FISH AND SEAFOOD

Market situation

The global fishery and aquaculture sector continued to expand in 2016, albeit at a modest rate. This reflects a number of factors, including diseases in aquaculture production, *El Niño*, regulatory constraints, and the ongoing inability of capture production to continue growing under current exploitation conditions. Aquaculture was responsible for the overall growth in production as capture fisheries experienced lower catches of selected major species including anchoveta (mainly used to produce fishmeal and fish oil).

Although several exporting countries faced supply constraints, the value of international fish trade increased in 2016, recouping part of the losses registered in 2015. This growth in value terms was mainly due to improved prices for a number of highly traded seafood commodities, in particular salmon. According to the FAO Fish Price Index, international fish prices were 7% higher on average in the second half of 2016 compared to the same period in the previous year. Despite higher prices, consumer demand for fish was sustained, with an overall slight increase in per capita fish intake. Due to a revision of historical capture fisheries data new statistics indicate that since 2013 aquaculture has become the main global source of fish for human consumption, rather than 2014 as previously believed.

Projection highlights

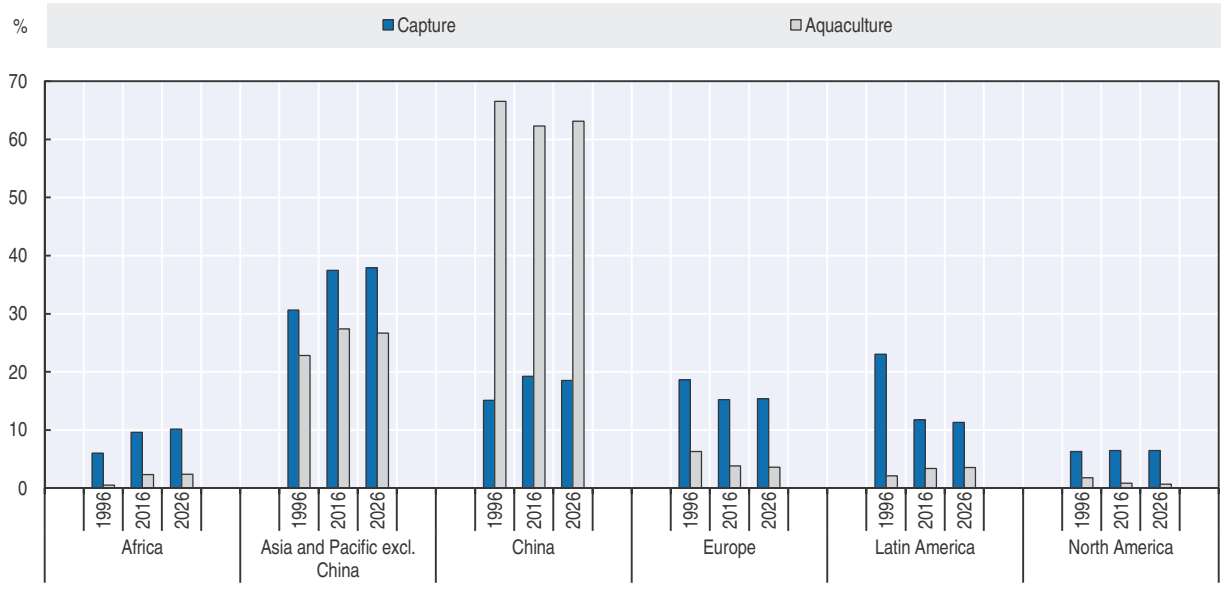
Average nominal traded fish prices are projected to continue increasing at a rate of 0.8% p.a. over the outlook period and are expected to grow by a total of 7.3% by 2026 when compared to the 2014-16 base period. Average nominal prices for both aquaculture and capture species are expected to remain relatively flat or decrease slightly up to 2020 but then begin growing up to 2026. Nominal prices for fishmeal and fish oil continue trending upwards over the outlook period with respective growth rates of 3.4% p.a. and 2.0% p.a.

Total fish production at the global level is anticipated to grow by just over 1% p.a. over the outlook period, a substantial reduction when compared to the 2.4% p.a. growth rate witnessed over the previous decade. In absolute terms total production is expected to reach 193.9 Mt by 2026, growing by a total of 15.2% (25.6 Mt) from the base period, partly affected by the assumed *El Niño* event in 2026. This slowdown is driven by the combined effect of growth rates falling in both capture fisheries and aquaculture. The annual rate of growth in world capture production is anticipated to be negative over the projected time period, at -0.1% p.a., compared with a positive 0.3% p.a. rate of growth observed over the previous decade (2007-16).

The observed slowdown in aquaculture growth is expected to continue, falling from 5.3% p.a. over the period 2007-16 to 2.3% p.a. for 2017-26. Aquaculture production is expected to surpass total capture fisheries production (including that utilised for non-food uses) in 2021, a year when capture production is assumed to be lower as a consequence of *El Niño*, and then continue to increase in absolute terms until the end of the outlook period. Global aquaculture production is anticipated to exceed the 100 Mt mark for the first time in 2025 and to reach 102 Mt in 2026. Continuing profitability as a consequence of relatively low feed prices is behind the ongoing growth of aquaculture, and profitability in the sector is expected to remain high in the short term, especially for species that require small

amounts of fishmeal and fish oil. Production of selected freshwater species, including catfish/pangas, tilapia, and carp are expected to grow fastest over the next decade, all by more than 35%, while salmon/trout and shrimp will grow by around 27% and 28%, respectively, and molluscs by around 24%.

Figure 3.6. **Regional contributions to world fish and seafood production**



Source: OECD/FAO (2017), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), *http://dx.doi.org/10.1787/agr-data-en.*

1 2 *http://dx.doi.org/10.1787/888933522111*

The share of capture fisheries production that is reduced into fishmeal and fish oil will continue to fall over the next decade, with 3.4% less fish being crushed in 2026 than the base period. Efficiency increases, that are enabling greater quantities of oil and fishmeal to be recovered from fish waste, mean that the reduced share going to crushing is not expected to affect total world fishmeal and fish oil production, which will be relatively stable (except in *El Niño* years). Production of fishmeal and fish oil from fish residue will continue to increase, both at rates of 1.6% and 1.5% p.a., respectively, over 2017-26. Between the base period and 2026 the proportion of total fish oil obtained from waste fish will grow from 35.7% to 40.1%; for fishmeal this proportion increases from 26.9% to 29.2% over the same period. With growing demand from aquaculture and a stable supply, the price of fishmeal will continue to increase relative to oilseed meals.

Fish consumed as food is expected to increase at the global level from 148.8 Mt in the base period to 177.4 Mt by 2026 but, mirroring changes in production, the rate of increase is slowing and expected to be 1.4% p.a. over the period 2017-26, down from 2.9% p.a. in 2007-16. Growth in per capita consumption is also anticipated to slow, from 1.7% p.a. in 2007-16 to 0.4% p.a. over the projection and to reach 21.6 kg in 2026. At the world level, proportionally more of the fish being produced will be consumed as food by 2026 (91.5%) than in the base period (88.4%). At the regional level, per capita consumption is expected to continue an increasing trend in the Americas and in Europe, whilst rates of growth will decline in Asia (from 2.5% p.a. over 2007-16 to 0.7% p.a. in 2017-26) and become negative in Africa (-0.3% p.a. over 2017-26). This prospective decline for Africa raises an alarm in terms of food security.

About 35% of total fish production (30% excluding intra-EU trade) is expected to be exported in different product forms for human consumption, fishmeal and fish oil. After falling in 2015-16 world trade of fish for human consumption will once again increase, at a rate of 1.5% p.a. over the outlook period and by a total of 12.9% by 2026 (5.0 Mt lw), but this rate of increase is flatter than that observed in the previous decade. Being the major producers, Asian countries are expected to continue to be the main exporters of fish for human consumption, with their share in world exports to increase from 50% in 2014-16 to 53% in 2026. During the same period, developed countries will reduce their share in world imports from 53% to 52%.

Many factors influence the evolution and dynamics of world fish markets and, as a consequence, a range of uncertainties exist when projecting into the future. For production this includes: environmental degradation and habitat destruction, overfishing, illegal, unreported and unregulated fishing (IUU), climate change, transboundary issues with respect to natural resource utilisation, poor governance, invasion of non-native species, diseases and escapes, accessibility and availability of sites and water resources, as well as to technology and finance. From the perspective of market access, issues include those related to food safety and traceability, the need to demonstrate that products are not derived from illegal and proscribed fishing operations, and uncertainties around the international trade environment in the short to medium term.

The expanded fish and seafood chapter is available at
http://dx.doi.org/10.1787/agr_outlook-2017-12-en

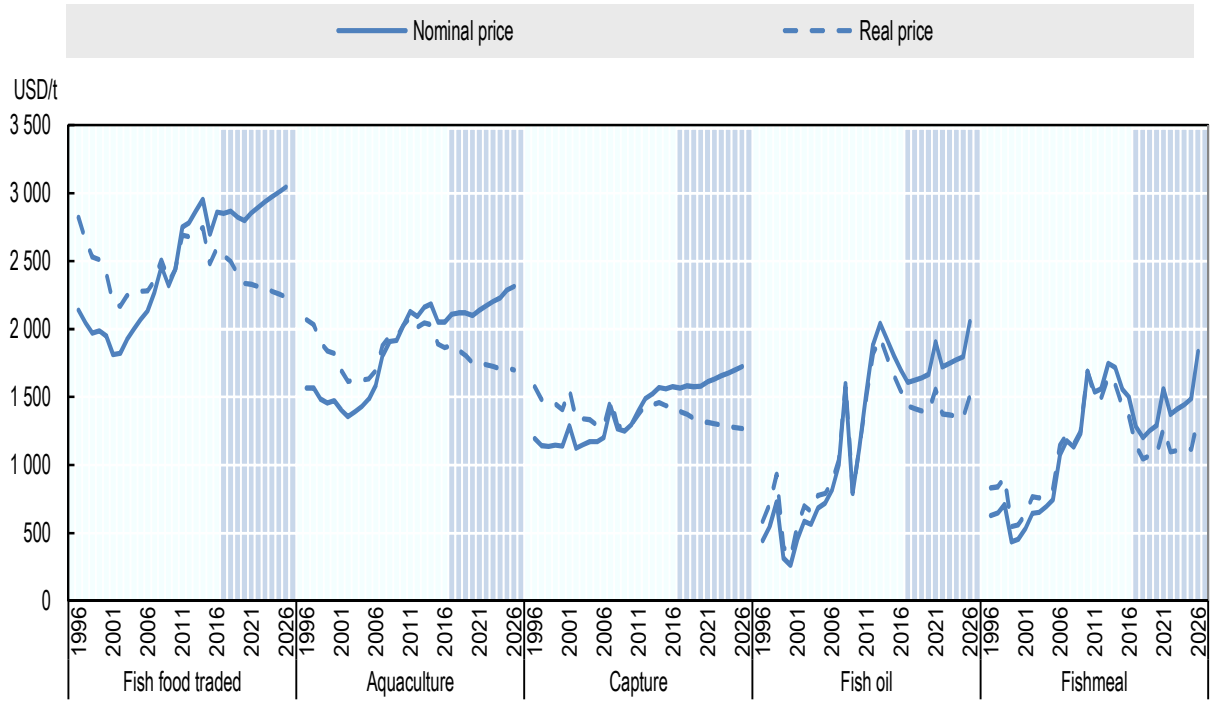
FISH AND SEAFOOD

Prices

Fish[1] prices are still at relatively high levels and in nominal terms they are expected to remain flat or fall slightly in the short term. In the medium term, after 2020, prices will once again begin to increase (Figure 3.6.1). World fish prices are determined by a range of both demand and supply side factors. Demand for fish depends on elements that include world population, income, per capita consumption, and the price of substitutes such as meat. Supply is influenced by input prices, such as energy or feed in the case of aquaculture, and for capture fisheries physical limits on sustainable levels of wild production. Continued growth in some aquaculture species also depends upon further reductions in their dependence on fishmeal produced from wild caught fish.

For both capture and aquaculture fish average nominal prices are expected to increase by around 10% by 2026 when compared to the base period. Despite constraints on further growth in capture production, the aquaculture industry's ability to focus on producing higher value species will continue to result in a higher average price when compared to capture fisheries (USD 2313/t vs USD 1725/t in 2026). Real prices will continue to fall over the projection for all groups. For wild caught fish prices are expected to fall 1.0% p.a. in real terms and result in a total decline of 12.1% by 2026. Aquaculture is expected to face a 1.1% p.a. reduction in the average real price, causing an 11.8% fall overall (Figure 3.6.1).

Figure 3.6.1. World fish prices



Note: Fish food traded: world unit value of trade (sum of exports and imports) of fish for human consumption. Aquaculture: FAO world unit value of aquaculture fisheries production (live weight basis). Capture: FAO estimated value of world ex-vessel value of capture fisheries production excluding for reduction. Fishmeal: 64-65% protein, Hamburg, Germany. Fish oil: any origin, N.W. Europe.

Source: OECD/FAO (2017), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database), http://dx.doi.org/10.1787/agr-data-en.

StatLink http://dx.doi.org/110.1787/888933522624

World prices of fishmeal and fish oil are expected to follow the price of oilseed products over time as a consequence of demand substitution. However, due to the specific feed attributes required by the aquaculture sector and continued demand for omega 3, the ratios of fishmeal and fish oil to oilseed prices have increased and will continue to increase slightly for fishmeal. Reductions in the share of fishmeal used in aquaculture feed rations and the substitution of fishmeal with oilseed meals has resulted in a sharp fall in fishmeal prices since they peaked in 2010-13. The fishmeal to protein meal ratio remains high though, despite protein meal being a substitute in many applications, a situation driven by supply constraints. The phenomenal growth of world aquaculture and the specific requirements of certain aquatic species for fishmeal has created a premium for the product over protein meal which is expected to continue to grow with the imbalance between demand and supply. For fish oil, the price ratio with vegetable oils was stable in non-*El Niño* years before the omega 3 boom resulted in a structural change and sharp price increases. Despite the sharp decline over the 2013-16 period, Fish oil prices have declined since (2013-16) but remain at relatively high levels, over the outlook it is assumed that the this new higher price difference will remain but not continue to grow (except in El Niño years).

Fishmeal is the only price where increases in annual growth rates are expected in both nominal and real terms over the projection period, increasing by 3.4% p.a. in nominal terms and 1.3% p.a. in real terms, with nominal price expected to reach USD 1835/t in 2026. This represents an increase of USD 243 per tonne compared to the base period. The price will be abnormally high in 2026 relative to oilseed meal because of the assumed *El Niño*[2] event. Like oilseed, the fishmeal price will be on an upward trend as of 2018, but since aquaculture will continue to grow significantly, the shortage of fishmeal will be exacerbated resulting in a further increase of the ratio of fishmeal to oilseed meal prices. These factors are expected to maintain upward price pressure on fishmeal and aquaculture over the medium term.

Following a short period of increase in 2015-16 the average nominal price of traded fish products also flattens out and then falls slightly until 2020. After this point, nominal prices recover to ultimately increase by 7.3% in 2026 when compared to the base period, a total of USD 206 per tonne (from USD 2 837 in 2014-16 to USD 3 043 in 2026). In real terms, traded fish prices will fall by 1.3% p.a. over the duration of the projection, finishing only marginally above the low point observed in 2002 and 19% below the peak of 2014.

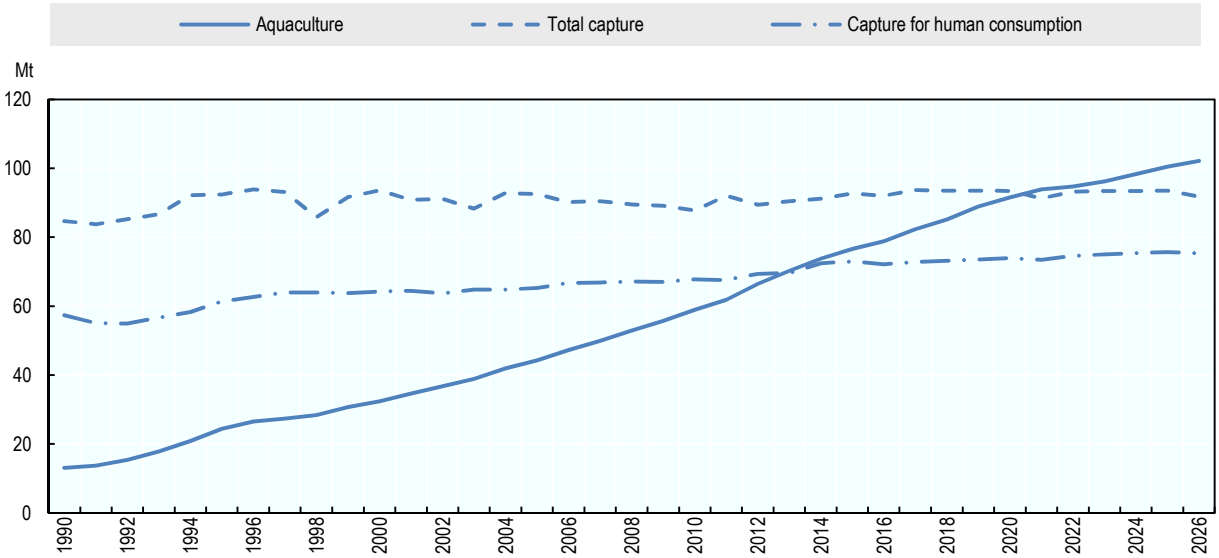
Production

The total quantity of fish produced at the world level is expected to increase 15.2% from 168 Mt in the base period to 194 Mt by the end of the outlook. As in the past, the vast majority of this will originate from Asia, which increases its share from 71 to 73% of global production and is expected to produce slightly less than 23 of the 26 Mt overall increase. While global fish production is still increasing in absolute terms over time (+15% over the outlook), the rate of growth is down substantially when compared to the 25% increase in global fish production achieved over the previous decade. This is the consequence of lower growth rates in both the capture (-0.1% p.a., partly influenced by the assumed *El Niño* event in 2026) and aquaculture sectors (2.3% p.a.) when compared to the previous decade (capture 0.3% p.a., aquaculture 5.3% p.a.). In general, the established pattern of capture fisheries production remaining stable and aquaculture growing is seen once again (Figure 3.6.2).

Increases in global aquaculture production have been the driving force behind the growth of global fish production for at least the last three decades and this will continue into the future. The 34% increase in aquaculture production projected to take place by 2026 means that aquaculture will finally overtake total wild fisheries production (food and non-food uses) by the middle of the projection period (in 2021) and will be another significant milestone for global aquaculture production when it is achieved. Associated with the increasing role of aquaculture in world fish supply is a closer relationship with agriculture and the supply of fish becomes more responsive to shocks as a consequence. Global fish supply will however still remain much less responsive than agriculture in the medium term due to the large proportion of supply that still originates from capture fisheries which is less integrated with agriculture and for the major part fixed by fishing quota. This will dampen the effect of price shocks on quantity, but will exacerbate quantity shocks on prices over the next decade.

As the situation of reduced feed prices is only anticipated to persist in the short term, general profitability in the aquaculture sector is expected to moderate in the medium term, ultimately stabilising at levels above those seen during the period of high feed prices (2006-2013). This will have least impact on the production of aquaculture species that do not require, or have low dependence upon, feeds comprised of fishmeal and fish oil and has resulted in the production of catfish, pangas, tilapia and carp growing fastest over the next decade. The production of species that require higher proportions of fishmeal and fish oil in their diets are expected to grow more slowly. Recent developments to the underlying fish model now allow the main aquaculture species to be identified and their individual importance assessed at the regional level in terms of both absolute change and rates of growth (Figure 3.6.3).

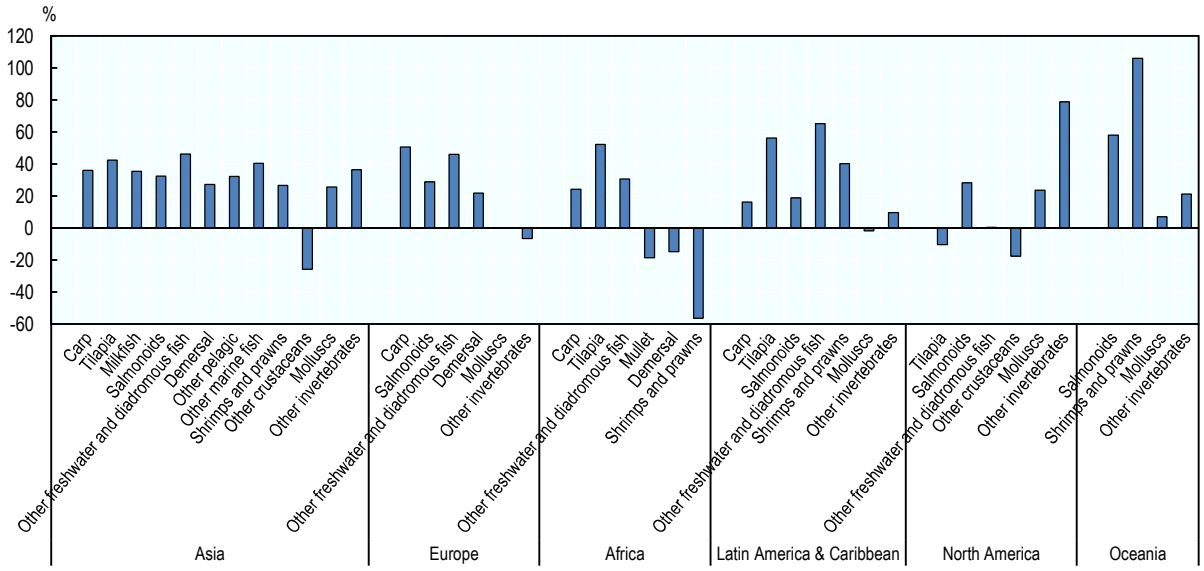
Figure 3.6.2. Aquaculture and capture fisheries



Source: OECD/FAO (2017), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database), http://dx.doi.org/10.1787/agr-data-en.

StatLink *http://dx.doi.org/10.1787/888933522738*

Figure 3.6.3. Growth in world aquaculture production by region and species, 2026 *vs* 2014-16



Source: OECD/FAO (2017), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database), http://dx.doi.org/10.1787/agr-data-en.

StatLink *http://dx.doi.org/10.1787/888933522757*

The continued slowdown in aquaculture growth is expected to persist and follow broadly the same trend over the duration of the projection. A range of factors are contributing to lower rates of growth at the global level and include increasing environmental regulation, animal diseases related to intensive production practices, a shortage of suitable production locations, and falling productivity gains. In less developed areas factors such as insufficient transportation links, poorly documented supply chains and inadequate hygiene or health controls can further limit the ability of producers to grow and increase production by reducing competitiveness or denying them access to global markets. Focusing only on relative measures of change is potentially misleading though as the rate of growth is also slowing as a consequence of the increasing size of the industry and the base that growth rates are calculated against gets progressively larger. For example, lower growth rates in the 2010's when compared to the 2000's hide the fact that in absolute terms production has increased by 29.8 Mt during the 2010's and by 23.3 Mt in the 2000's.

Over the next decated it is expected that world capture fisheries production will fluctuate between lows of 91.3 Mt in *El Niño* years and highs of 93.7 Mt in the best fishing years (Figure 3.6.2). This is a higher maximum level of capture fisheries production than seen in the previous decade and is the result of a combination of improved catches in some fishing areas (due to improved management regimes in some cases but increases in effort in others), higher market prices and new regulations stimulating reductions in discards and waste aboard vessels. It is assumed that quotas will be filled on the whole and as such there is little room for further increases in the level of wild fisheries production. It is assumed that *El Niño* will occur in 2021 and 2026, in each instance this reduces capture fishery production in South America and global supply of fishmeal and fish oil, resulting in world capture production falling approximately 2% (about 2 Mt) in these periods.

After falling in the previous decade, world levels of production are projected to increase by 7.7% (0.34 Mt) for fishmeal and 5.0% (0.04 Mt) for fish oil. Demand pressure and high prices for fishmeal and fish oil continue to create strong incentives for efficiency with respect to their use as factors of production. A growing share of fishmeal is being obtained from fish waste, alleviating some of the pressure on capture fisheries, and the share of capture fisheries production being reduced into fishmeal is expected to stabilise at around 16% in non-*El Niño* years over the projection. Higher incomes at the world level are also creating more fish waste to be used in the production of fishmeal, as people are consuming an increasing quantity of processed and filleted fish products.

Consumption

During the next decade, demand for fish is expected to continue to grow. In addition to increased production, greater consumption will be stimulated by improvements in post-harvest methods and distribution channels expanding the commercialisation of fish. Being highly perishable, these improvements are both particularly significant for fish as it requires specific handling and preservation techniques. Demand will also be fuelled by ongoing changes in dietary trends, which point towards a greater variety in food choice along with increased health, nutrition and diet concerns. At the same time consumers are becoming more aware of the nutritional value of fish as a relevant source of protein and valuable micronutrients. World fish food[3] consumption is projected to increase by 19% (or 29 Mt live weight (lw)) in 2026 compared to the base period, at a slower pace than that experienced in previous decades. This slowdown is mainly due to a reduced production expansion, higher fish prices, in particular in the latter half of the projection period, and a deceleration in population growth.

Of the 177 Mt available for human consumption in 2026, the lowest quantities will be consumed in Oceania and Latin America. Asia is expected to consume 127 Mt, more than two-thirds of the total, and to continue to dominate growth in consumption, accounting for 76% of the additional fish consumed by 2026. Total fish food consumption should rise in all continents, by 2026 compared to the base period, with major growth expected in Oceania (+31%), Africa (+24%) and Asia (+21%).

Growth in demand will stem mostly from developing countries, which will be responsible for 93% of the increase in consumption and will consume 81% of the fish available for human consumption in 2026. In addition to growing populations, demand in developing countries will also be strengthened by income growth and urbanisation, which will push the intake of animal proteins, including fish, at the expense of foods of vegetal origin. Overall, developing countries will increase their fish food consumption by 23% by 2026 over the average level for 2014-16, but at a slower rate when compared to the previous decade (from 3.9% p.a. to 1.7% p.a.). Conversely, in developed countries, with already high initial levels, food fish consumption is expected to show little growth (+6.1% by 2026 compared to the base period), mainly due to slowdowns in population and economic growth, together with ageing populations. However, compared to the previous decade, the annual growth rate will increase slightly (from -0.1% p.a. to +0.4% p.a.).

Despite the substantial growth in fish food consumption, on a per capita basis, fish consumption in developing countries will continue to remain below that of more developed regions (21.2 kg compared with 23.3 kg in 2026). Overall, a sizeable and growing share of fish consumed in developed countries will consist of imports, owing to

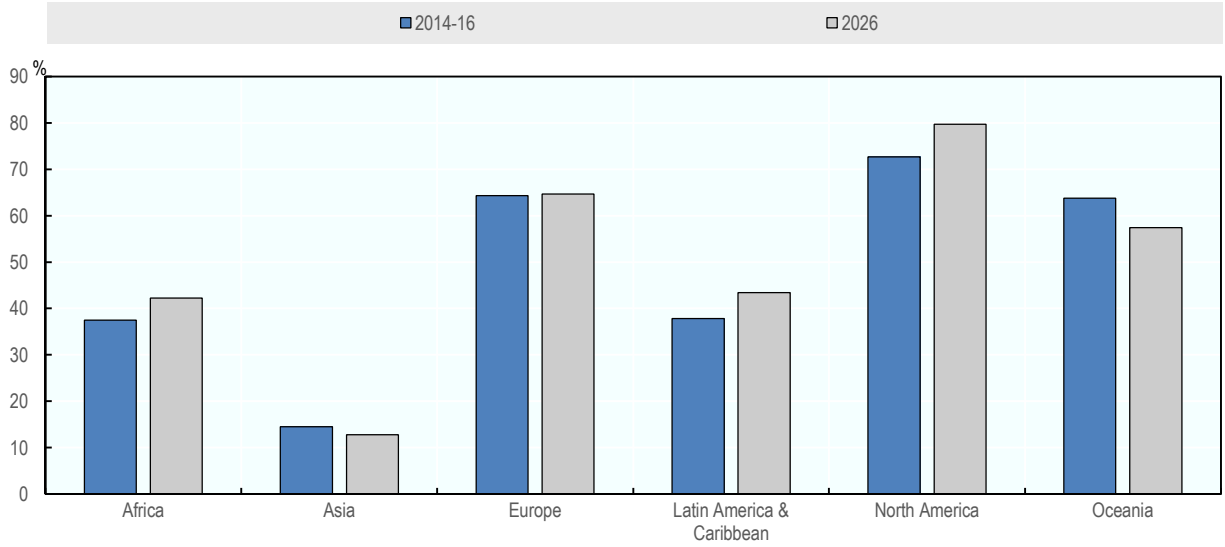
steady demand and declining domestic fishery production. At the regional level, the share of fish imports in food fish consumption (Figure 3.6.4) will be at about 78% in North America and 63% in Europe.

Per capita fish consumption should rise on all continents, except in Africa where population growth will outstrip its increasing food fish supply. In Africa, per capita fish consumption followed a positive trend over the period 1994-2011, but subsequently flattened out and began to gradually decline from 2014. This observed fall in per capita consumption should continue in the next decade as in many African countries the preceding growth in fish consumption was mainly achieved through increased domestic production of capture fisheries and imports. In the next decade, it is not expected that capture production will continue at the current path rates. The region's dependency on fish imports in food fish consumption is expected to rise from 37% in the base period to 41% in 2026, but this growth, together with increased expansion of aquaculture production (+38% in 2026 compared to the 2014-16 base period), will only partially mitigate the population increase and the constraint on supply from capture fisheries. One of the few exceptions will be Egypt where aquaculture production is already substantial and expected to grow further.

In Africa per capita fish consumption is expected to decline by 0.3% p.a. during next decade, decreasing from an average of 9.8 kg in the 2014-16 base period to 9.4 kg in 2026. In Sub-Saharan Africa the decline will be even more striking, going from 8.7 kg to 8.1 kg over the same period. This prospected decline for Africa raises an alarm in terms of food security. Even if current per capita fish consumption in Africa is lower than the world average, fish plays a major role in the region providing very valuable micronutrients and proteins. On average, fish represents about 19% of total animal protein intake and this can be higher than 50% in selected African countries.

Despite the increased availability of fish to most consumers, the rise in fish consumption will not be homogenous among countries and within countries in terms of the quantity or variety consumed. This heterogeneity reflects different dietary patterns that depend upon individual purchasing power, income elasticities of demand, cultural preferences, social behaviours, availability, accessibility as well many other factors including infrastructures and marketing facilities. A growing share of fish consumption is expected to originate from aquaculture production, which is projected to represent 58% of the total food fish consumed in 2026 (Figure 3.6.5.) and to continue to push the demand for, and consumption of, species that have shifted from being primarily wild-caught to being primarily aquaculture-produced.

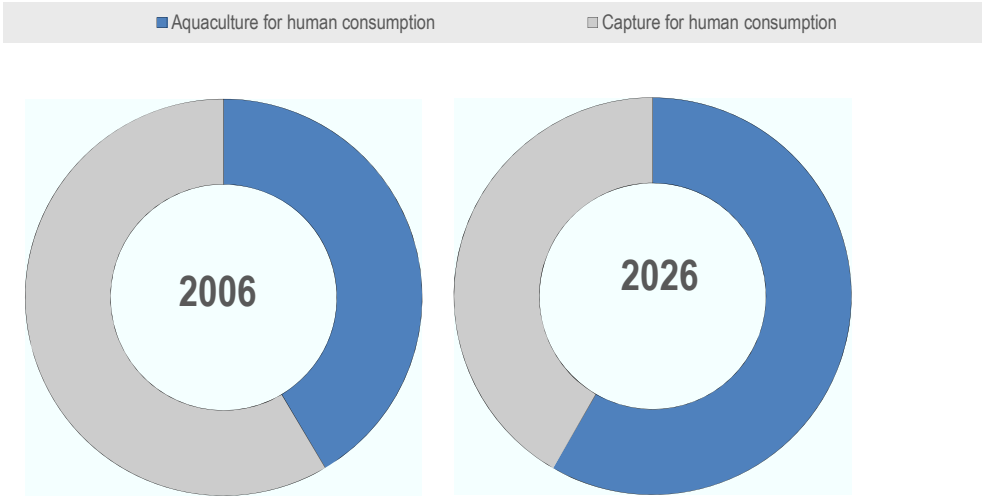
Figure 3.6.4. Share of imports in food fish consumption



Source: OECD/FAO (2017), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database), http://dx.doi.org/10.1787/agr-data-en.

StatLink http://dx.doi.org/10.1787/888933522776

Figure 3.6.5. Share of aquaculture in total fish food consumption, 2006-2026



Source: OECD/FAO (2017), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database), http://dx.doi.org/10.1787/agr-data-en.

StatLink http://dx.doi.org/10.1787/888933522795

Consumption of fishmeal and fish oil will be constrained by their rather stable production. Markets will continue to be characterised by traditional competition for the use of fishmeal between aquaculture and livestock and between aquaculture and dietary supplements for direct human consumption for fish oil. The amount of fishmeal and fish oil in aquaculture feeds is expected to continue its downward trend due to high prices and major innovation efforts. Fishmeal and fish oil will be more frequently used as strategic ingredients to enhance growth at specific stages of fish production. The reduction in fishmeal use has already created a new market for oilseed meals in the aquaculture industry, where oilseed meal use is expected to reach 9 Mt in 2026. The use of fishmeal as feed is anticipated to remain concentrated in China, which should represent over 40% of the total in 2026. Fish oil is still expected to predominantly be used in the aquaculture industry, but also processed for direct human consumption as it usually obtains a better price in this market.

Trade

Fish and fishery products are expected to continue to be among the most traded food commodities worldwide. Sustained demand, trade liberalisation policies, globalisation of food systems including outsourcing of processing – improved logistics and technological innovations will further expand international fish trade, even if at a slower pace in the next decade compared to the previous one. Trade of fish for human consumption is projected to reach 44.0 Mt (lw) in 2026, up 13% from the base period, but lower than the 23% growth of the previous decade (2007-16). This is partly due to slower expansion of production, stronger domestic demand in some of the major producing countries, combined with rather high fish prices, which will restrain overall fish consumption. Aquaculture will contribute to a growing share of international trade in fishery commodities for human consumption.

Traditional exporting countries are expected to maintain a high share of the global fish trade and further strengthen their strategic position within the structure of international trade of fish for human consumption. By 2026, besides being the major producers, Asian countries are expected to remain the major exporters, accounting for 74% of the additional shipments and further increasing their share in world exports for human consumption from 50% to 53% as a result of growing investment in the aquaculture sector. China will consolidate its leading role as a global major exporter of fish for human consumption, with a 23% share of world exports in 2026 (20% in 2014-16), followed by Viet Nam (from 7% to 8%) who will overtake Norway (consolidating its 7% share), and Thailand (from 5% to 6%). In contrast, the share of exports from European Union countries will weaken over the outlook period (from 6% to 5%) as will those of OECD countries (from 33% to 32%) and American countries (from 18.3% to 17.9%).

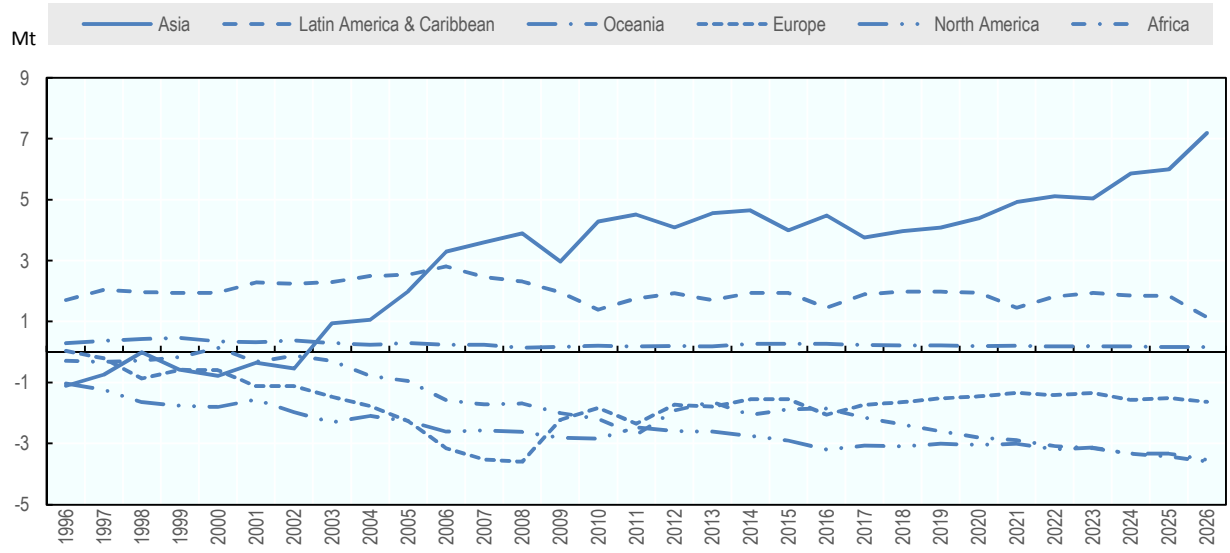
Developing countries will continue to be well integrated in the global trade of fish for human consumption and will account for 73% of the additional fish exported in 2026, relative to the base period, and they will increase their share in total world exports from 67% to 68% by 2026. In contrast, the position of developed countries as the world's major fish importers, while still significant and showing an increasing growth rate (from 0.2% p.a. to 0.9% p.a in 2026), will continue to weaken through the outlook period declining from 53% to 52% of total imports. Developed countries are expected to continue to account for a greater proportion of world trade in terms of value (between 60-70%) given that they import species of higher value. By 2026, developing countries will increase their imports of edible fish by 18%, compared to the base period. These imports will consist of fish for domestic consumption, particularly in emerging economies, as well as unprocessed fish to be used as raw material for their processing industries and to be subsequently exported.

OECD countries will consolidate their position as the leading importers of fish for human consumption and will be responsible for 47% of the overall growth in world imports by 2026. This is despite their share of world imports decreasing slightly, from 54% to 53%, over the same period. The European Union will represent the largest single market with a share of 20%, followed by the United States (14%) and Japan (8%). Imports to these markets are all expected to increase over the next decade: +8%, 22% and 1%, respectively.

In Figure 3.6.6, trade of fish for human consumption is represented in terms of net-exports, with negative numbers representing net-imports. The net imports of Africa are expected to increase substantially over the Outlook period, implying an increasing import dependency, which can expose the region to greater variability and vulnerability in case of shocks and unexpected increases in prices in global markets. North America and Europe are expected to remain major net importers, while Latin America and in particular Asia will consolidate their net export positions.

Trade of fishmeal is projected to remain rather stable throughout the projection period, growing only 7% to reach 2.7 Mt (product weight) in 2026. However, a factor contributing to this limited growth is the assumed 2026 *El Niño* event, which causes a contraction of fishmeal and fish oil production in that year. Peru will remain the leading exporter of fishmeal, but its share in total exports will decline from 29% to 27% over the outlook period. Asian countries will expand their imports of fishmeal by 11% by 2026 compared to the base period and their share of the total will increase from 67% to 77% by 2026 due to their sizeable aquaculture production. Fish oil exports are projected to decrease by 4% over the period under review. European countries will remain the leading importers of fish oil, which will be used for their salmon industry and also as a food supplement. They will have a 57% share of world fish oil imports, with Norway accounting for 31% of those imports by 2026.

Figure 3.6.6. Net-trade of fish for human consumption



Source: OECD/FAO (2017), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database), http://dx.doi.org/10.1787/agr-data-en.

StatLink http://dx.doi.org/10.1787/888933522814

Main issues and uncertainties

The medium-term fish projections analysed in this chapter are a conditional scenario of likely developments based on a number of specific economic and policy assumptions. These include the macroeconomic environment, international trade rules and tariffs, frequency and effects of *El Niño* phenomenon, absence of abnormal fish-related disease outbreaks having an impact on aquaculture production, fishery quotas, longer term productivity trends and the absence of unforeseen market shocks. Should one of these assumptions change, the resulting fish projections would be affected. In addition, a number of uncertainties remain and many factors can affect the projections for the fisheries and aquaculture sector.

The sustainability and productivity of the fisheries and aquaculture sector face a number of challenges. With the exception of the impact of *El Niño*, which has been accounted for by the fish model in 2021 and 2026, this *Outlook* assumes normal weather conditions. However, climate variability and change, and extreme weather events, represent compounding threats to the sustainability of capture fisheries and aquaculture development in both marine and freshwater environments (FAO, 2016a). Climate related disruptions to aquatic ecosystems can reduce the resilience of production systems and contribute to natural resource degradation as a result of both gradual atmospheric warming and associated physical and chemical changes of the aquatic environment (IPCC, 2013). Quantifying such impacts on future fish supply and consumption is complex to determine, as climate change events will affect different regions with varying intensity and characteristics. The magnitude of the changes is expected to be more evident at the country and regional level, rather than globally, and also to have an effect on the availability and circulation of fish goods. Climate change will affect the distribution of marine species, with their distributions shifting to follow thermal preferences or avoid low oxygen zones (Pörtner, H.-O. et al., 2014), and the composition of ecosystems and the dynamics of predators and prey relationships changing as a consequence. The sizes of fish populations, reproductive cycles and/or survival rates are also anticipated to be at risk of changing. In addition, altered riverine flows and freshwater runoffs, and changing coastal and freshwater quality, are expected to affect ecosystem productivity and species dominance. Coastal systems are especially vulnerable to multiple stressors from temperature increases, hypoxic zones, acidification, and extreme (weather) events such as sea level rise and storms. The repercussions are expected to be more relevant for fishing-dependent communities that rely on fish for food and livelihoods (Barange, M., et al., 2014) and in particular for those living near climate-sensitive environments. In these areas, climate change adaptation and mitigation clearly constitute a high priority. The impacts are also expected to affect aquaculture, including through the gradual warming and acidification of seawater, sea level rise and resultant salt water intrusion, and extreme events such as changes in the frequency, intensity and location of storms (De Silva and Soto, 2009). Climate change will affect not only fish production but the entire value chain, especially in relation to essential infrastructure, essential inputs and the services required to fish and undertake aquaculture activities. It is also expected to alter fish prices, trade and consumption, by changing competitiveness and patterns.

These possible events take place in the context of other global social and economic pressures on natural resources and ecosystems, including environmental degradation and increasing land and water scarcity. New climate adaptation approaches will likely have to be integrated into the processes of improving fisheries governance. Action may also be required to ensure the conservation of aquatic ecosystems and safeguard stocks and productivity through technological innovation, investment in R&D and a more closely controlled approach to fisheries management. Fisheries and aquaculture hold great potential, but sustainability is key to continuing success in all subsectors. Policies should be focused on enhancing equitable, productive and sustainable natural resource management and utilization, also through a reduction of natural resource degradation and conservation of genetic resources.

Increased risk from invasive species and the spread of diseases raise additional concerns. As water temperatures rise, a number of diseases endemic to both wild and farmed fish populations are expected to become more prevalent, and threats associated with exotic pathogens may rise, especially when species become increasingly stressed as their thermal optima are exceeded (De Silva and Soto, 2009; Gubbins, Bricknell and Service, 2013). Fish diseases could have major impacts on supply, demand and trade within domestic and international markets, since resulting trade restrictions might alter markets for extended periods of time. Consumer concerns related to issues such as animal welfare, food quality, production and processing methods may further cause uncertainties in the fish sector. From a trade perspective, for small-scale fish producers and operators wishing to penetrate international markets and distribution channels stringent quality and safety-related import standards, together with requirements for products to meet international animal health, environmental standards and social responsibility requirements, may act as barriers and represent challenges to growth. Future prices might also be influenced by the growing introduction of more rigorous regulations related to environment, food safety, environmental traceability and animal welfare regulations.

During next decade, capture fisheries production is projected to remain stable. Yet, the effective prospects of capture fisheries are difficult to determine given the many variables and uncertainties. The overcapacity of fishing fleets globally and IUU fishing (Box 3.6.1) are also important threats that affect the sustainability of fisheries resources and negatively impact economic efficiency and product quality. Effective fisheries management policies should be implemented in order to reduce pressure on overexploited stocks. In this respect, it is important to mention the objectives of Sustainable Development Goal (SDG) 14 "Conserve and sustainably use the oceans, seas and marine resources" (UN (2015), and in particular the components relating to IUU (SDG 14.4) and subsidies (SDG 14.6) which all have a target date of 2030. Subsidies are also currently considered a "critical area for action" at the World Trade Organization (WTO), where an outcome on fisheries subsidies is hoped for at the organisation's Eleventh Ministerial Conference (MC11) taking place in December 2017. Progress in these areas of management has the potential to change total fisheries production over both the short-to-medium term (possible reductions) and long term (increases).

Future growth in fish production is expected to come predominantly from aquaculture. The industry is expected to continue to grow through intensification, species diversification, expansion into new milieus, including moving further into offshore marine waters, and through the introduction of innovative, more resource-efficient farming technologies. However, weak management of this sector's development and intensification could result in production growing more slowly than expected. Many factors have the potential to affect the prospects of this sector, including scarcity of land and water and associated conflicts, feed, seed[4] supply and genetic resources, environmental integrity and disease risks, development and adoption of new and improved farming technologies, market, trade and food safety, climate change and investment capital impediments and problems that can originate from unmonitored aquaculture practices. The significance of growth limiting factors varies by area, in developing countries inadequate environmental policy and enforcement tends to be a higher risk than in developed countries where factors such as competition for space and regulatory burden may pose greater constraints. Nevertheless, the way in which policies are developed and applied will be critical in all contexts if these challenges are to be overcome and aquaculture is to reach its potential in a sustainable manner (OECD, 2015).

Fishery and aquaculture projections presented in this *Outlook* for the European Union do not take into consideration the effects of implementing the new Common Fisheries Policy (CFP). This may increase European Union capture fisheries and aquaculture production over the next decade, but as the exact effects are still difficult to predict they have not been formally included in the assumptions. The CFP was first introduced in the 1970s and has gone through successive updates, the most recent of which took effect on 1 January 2014. It covers different aspects of the fisheries and aquaculture sector. The CFP is a set of rules for managing European fishing fleets and for conserving fish stocks. The CFP aims to ensure that fishing and aquaculture are environmentally, economically and socially sustainable. The current policy stipulates that between 2015 and 2020 catch limits should be set to ensure sustainability and to maintain fish stocks in the long term.

Box 3.6.1. The global threat of illegal, unreported and unregulated (IUU) fishing

IUU fishing refers to fishing that takes place in contravention of national laws or internationally agreed management measures. It is estimated to account for up to 26 Mt annually (Agnew, 2009), in addition to the amount reported for capture fisheries production (92 Mt in 2016 in this Outlook). IUU is conducted everywhere around the world and is believed to be a significant factor contributing to the overexploitation of fisheries resources.

Besides resulting in reduced landings, revenues or profitability for legal fishers, IUU fishing undermines effective management systems and can threaten local biodiversity, have an adverse effect on the marine ecosystem, lead to the collapse of local fisheries, and reduce productivity and ecosystem resilience. In turn this can negatively affect social welfare, in particular that of legal fishers subject to unfair competition but also that of other stakeholders in the fisheries sector. More broadly, IUU also has the potential to exacerbate poverty and food insecurity.

Weak legal and governance frameworks, together with the lack of sufficient political will, have been major impediments to tackling IUU fishing (FAO, 2016b). Due to the trans-boundary nature of fish stocks, the mobility of fishing fleets and the globalization of markets, no single strategy is sufficient to eliminate or reduce IUU fishing: a concerted and multi-pronged approach is required nationally, regionally and internationally, and by type of fishery (OECD, 2005).

Over the years, the global community has developed a framework of international instruments that represents a powerful suite of tools that can be used to combat IUU fishing. An important part of those instruments is the result of cooperative and binding agreements in the context of RFMOs (Regional fisheries management organisations), and are based on the main principles of the Law of the Sea. Among those principles, the primary responsibility of the flag State towards vessels under its jurisdiction is a pillar to ensure the enforcement of appropriate conservation and management measures adopted by the RFMOs. The role of the States is also a key driver in combatting IUU fishing. The 2009 FAO Agreement on Port State Measures (PSMA), which entered into force on 5 June 2016, is expected to be a key driver in the fight against IUU fishing, whereby States shall prevent foreign vessels engaged in IUU fishing from entering their ports and/or using port facilities and landing their catches. Furthermore, major importing markets of fish and fishery products such as the European Union and the United States have adopted trade measures to limit the import of fish products that are not verified as being totally legally sourced. In addition to those binding measures, a certain number

of voluntary guidelines have been adopted, mainly in the frame of FAO, such as the International Plan of Action to prevent, deter and eliminate IUU fishing (IPOA-IUU). However, the effectiveness of all these measures relies on them being adequately and universally applied.

Combatting IUU fishing is now firmly on the agenda of leading political initiatives with the United Nations Sustainable Developments Goal (SDG) 14.4, which specifically calls for an end to IUU fishing, together with implementing science-based management plans and effectively regulating harvesting, as an essential component to restore fish stocks. International organizations, such as the OECD and FAO, provide support for policy makers to better understand alternatives and gaps in fighting IUU fishing and related economic crimes in order to improve governance frameworks to move towards the SDG.

Effectively addressing IUU fishing is crucial to ensure the sustainable exploitation of aquatic resources and the long-term viability of the sector. If coupled with the effective management of resources, in the short term, these efforts may lead to reduced fish supply, but over the long term, they have the potential to increase fish catch in a sustainable manner due to the potential recovery of severely overexploited fish stocks. Quantifying the time needed to win the fight against IUU, and the long term benefits of stock recovery and increased future catches is complex and figures differ according to the assumptions. For these reasons, the 2017 *Outlook* does not assume a significant reduction in IUU fishing during the next decade and reported global catches are expected to remain at about 92 Mt to 2026. However, the World Bank (WB 2017) has recently calculated that allowing natural biological processes to reverse the decline in fish stocks, and taking into account not only the effect of reducing IUU fishing, would likely lead to marine fish biomass increasing by a factor of 2.7 and annual reported harvests increasing by 13% (to about 104 Mt). Just reducing the global fishing effort by 5% a year for ten years would allow global stocks to reach this ideal level in about 30 years.

Sources: Agnew (2009); FAO (2016b); OECD (2016a); OECD (2005); UNODC (2011); WB (2017).

Notes

1. The terms “fish” and “fish and seafood” indicate fish, crustaceans, molluscs and other aquatic invertebrates, but excludes aquatic mammals and aquatic plants. All quantities are expressed in live weight equivalent, except those of fishmeal and fish oil.

2. Set in the model at 2021 and 2026.

3. Fish for food/human consumption indicates fish production, excluding non-food uses, such as fish destined to reduction into fishmeal and fish oil, minus exports, plus imports, plus/minus stock data. Fish consumption data reported in this section refer to apparent consumption, which refers to the average food available for consumption, which, for a number of reasons (for example, waste at the household level), is not equal to edible food intake/edible food consumption.

4. Fish seeds indicate eggs, spawn, offspring, progeny or brood of the aquatic organism (including aquatic plants) being cultured. At this infantile stage, seed may also be referred to or known as fry, larvae, post-larvae, spat and fingerlings.

References

Agnew D.J., J. Pearce, G. Pramod, T. Peatman, R. Watson., J.R. Beddington (2009), "Estimating the worldwide extent of illegal fishing", *PLoS ONE*, Vol. 4(2).

Barange, M., et al. (2014), "Impacts of climate change on marine ecosystem production in fisheries-dependent societies", *Nature Climate Change*, Vol. 4.

De Silva, S.S. and D. Soto (2009), « Climate change and aquaculture: Potential impacts, adaptation and mitigation. In K. Cochrane et al. (eds) (2009), *Climate change implications for fisheries and aquaculture: overview of current scientific knowledge,* FAO Fisheries and Aquaculture Technical Paper, No. 530, FAO Publications, Rome.

FAO (2016a), *The state of world fisheries and aquaculture 2016. Contributing to food security and nutrition for all*, FAO Publications, Rome.

FAO (2016b). *Climate change and food security: risks and responses*, FAO Publications, Rome, www.fao.org/3/a-i5188e.pdf.

Gubbins. M., Bricknell I., and Service M. (2013), "Marine climate change impacts partnership science review", *Marine Climate Change Impacts Partnership: Science Review 2013: 318-327.*

IPCC (2013), *Climate change 2013: The physical science basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*,T.F. Stocker et al., (eds), Cambridge University Press, Cambridge, and New York.

OECD (2016a). "Conference: Combating tax crime and other crimes in the fisheries sector" www.oecd.org/tad/events/combating-crimes-fisheries-conference-2016.htm .

OECD (2016b), *Agricultural policy monitoring and evaluation 2016*, OECD Publishing, Paris. http://dx.doi.org/10.1787/agr_pol-2016-en.

OECD (2015), *Green growth in fisheries and aquaculture*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264232143-en.

OECD (2005), "OECD workshop on IUU fishing activities. Key observations and findings by the workshop chairs", www.oecd.org/tad/fisheries/31603545.pdf.

Pörtner, H.-O. et al. (2014), "Ocean systems" in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge and New York,

UN (2015), *Goal 14: Conserve and sustainably use the oceans, seas and marine resources*, www.un.org/sustainabledevelopment/oceans/.

UNODC (2011), *Transnational organized crime in the fishing industry*, Vienna.

World Bank (2017), *The sunken billions revisited: Progress and challenges in global marine fisheries*, Environment and Development, World Bank, Washington, DC, https://openknowledge.worldbank.org/handle/10986/24056.