| Ireland | The Food Vision 2030 is a nationwide strategy aimed at facilitating the transition to sustainable food systems, encompassing fisheries and aquaculture sectors. More specifically, the strategy advocates for an increased role for women in these sectors and proposes the establishment of networks and support systems for female farmers, fishers and rural female entrepreneurs in Ireland. Additionally, the strategy emphasises the necessity for continuous updating of education and training programmes to align with the evolving needs of the sector, highlighting the significance of lifelong and peer-to-peer learning opportunities. Furthermore, the strategy aims to promote women's participation in farming and publish gender data on policy implementation. |
| Japan | The Fisheries Basic Act – Article 28 (Promotion of Women's Participation in Fisheries) stipulates that the state, recognising the importance of both men and women, shall ensure equal opportunities for their participation in all activities as integral members of society. It mandates the fair assessment of women's roles in fisheries and advocates for the enhancement of the environment to facilitate women's voluntary participation in fisheries and related activities (Government of Japan, 2001[54]; FAO, 2022[29]). |
| Korea | The Support for Female Farmers and Fishermen Act aims to contribute to the development of agriculture and fisheries in rural communities by actively supporting the protection and rights of female fishermen and farmers, including the advancement of their status and maternity protection. Specific provisions of this act include research on conditions, management improvement, administrative support for women's organisations and the establishment of facilities (Government of Korea, 2015[55]; FAO, 2022[29]) |
| Norway | Food, People, and the Environment: The Government's Action Plan on Sustainable Food Systems in the Context of Norwegian Foreign and Development Policy underscores the critical role of women in food systems, including fisheries and aquaculture. The plan is designed to enhance women's participation across the entire spectrum of business activities (including fisheries and aquaculture). This involves offering start-up support to women entrepreneurs, fostering the establishment of women's groups within the fishing and aquaculture sectors, and facilitating improved access to loans and credit for women engaged in these industries (Norwegian Ministries, 2019[56]). |
| | Norway has an arrangement called the **Recruitment Quota Bonus**, whereby bonus quotas are equally distributed among men and women. However, the age limit is 30 for men, while it is 40 for women. Additionally, in 2024, the Norwegian government launched 12 projects with an approximate value of EUR 20 000 to promote gender equality in the sector. While the projects target both men and women, the primary goal is to increase the number of women in the fisheries sector. This includes grants to non-governmental organisations to create networking opportunities for women in the sector to enhance recruitment. |

| Country | Policy objective |
|---|---|
| Spain | In 2010, the General Secretary for Fisheries established the Spanish Network of Women in the Fishing Sector, known as the *Red Española de Mujeres en el Sector Pesquero*. The network aims to promote the role of women in the fishing industry and to advance gender equality. It includes activities such as organising congresses at the national level, monitoring, exchanging ideas and sharing best practices (Herrera-Racionero et al., 2021; MAPYA, n.d.) |
| Viet Nam | The Decree Elaboration of Some Articles of the Law on Provision of Assistance for Small and Medium Enterprises contains policies that include special provisions for women, including those involved in aquaculture. These provisions prioritise women-owned small and medium-sized enterprises (SMEs); SMEs with high female employment; and SMEs that are social enterprises as stipulated by law in sectors such as agriculture, forestry, aquaculture and industry. Additionally, the decree exempts employees of SMEs, women-owned SMEs, SMEs with high female employment and SMEs that are social enterprises from tuition fees when participating in business administration courses (Government of Viet Nam, 2021[57]). |

### *8.3.2. Disaggregated data are lacking to further integrate gender into fisheries and aquaculture policy*

Underlying gender mainstreaming as well as other approaches to integrate a gender lens into policymaking is the need for timely and quality gender data to inform their use and implementation and evaluate their effectiveness. Data are needed that consider factors like race, age, gender and socio-economic status – and how they intersect and influence access to policies – to understand and address gender-specific issues, define policy goals for gender-responsive policy making that ensures policies reflect the needs of all citizens and track progress (OECD, 2024[1]; OECD, 2023[10]). The lack of gender-disaggregated data thus presents a significant challenge for further integrating gender considerations into policy making for the fisheries and aquaculture sector.

Gender-disaggregated data are also required to effectively implement approaches such as gender mainstreaming at the relevant geographical scale. The diversity of gender roles and cultural norms across different regions means that a one-size-fits all policy response to promote the inclusivity of women in fisheries and aquaculture may not be appropriate and recognising these complexities is important when designing gender-inclusive policies.

Moreover, collecting evidence on the impact of oceans' degradation on women's health, well-being and employment opportunities, with a focus on the most vulnerable and through an intersectionality lens, would also be beneficial for better understanding women in fisheries and aquaculture. Such data would provide insights into the specific challenges women face in these sectors and inform policy measures to address them effectively (OECD, 2021[4]).

Gaps in gender data are not unique to the fisheries and aquaculture sector. For example, in areas such as environmental protection, data disaggregated by gender remains inconsistent in both OECD Members and non-Members, with less than 40% of data being gender-disaggregated (PARIS21, 2023[58]; OECD, 2024[1]; OECD, 2019[19]). Common approaches across sectors could help in developing resource-efficient methodologies for data collection. A few countries such as Finland, Spain and Sweden have already explicitly incorporated actions or commitments related to collecting data on the basis of gender or other characteristics (OECD, 2024[1]).

## 8.4. What can governments do?

There is a lack of sex disaggregated data and information on the role of women in fisheries value chains and evidence on how greater participation of women in fisheries and aquaculture could benefit the sector, and societies in general, remains scarce. This is notably the case for OECD Members, as the literature tends to focus on small-scale fisheries in developing and emerging economies (Freeman and Svels, 2022[59]; NOAA, 2020[60]). The fact that, in many places, women also play crucial roles in aquaculture and within larger seafood companies remains poorly documented (Liontakis et al., 2020[61]).

This general lack of information poses challenges for policymakers looking to address gender equality and equity in the sector. Therefore, further research and analysis are clearly needed to better understand the problems and effectively implement a gender mainstreaming approach. Key questions policymakers should consider include:

- How can the data gaps with respect to gender issues across the fisheries and aquaculture sector be closed?
- What are the broader impacts of gender inequality and inequity on women as consumers of fish and users of other ocean ecosystem services?
- What approaches have proven effective to address gender equality and equity in fisheries and aquaculture policy?

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## Notes

[1] Gender equality ensures that all genders have equal rights and opportunities while gender equity focuses on providing fair and impartial treatment based on the specific needs of each gender (FAO, 2009[62]).

[2] For the 41 countries and territories covered in the report, sex is specified in the OECD-FAO Employment data set for only 32% of fish farmers, 64% of fishers and 7% of fish processors. In the remaining cases, sex is unknown.

[3] For the OECD Members, sex was specified in the OECD-FAO Employment data set for 62% of fish farmers, 34% of fishers and 37% of fish processors.

[4] The literature also suggests that women often take the lead in diversifying income sources to ensure family earnings, particularly when the primary fishing income is under threat. This diversification includes activities such as direct sales, fish processing for higher value-added products, engaging in fishing tourism, and providing touristic services like restaurants and bed and breakfasts (Liontakis et al., 2020[61]; Frangoudes et al., 2008[63]).

[5] Based on the OECD Policy Framework for Gender-Sensitive Public Governance (OECD, 2021[4]), the OECD developed a Toolkit for Mainstreaming and Implementing Gender Equality in 2023 to provide guidance for policymakers to achieve these goals (OECD, 2013[15]). More information can also be found in the *OECD's Joining Forces to Gender Equality Report* and the *OECD's Fast Forward to Gender Equality Report*.

[6] International agreements and regional and bilateral agreements like those of the European Union and Association of Southeast Asian Nations were excluded to avoid double counting.

# OECD Review of Fisheries 2025

The *OECD Review of Fisheries 2025* monitors and analyses fisheries management and support policies in OECD Member countries and other major fishing nations to inform decision makers and help foster sustainable and resilient fisheries that can provide jobs, food, and livelihoods for future generations. The *Review* assesses the health and productivity of fish stocks and explores how fishing can be better managed. It monitors spending on fisheries subsidies, building on the OECD Fisheries Support Estimate (FSE) database, the most comprehensive and detailed collection of country-level data on government support to fisheries, and presents a framework to help governments identify where support risks encouraging unsustainable fishing. The *Review* also proposes concrete recommendations to mitigate these risks through better design and targeting of support policies. Finally, this edition discusses climate change adaptation and mitigation in fisheries, and examines some of the gender-specific issues in fisheries.

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