Planet Tracker

Catch it like it's hot

Climate change hits seafood finances and demands systemic adaptation

December 2025

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Executive summary

The health of the seafood industry depends on ocean productivity, species abundance, and ecosystem stability. Climate change is stressing these natural assets, putting financial investments in the seafood economy at risk.

In this report, Planet Tracker:

- introduces a typology of 83 climate change-driven risks for the seafood industry, impacting companies, governments, communities, banks, asset managers, asset owners, insurers and the wider economy (summarised in Figure 1)
- demonstrates, through case studies, that many of these risks are already destroying billions of dollars of financial value
- maps the pathways by which physical risks become financial risks (e.g. from ocean acidification to asset impairment, or from ocean warming to non-performing loans), specifying which financial items are affected
- argues that bio-physical variables such as sea temperature, extreme weather events or fish biomass (expected to decline by 7-21% globally by 2100 depending on emission levels) are key drivers of present and future financial performance
- calls for a significant and urgent increase in:
  a) capacity building on this topic;
  b) climate adaptation investments;
  c) integration of nature (including climate) in business strategy and reporting; and
  d) alignment and collaboration between science, industry, policy and finance.

Figure 1: How climate-driven changes in the ocean impact the seafood industry and create financial and economic risk. Source: Planet Tracker - For specification of 'Changes to the ocean', and 'Industry risk' see the section titled 'How climate change affects seafood', for specification on 'Economic risk' see 'How these changes affect the wider economy', and for 'Financial Risk' see 'How climate-driven changes impacts financial systems' .

Introduction

Climate change threatens the global seafood industry. It adds and amplifies a complex, interlinked web of physical, economic, financial and systemic risks.

Planet Tracker has demonstrated the financial materiality of climate change to the seafood industry in previous research including *In Hot Water* (Indonesia tuna), *Pollockonomics* (US/Russia, Alaska pollock), and *Fishful Thinking* (China distant-water fishing).

These risks impact both aquaculture and wild-capture fisheries. Their physical, economic and financial manifestations cascade down value chains, affecting economies, livelihoods, social structures, food security and geopolitics. These climate-driven risks are compounded by other drivers of biodiversity loss in the context of a growing demand for seafood.

Structure of this report

This report illustrates the urgency of mitigating and adapting to climate change impacts by characterising the different ways in which climate change financially affects companies, governments, communities and investments in the seafood industry.

We first introduce the major risks to seafood production, illustrated by case studies that demonstrate how these risks are already materialising. Next we discuss their impact on the wider economy and the financial system. We then demonstrate how physical risks can translate into financial risks by outlining how changes in physical variables such as sea temperature, salinity or disease prevalence can impact profitability. We conclude by showing how adaptation investments could mitigate these risks.

Throughout this report, we use the term 'the seafood industry' to refer to industrial fishing and aquaculture, and the subsequent stages of the supply chain (processing, wholesale, storage, retail). References to 'seafood producers' encompass fishing and aquaculture only[a]. A financial description of the seafood industry can be found here.

Although climate risks also impact non-industrial fishing and aquaculture, this report focuses on the seafood industry, the financial institutions and governments involved in its financing and management.

We have retained only climate change-related risks that originate in the ocean. Issues such as disruptions to freshwater supply or terrestrial ingredients-based feed availability are not addressed in this report.

a With wild fish stocks under increasing pressure from biodiversity loss and climate-related disruptions, aquaculture surpassed capture fisheries production and produced 94.4 million tonnes of farmed aquatic animals, vs 92.3 million tonnes for global capture fisheries production in 2022.

How climate change affects seafood production

Climate change directly and indirectly affects the production of seafood in multiple interconnected ways, which science categorises into five clusters – see Figure 2:

- ocean warming
- ocean deoxygenation
- ocean acidification
- sea level rise
- and extreme weather

All are already disrupting the productive capacity of the seafood industry and increasing costs. These effects are expected to multiply as climate change continues.[1]

In this section, we first look at how the production of seafood is impacted by each of these five clusters of physical risks. We then isolate specific risks and vulnerabilities for aquaculture, and finally examine what that means for the supply chain.

Overall, we have identified 35 distinct risks that climate change represents to seafood producers. Figure 2 illustrates how these risks interconnect and amplify, highlighting the interconnected consequences of climate change on the marine ecosystems and seafood operations.

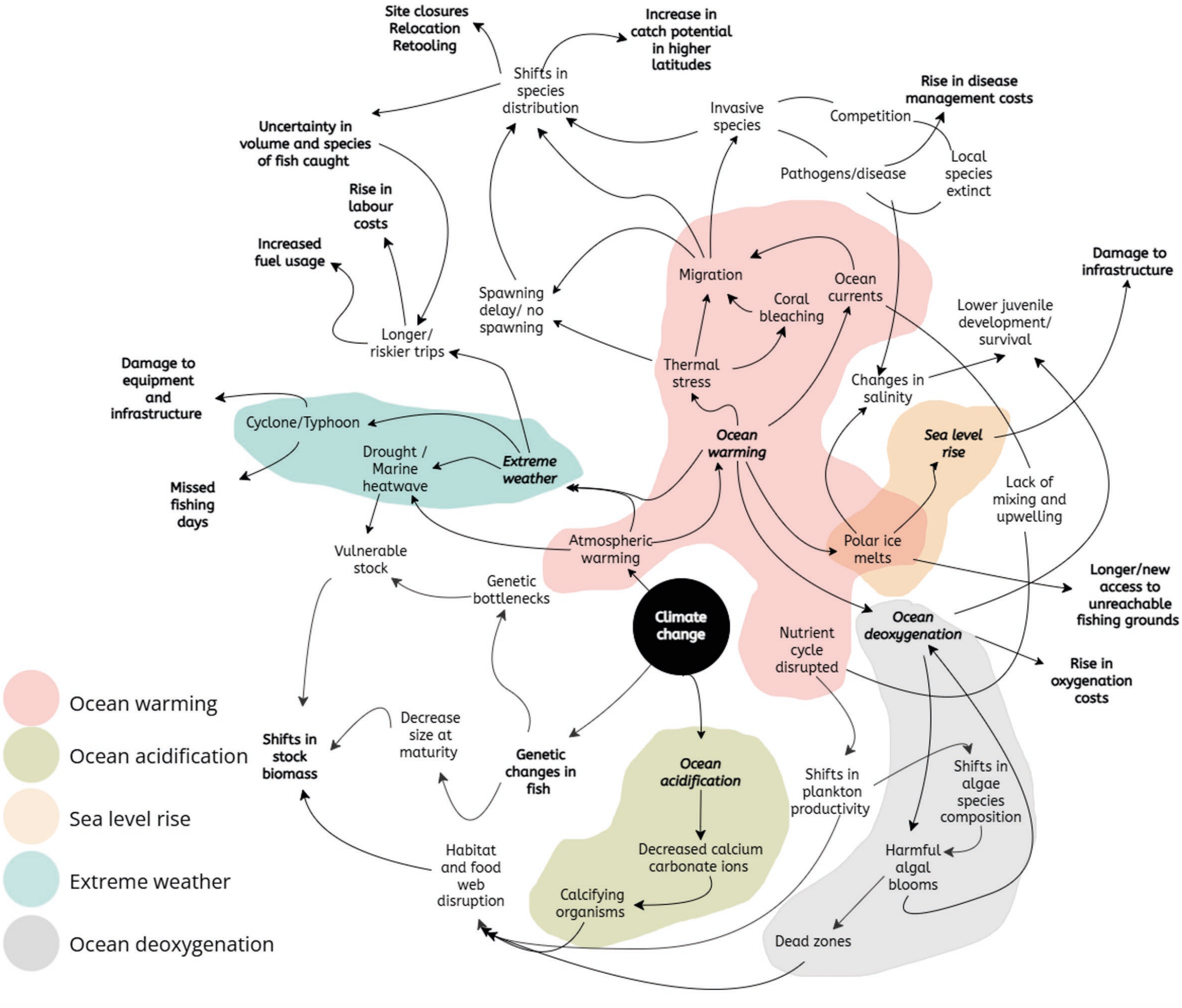

Figure 2: Direct impacts of climate change on seafood production, grouped into five main drivers (ocean warming, acidification, deoxygenation, extreme weather, and sea level rise). Source: Planet Tracker.

This interconnected complexity reflects the reality that climate stressors rarely act in isolation. For instance, ocean warming simultaneously affects coral bleaching, species distribution, thermal stress and so on, whilst these impacts further interact with one another.

Table 1 focuses on the most well-established direct relationships between climate drivers and specific risks, providing a manageable framework for understanding primary risks and their main causes. This approach, though necessarily simplified given the complexity illustrated in Figure 2, acts as a foundation for risk assessment while acknowledging that the full scope of cascading effects exists.

We listed and categorised 35 different risks that climate change represents for seafood production as follows[b].

b In addition to these 35 risks for seafood producers, we have identified a further 11 risks that manifest further down the supply chain, which we address later, in Table 4.

Risk type	Risk	Main causes
Production volume risks	Change in number of fish caught	Disruption to fish biomass (driven by changing population productivity, shifting spatial distributions and/or external market forces)
	Change in weight of average fish caught	Warming waters; prey availability
	Change in species composition of catch	Shift in species distribution
	Change in seasonal availability of catch	Shift in species distribution; phenology[c]
	Change in regulation	Warming waters; shift in species distribution
	Change in geographical availability of catch	Warming waters; prey availability
	Climate-driven mortality events	Warming waters; deoxygenation; ocean acidification
	Disease outbreak frequency increase	Warming waters; deoxygenation
	Harmful algal blooms; jellyfish bloom increase	
	Change in species farmed	
Production cost escalation	Fuel costs for longer fishing trips	Shift in species distribution
	Cooling/refrigeration energy costs	Shift in species distribution; disruption to fish biomass
	Equipment adaptation expenses	Shift in species distribution
	Labour cost increases in harsh conditions	Extreme weather
	Feed conversion efficiency declines	Warming waters
	Rise in oxygenation costs	Deoxygenation
	Aquaculture site relocation costs	Aquaculture infrastructure relocation
Capital expenditures	Investments in climate adaptation	Shift in species distribution; extreme weather; sea level rise; ocean acidification
	Extreme weather-resilient aquaculture infrastructure	Extreme weather
	Aquaculture infrastructure relocation	Warming waters; jellyfish blooms
	New fishing ports	Shift in species distribution
Asset risk	Ports closure	Shift in species distribution; disruption to fish biomass; sea level rise
	Aquaculture sites closure	Warming waters
	Fishing vessels and equipment optimised for certain species/regions become unused	Shift in species distribution; disruption to fish biomass
	Fishing quotas for declining species	
	Licences for unproductive fishing grounds	
	Brand value tied to regional seafood	
Price risk dynamics	Short-term price spikes	Disruption to fish biomass
	Long-term structural price increases	
	Cross-commodity substitution effects	Shift in species distribution; disruption to fish biomass
	Seasonal price volatility	
Competitive and regulatory risks	Increased competition for shrinking market	Shift in species distribution
	Quota system revisions	
	Trade agreement renegotiations	Shift in species distribution; disruption to fish biomass
	Vertical integration acceleration	Processor margin squeeze due to rising cost of raw materials

Table 1: Typology of the climate change-related risks for fishing and aquaculture. Source: Planet Tracker.

c Timing of life history events, e.g., timing of spawning aggregations.

The risks presented in Table 1 impact seafood actors in different ways, which we gathered in five clusters (ocean warming, ocean acidification, sea level rise and extreme weather events).

Ocean warming already impacts the industry in multiple ways

Ocean warming disrupts the distribution and abundance of fish stocks by causing thermal displacement[d], metabolic disruption[e] and reproductive failure, which creates supply-side risks across the global seafood sector.

Figure 2 above shows the overlapping web of impacts climate change imposes on seafood production, highlighting the number of issues linked to ocean warming.

Ocean warming is positively correlated to atmospheric warming. Since 1971, the ocean has absorbed more than 93% of the heat generated by anthropogenic global warming[f]. This increases the ocean's temperature, due to its large volume, surface area and low albedo[g].[2] Once thought to be confined to surface layers, ocean warming is gradually penetrating deeper while surface temperatures continue increasing at an alarming rate (Figure 3).

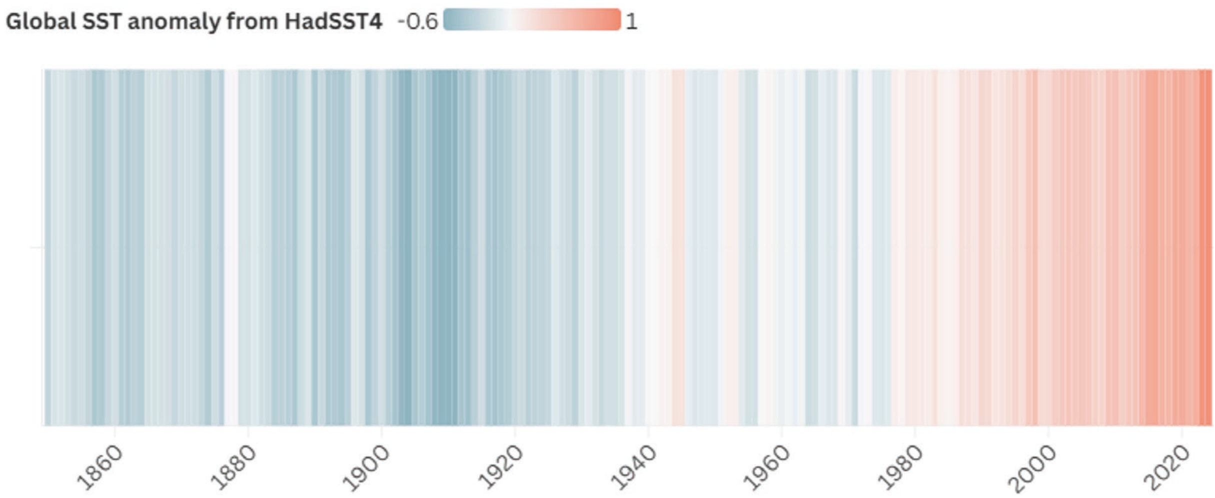

Figure 3: Global annual mean sea surface temperature anomalies relative to the 1961–1990 average (HadSST4 dataset, 1850–2024, in degrees Celsius). Stripes show warmer years in red and cooler years in blue. The spike in temperature in 1945 is thought to be due to a bias introduced by a change in sampling technique during WWII.
Source: HadSST4, Planet Tracker.

d The movement of marine species in response to changes in ocean temperatures, particularly during marine heatwaves.

e The impairment of normal biochemical processes in fish due to environmental stressors resulting in altered energy production, feeding behaviour, and physiological functions that can reduce fish survival and reproductive success.

f A theory explaining today's long-term increase in the average temperature of Earth's atmosphere as an effect of human industry and agriculture.

g The measure of how much sunlight is reflected by a surface. Lighter surfaces (like ice and snow) reflect more sunlight, while darker surfaces (like forests and oceans) absorb more heat.

This warming alters ocean currents, which enhances stratification[h] and reduces the vertical mixing of nutrients from deeper water and causes oxygen minimum layers to shoal closer to the surface. While current changes can have varying effects on mixing depending on conditions, the dominant impact of warming-driven stratification[i] is a net reduction in nutrient availability from depth, disrupting primary productivity and negatively impacting the nutrient cycle.

Considerable regional differences in the rate of warming can be seen globally, with polar warming happening at a faster rate and currents heavily influencing the development of enhanced regional warming 'hotspots'[j].[3]

Although this warming drives significant shifts in species distributions, it benefits some species as commercially valuable species begin expanding poleward into previously colder regions. However, the overall impacts on the seafood industry are predominantly negative. Warming waters also involve the spread of invasive species, delays or decreases in spawning in traditional fishing grounds, disruptions to fish biomass from harmful algal blooms, and the loss of thermal refugia for cold-adapted species that cannot migrate further poleward.

Thermal displacement and species distribution

Increased ocean warming causes thermal stress and consequently migration where species are forced to migrate toward cooler, higher-latitude waters to stay in their optimal thermal zone.[4] Hodapp and Roca et al. (2023) estimates that in a 2ºC warming scenario (RCP4.5[k]), the composition of species will change for 85% of the global ocean.[5]

h The natural difference in density of water in the ocean. The warmer, lighter, less salty water layers on top of heavier, colder, saltier water. Mixing between layers occurs as heat slowly seeps deeper into the ocean and by the action of current, winds, and tides. The greater difference between the layers, the more difficult the mixing becomes.

i The formation of distinct horizontal layers of water with different densities, primarily driven by variations in temperature and salinity.

j Localised areas of enhanced warming.

k Through this paper the three Representative Concentration Pathways (RCPs) are used to describe different climate scenarios. They are:

RPC 2.6 (Very low future emissions): a 0.9-2.3°C change in mean global surface temperature by 2081-2100.

RPC 4.5 (Low-moderate future emissions): 1.7-3.2°C change in mean global surface temperature by 2081-2100.

RPC 8.5 (Very high future emissions): 3.2-5.4°C change in mean global surface temperature by 2081-2100.

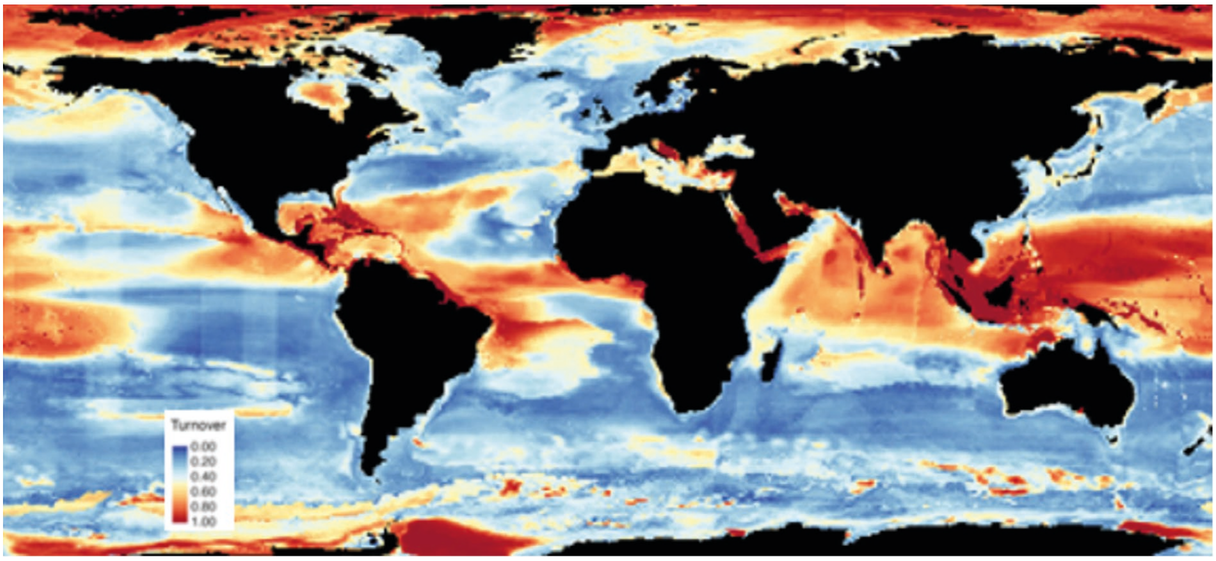

Figure 4: Median number of local species loss (red) and gain (blue) in marine species composition between the beginning and the end of the 21st century under RCP8.5 scenario. Source: Hodapp, Roca, Fiorentina et al, 2023.[5]

As seen above in Figure 4, the migratory impact is most acute in tropical and equatorial areas impacted, (see also *In Hot Water*), but fish stock outside these bands are also impacted.

Even in a low-emission climate scenario (RCP2.6), modelling of 347 straddling[I] stocks shows 54% will shift between Exclusive Economic Zones (EEZ) and high seas by 2050, with more stock entering international waters.[6]

Case study 1: UK waters becoming too hot for cod

Warm water species, such as seabass and anchovies, have been seen moving into areas around the UK previously too cold for them or their prey.[7] Other species, such as cod, anglerfish and plaice, have shifted to deeper waters and higher latitudes, away from the UK, to stay cool.[7] For instance, Atlantic cod in the North Sea traditionally are found 200-300 meters below sea level, in waters up to 15°C,[8] but are migrating to higher latitudes and deeper waters.

By 2100, valuable cold-water species like herring, cod, and haddock stock biomass are projected to decline in the North Sea by 10-20% under moderate warming scenarios (RCP 4.5).[9]

Climate change severity is a key driver of how drastically ecosystems and economies are affected, even in areas experiencing relatively milder climate impacts – see Figure 5.

I Species, stocks, or resources that move across or live in more than one jurisdictional area.

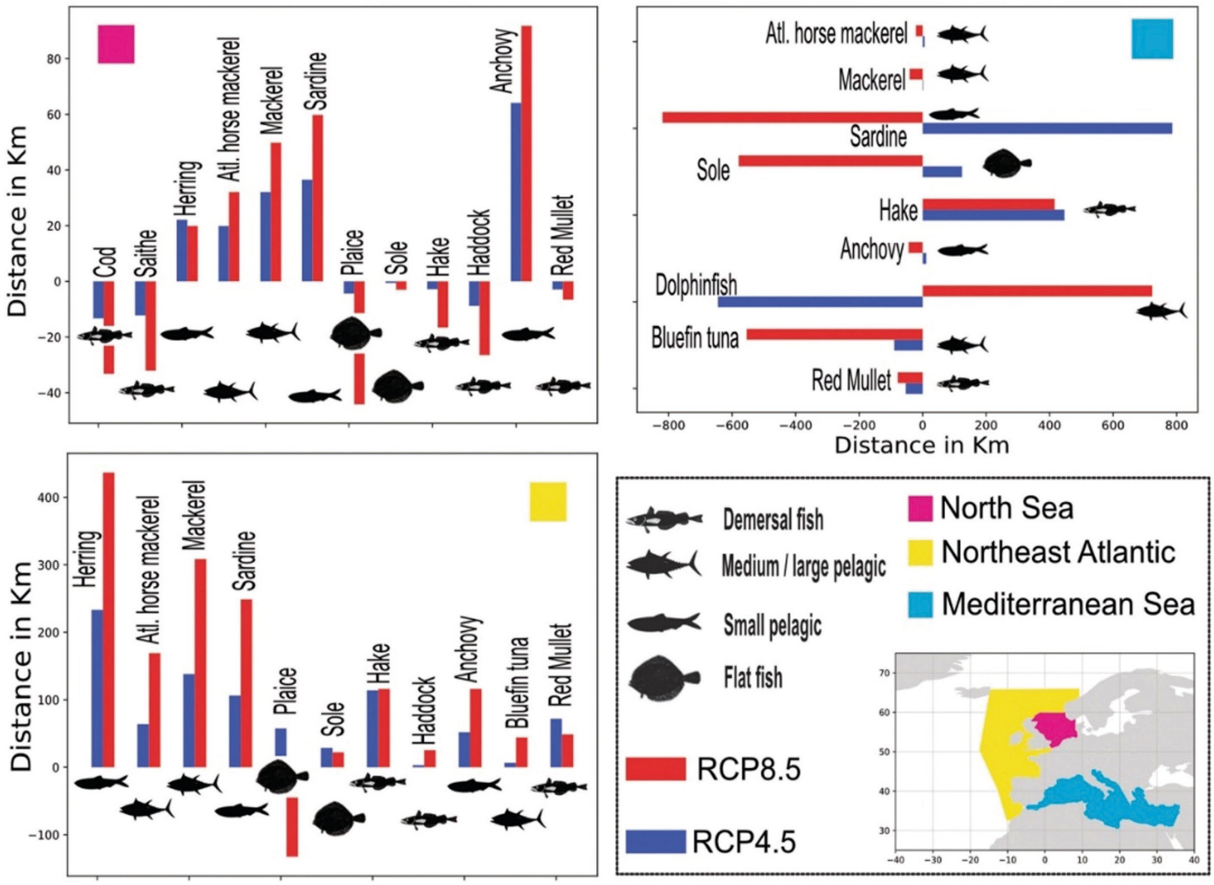

Figure 5: Change in the location of the fish population center by the end of the century compared to 2000–2010, per basin expressed in km, in a no fishing scenario, showing the main direction of change (North–South in the NE Atlantic and North Sea, East–West in the Mediterranean Sea. Map lines delineate study areas). Source: Plymouth Marine Laboratory.[10]

Fish species may face constraints in migrating to locations of optimum temperature, including regional temperature gradients, difference, variance in climate velocity[m] and geographical constraints.

This shift is not always horizontal, north-south or east-west like the species in Figure 5. In some instances, due to geographical restraints, species are experiencing a vertical climate driven shift, going into deeper waters. A study by Pinsky et al. (2013) showed that fish in the Gulf of Mexico shifted into deeper water, as coastal features of the semi-enclosed Gulf prevented a shift northwards.[10]

Disrupted ocean currents and migration patterns

Ocean currents are important to the productivity of fish stocks, facilitating the dispersal of larvae from spawning grounds to nursery areas and aiding in the seasonal migrations of fish populations from, for example, nursery grounds to adult feeding areas.

m The rate and direction that climate shift across the landscape.

Climate-driven disruptions to the direction, magnitude, and spatial extent of oceanographic currents have the potential to affect the timing of migration, feeding, and reproduction, with potential negative impacts on the population biomass of commercial species. This is particularly important for species following seasonal migrations like mackerel, herring and tuna.

Metabolic disruptions and population collapses

Just as ocean warming forces fish to change their migratory and reproductive patterns, increased temperatures also speeds up their energy demands. By increasing metabolic costs, decreases in potential catch volumes can occur if increased energy demands cannot be offset by increased food availability: fish either shrink in size or starve. For instance, in 2021, record temperatures in the Bering Sea caused billions of Alaskan snow crab to die as the crabs' metabolism increased beyond levels sustained by the ecosystem.[11] This fishery, with an annual harvest worth USD 200 million dollars, had to be closed with little hope that the stock will ever recover to levels seen historically.[11]

Overall, global fish biomass is expected to decrease by 7% by 2100 in a less than 2-degree scenario (RCP 2.6), and 21% in a more than 4-degree pathway (RCP8.5).[12]

Oceanic deoxygenation has already led to extensive public bailouts

As warmer water holds less dissolved oxygen, ocean warming from anthropogenic emissions is considered a primary driver[n] of deoxygenation in marine ecosystems, particularly in the surface layers, as temperature climb. Between 1960 and 2010, oceanic oxygen reserves have decreased by 2%[13] and under the RCP8.5 scenario, before 2050, deoxygenation signals would appear in the epipelagic, mesopelagic, and bathypelagic zones[o].[14]

The effects of these conditions include a reduction in habitat for aerobically respiring organisms, shifts in species distribution and alterations of biochemical cycling of nitrogen, phosphorus and iron. In areas of particularly low-oxygen levels, organisms may experience reduced growth and reproductivity. Deoxygenation can be fatal, particularly for non-mobile species.[14]

n Eutrophication is the other primary driver.

o The epipelagic zone is the upper "sunlight zone" (0–200 meters) where light supports photosynthesis. The mesopelagic zone, or "twilight zone" (200–1,000 meters), receives some light but is too dark for photosynthesis, while the bathypelagic zone, or "midnight zone" (1,000–4,000 meters), is in total darkness.

Case study 2: Economic impacts of deoxygenation in the Baltic Sea

In the Baltic Sea, excess nutrient inputs from agriculture and sewage have long driven large algal blooms, whose decay depletes oxygen and creates persistent hypoxia in deeper waters. Climate change now amplifies this problem through warmer temperatures and increased stratification, which both reduce the renewal of oxygen in the bottom layers. These low-oxygen conditions have led to the collapse of key fisheries like eastern Baltic cod, herring, and salmon, as hypoxia restricts fish habitats and depletes their benthic prey. The economic consequences have been severe: cod prices, for example, have plummeted by more than 90% between 2001 and 2019, and fishing bans ordered in response to stock collapses have forced governments and the EU to provide several million euros worth of bailouts, including compensation payments and vessel buyouts for fishers and communities that lost their livelihoods.[15]

Although deoxygenation is a byproduct of ocean warming, it is also caused, and made worse, by the changes in ocean currents and circulation which is increasing stratification and changing source water contributions. In the Arctic ocean, species are experiencing on of the highest losses of oxygen, a 7.8%[p] decrease since 1960, as warming increase sea ice loss, adding less dense freshwater to the ocean, reducing mixing and causing strong layering, acting as further barrier preventing ocean ventilation[q].[14] This largely influences species ability to move to deeper depths globally, leaving them exposed to predation and preventing predators from hunting at depth. This may increase catch of commercially viable species initially. However, increased instances of hypoxia, made worse by algal blooms, and the effects of deoxygenation will likely decrease catch long term.[14]

Harmful algal blooms on the rise

When paired with high CO_2 availability[r], the shifting of currents, changes to vertical mixing and increased ocean surface temperature disrupt the nutrient cycle to create an environment that is ideal to the formation of harmful algal blooms (HABs). Dinoflagellates, the class of algae responsible for most of marine HABs, are thought to benefit more from the rising CO_2 levels compared to other phytoplankton.

These blooms can be harmful to other organisms since they deplete oxygen in the water column, and depending on the species comprising the bloom, can be toxic. Their toxicity can magnify up the food web and cause mass mortality of marine organisms and affect humans when contaminated seafood is ingested.[16] These blooms can therefore have large impacts on local economies and in some areas leads to the closure of fisheries and aquaculture sites.

p Decrease as a percentage of basin change since 1960.

q The transport of surface waters, with high oxygen, nutrients and carbon, to the deep ocean.

r Elevated dissolved CO2 concentrations in water, often resulting from ocean acidification, upwelling, or experimental manipulation, which can affect photosynthetic organisms and pH balance.

Case study 3: The cost of harmful algal blooms in the West Coast

In the spring of 2015, a large harmful algal bloom of a toxin producing diatom, caused by the North Pacific marine heatwave, resulted in the largest recorded outbreak of toxin domoic acid. It led to fisheries closures fisheries' closure, in some cases through to 2016, and generated a knock-on economic shock for the surrounding coastal fisheries and associated communities.

The West Coast Dungeness crab fishery accounted for 26% of all fishery revenue in California at USD 200 million annually (from 2014-2016) and included over 100 participating companies. It was forced to delay the opening of the 2015-2016 crab fishing season by 4 months as the crabs were no longer fit for human consumption.[17] 71% of the crab fishing vessels stopped fishing during the season delay and landings decreased by 50%. Market value of landed crab was reduced because of public perception and its absence during peak holiday demand. The direct economic losses were estimated to be USD 48.3 million and a federal fishery disaster declaration was awarded to the industry.[18]

Ocean acidification is already destroying value in shellfish production

Of the five major effects of climate change on oceans, acidification may have the most catastrophic impact on high-value shellfish fisheries, whilst also damaging corals reefs. Caused by atmospheric CO_2 dissolving into seawater, ocean acidification reduces pH and carbonate ion availability. This chemical change fundamentally disrupts calcification processes essential for shell-forming organisms and coral reefs.[19] Acidification is worse in regions with significant upwelling[s], where CO_2 rich waters (i.e. with a low pH) rise from the deep ocean towards the surface. This leads to further acidification, increased algal blooms and possible outgassing of CO_2 into the atmosphere (if the ocean's concentration exceeds atmospheric concentration).[20]

Case study 4: Losses due to acidification in the US oyster industry

Ocean acidification has cost the oyster industry in the US Pacific Northwest nearly 110 million due over 2005-2009. Acidification not only causes larval oyster mortality in hatcheries, which reduces production and yield, but also increases operational costs as companies incorporate adaptation measures such as CO_2 monitoring tools and buffing systems that can adjust water chemistry in hatcheries.[21]

s A process in which deep, cold water rises toward the surface, usually nutrient rich.

Sea level rise already affects seafood production

The rise in sea levels is mainly due to thermal expansion of warming ocean water and accelerated melting of glaciers and ice sheets. By 2050, the IPCC projects global mean sea level will rise between 24 cm (17–32 cm likely range) under the lowest emissions scenario (RCP2.6) and 32 cm (23–40 cm likely range) under the highest emissions scenario (RCP8.5).[22]

This is threatening coastal communities and infrastructure worldwide, damaging coastal assets and eroding nursery habitats like mangroves and estuaries. Sea level rise increases the salinity of freshwater systems vital to inland and aquaculture production, which can be detrimental to brackish and freshwater species.[23] This increases species mortality, disrupts supply chains and raises maintenance and insurance costs.

Case study 5: Rising waters already impacting at least 5% of the world's shrimp aquaculture area

In estuarian regions, sea level rise is already forcing changes in fishing practices and causing financial losses. In Vietnam, the Mekong Delta, as a low-lying area, is cause for concern. It is thought that sea level rise will cause salinity intrusion to begin earlier in the year and end later than at present, causing saline water to intrude deeper into the mainstream river.[24] As the water's salinity rose above the shrimp's optimum for survival, 79,000 hectares of aquaculture (mainly brackish water shrimp farming) have already been impacted.[25] This represents c. 11% of the area dedicated to shrimp aquaculture in the Mekong Delta,[26] or about 5% of the global total.[27]

Extreme weather is already damaging natural and built infrastructure

Climate change is also causing more frequent and severe extreme weather events affecting the ocean. Between 1982 and 2016, marine heatwaves[t] have doubled in frequency whilst also becoming longer lasting, more intense and extensive.[28] In 2023, the ocean experienced marine heatwaves with the longest duration, widest extent and highest intensities on record.[29]

Case study 6: Typhoon-related fishing gear destruction in the Philippines

The Philippines have around 800,000 fishing operations active, contributing to 1.8% of the country's GDP.[30] These include both individual fishers and fishing businesses ranging from small-scale operations using gill nets and hook-and-line to larger commercial vessels. Tropical cyclones, although common in this part of the world, are becoming more frequent as climate change increases extreme weather events.[31]

In November 2013, super typhoon Haiyan hit the Philippines and caused an estimated USD 12.9 billion in damages and losses, equivalent to 4.7% of the country's GDP.[32] In the New Washington-Batan estuary, around 60% of fishing gear was moderately or severely damaged and 35% was completely destroyed.[33] It is estimated that over one-third of farmers and fishers in the area lost their income. This led to a total loss of USD 724 million in the agriculture and fishing sector.[34]

Industrial supply chains are also impacted by such events, since small-scale fisheries often generate income by connecting to industrial actors. In 2022, the Philippines exported 282,674MT of fish and fishery products to the global markets, valued at USD 1.144 billion.[35]

The cost of these damages for the seafood industry is significant, but disaster relief often fails to fully compensate actual losses. An example of this was losses suffered by Louisiana's seafood sector from hurricanes in 2021 – see below.[36] [37]

Table 2: Losses and disaster relief associated with hurricanes in Louisiana's seafood sector. Source:SeafoodSource.

Sector	Louisiana's seafood sector
Associated economic activity	USD 2,470 million (2021)
Hurricane-related losses (2020-2021)	**USD 570 million**
of which infrastructure destruction	USD 305 million
of which loss in revenue	USD 155 million
of which loss in biological resource (natural habitat of oysters and finfish)	USD 118 million
Disaster relief allocated by NOAA	**USD 27 million (< 5% of total losses)**
Unrecovered loss	**USD 543 million**

t When the daily sea surface temperature exceeds the local 99th percentile.

Aquaculture already suffers from specific risks and vulnerabilities

Aquaculture has recently overtaken wild capture fisheries in global production volumes. Aquaculture sites face a different profile of climate risks compared to wild catch fisheries, sharing some common impacts while also experiencing specific challenges such as temperature-driven mortality events and increased disease outbreak frequency from ocean warming. The sector's exposure to specific climate risks (see below) presents a threat to investor returns. Planet Tracker previously discussed the long-term risks faced by the aquaculture industry in *'Avoiding Aquafailure'*.

Table 3: Typology of the climate change-related risks for aquaculture only. Source: Planet Tracker.

Risk type	Risk	Main causes
Production volume risks	Temperature-driven mortality events	Warming waters
	Disease outbreak frequency increase	
	Harmful algal blooms; jellyfish bloom increase	
	Change in species farmed	
Production cost escalation	Feed conversion efficiency declines	Warming waters
	Rise in oxygenation costs	Deoxygenation; harmful algal blooms
	Aquaculture site relocation costs	Aquaculture infrastructure relocation
Capital expenditures	Extreme weather-resilient aquaculture infrastructure	Extreme weather
	Aquaculture infrastructure relocation	Warming waters; jellyfish blooms
Asset risk	Aquaculture sites closure	Warming waters

Disease and temperature driven mortality

Many of the physical stressors discussed throughout this report weaken a species' ability to resist infections, whilst also providing an environment that enhances bacterial and fungal growth. The result: increased spread of disease. Warm water increases the metabolism of the parasitic pathogens, increasing the feeding and reproduction of the pathogens. It also allows for a longer transmission window, especially in more polar regions. This extends the life cycle of the parasite, enabling it to infect more hosts over a prolonged season. It is especially true for aquaculture.

Aquaculture systems are particularly vulnerable to these risks due to the high density of fish confined in cages, facilitating a rapid parasite transmission whilst also preventing fish from escaping infected areas. The continuous presence of susceptible hosts, paired with limited water and stress induced immune suppression in the fish, create conditions where an extended transmission windows could lead to devastating outbreaks that are difficult and expensive to control.

According to the Food and Agriculture Organization, disease outbreaks currently cost the global aquaculture industry approximately USD 6 billion per year.[38] Continued warming combined with rising infections and antibiotic resistance will inflate these costs in future.

Case study 7: Chilean salmon's ISA crisis (2007-2012)
Chile's large aquaculture industry *heavily focuses* on the production of salmon species. An infectious salmon anaemia (ISA) outbreak caused the production of Atlantic salmon to drop by about two-thirds due to fish mortality and the culling of affected farms between 2007 and 2009. The economic effects of this were felt not only by companies, but also by specific banks in this area. Coupled with the impact of the financial crisis, salmon farming companies and their suppliers owed banks a cumulative total of USD 4 billion as of 2009. The outbreak of ISA prevented them from paying it back in time. The crisis continued until 2010 with peak economic impacts felt in 2009-2010. Production losses, facility closures, and the extended period required for sites meant financial obligations could not be met on the original timelines, with approximately USD2 billion in total losses and 20,000 jobs lost across the affected regions.[38]

While ocean warming is not the sole cause of increasing disease prevalence, higher temperatures lead to a higher risk of disease. Thus, disease prevalence and associated costs worsen with ocean warming.

Jellyfish blooms

In addition to harmful algal blooms (see above), aquaculture sites may also be negatively impacted by jellyfish stings, which can trigger gill disorders and harm fish. This is a particular problem for the aquaculture industry: netted fish cannot escape them, which increases mortality in fish farms. These risks, although present normally, are exacerbated by ocean warming as it accelerates the life-cycle of jellyfish and the increase of phytoplankton, causing extreme population growth.[39]

Case study 8: Jellyfish-related culls impact aquaculture companies
In 2023, aquaculture company SalMar had to cull all of the approximately 1.2 million salmon living at its Ørnfjordbotn site in northern Norway due to an influx of jellyfish (Apolemia uvaria) causing damage and fish welfare issues.[40] The company acknowledged to investors that the presence of jellyfish attacks led to a lower proportion of superior grade fish and lower average weight in northern Norway. The estimated impact on the year's EBIT was 2-3%.[41]

In 2025, the same species of jellyfish also caused emergency harvests in two Scottish salmon farms, with a loss of 32,000 fish in one farm and 163,232 salmon in the other.[42]

How climate change affects the rest of the seafood supply chain

Further down the supply chain, processors, wholesalers, distributors or retailers of seafood face the indirect consequences of the climate-related risks to production described above but also additional specific impacts.

Table 4: Typology of the climate change-related risks faced specifically by seafood processors, distributors, wholesalers and retailers. Source: Planet Tracker.

Risk type	Risk	Main causes
Asset risk	Processing facilities closure	Shift in species distribution; disruption to fish biomass; sea level rise
	Cold storage facilities in vulnerable locations	
	Brand value tied to regional seafood	Shift in species distribution; disruption to fish biomass
Supply chain risks	Processor margin squeeze due to rising cost of raw materials	Short-term supply shock price spikes; long-term structural price increases
	Distribution costs increases	
	Inventory management challenges	Short-term supply shock price spikes; disruption to fish biomass
	Cost of retooling processing plants	Shift in species distribution; disruption to fish biomass
Price risk dynamics	Short-term supply shock price spikes	Disruption to fish biomass
	Long-term structural price increases	
	Cross-commodity substitution effects	Shift in species distribution; disruption to fish biomass
	Seasonal price pattern disruptions	

Processing margin squeezes

Many of the risks that climate change presents to production trickle down to processing. For instance, the rising cost of raw materials or the cost of retooling to new species due to a shift in species distribution might lead to decreased margins.

Case study 9: The rising price of fishmeal and fish oil (FMFO)

The aquaculture industry relies heavily on the fishing industry to provide feed. Over half a million tonnes of fish extracted from the ocean each year are converted to FMFO to feed farmed fish and livestock, mostly in Europe and Asia.[43] For instance, approximately 20-40% of salmon feed uses ingredients from marine origin (e.g. fish meal, fish oil, trimmings).[44]

One of the key sources of FMFO originates from Peruvian anchoveta and other small pelagic fish. FMFO production from this region declined by 26.5% between 2000-2018, partially due to ENSO (El Niño Southern Oscillation) effects. The decline resulted in a three-fold increase in the price of FMFO over this time.[45]

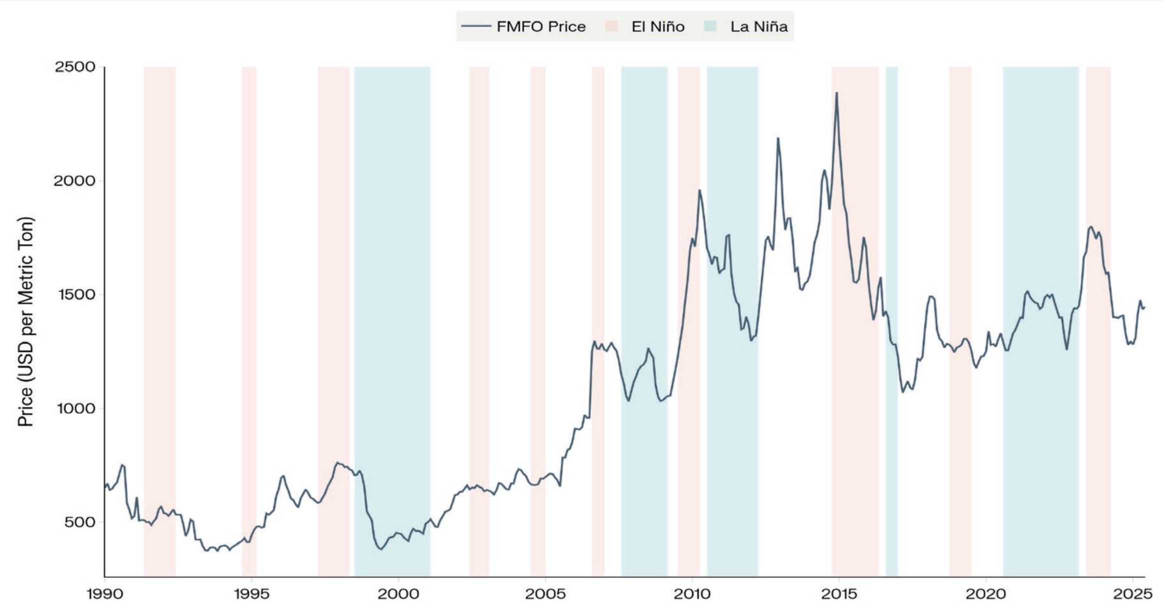

Figure 6: Price of fish meal and fish oil compared to El Niño years (red) and La Niña (green)

Short-term supply shock price spikes

Significant variation in the availability of seafood can disrupt inventory management along the supply-chain, while price volatility can affect margins. This could lead to the closure of some of the most vulnerable midstream and downstream companies, which typically operate on thin margins (*5% or less* as per our previous research).

Erosion of local brand values

Specialised local companies can also be exposed to shut-down risk, if the region is associated with a particular “emblematic” species which is no longer present.

Case study 10: 'Sacred Cod' no more

A striking example of local brand erosion due to species depletion comes from Maine's historic cod fishery. Once synonymous with New England's maritime identity (to the point that a ‘Sacred Cod’ carving hangs in the Massachusetts State House), Atlantic cod has virtually disappeared from the state’s traditional fishing grounds. The state's cod were worth just over USD 0.2 million at the docks in 2018, compared to the USD 2-16 million of cod routinely landed in the 1980s and 1990s.[46] This collapse is likely linked to rapid ocean warming in the Gulf of Maine, where sea surface temperatures rose faster than anywhere else on the planet between 2003 and 2014, altering the ecosystems that supported cod populations.[47]

Whilst attributing direct causality to climate change is difficult, since historical overfishing is also a factor, several local processing companies that sold Atlantic cod in Maine (among other species) went bankrupt in recent years.[48]

How these changes affect the wider economy

The way climate change impacts companies across the seafood value chain goes on to have socio-economic implications for the wider economy.

Economic and social challenges

The effects of climate change on the seafood value chain can impact local economies. Pressure on volumes and profitability can lead to closures of fisheries, processing plants and ports. At sufficient scale, this can lead to unemployment, lower economic activity and reduced tax intake - see Table 5.

Table 5: Simplified typology of how climate-driven impacts in the seafood industry affect the wider (local) economy. Source: Planet Tracker.

Risk type	Risk	Main causes
Social	Food security risks	Shift in species disruption; disruption to fish biomass, aquaculture yield
	Unemployment	Shift in species disruption; disruption to fish biomass, aquaculture yield or processing output; production cost escalation; site closures; aquaculture infrastructure relocation
	Depopulation	Unemployment
Economic	Reduced consumer spending power	Unemployment
	Tax base erosion	Unemployment; depopulation
	Social security system pressures	Fiscal stress from industry support measures; rising adaptation costs, drop in seafood-related revenue
	Reduced seafood-related government revenue	Shift in species disruption; disruption to fish biomass, aquaculture yield or processing output
Political	Increased political tensions	Food security risks; reduced seafood-related government revenue; tax base erosion in affected regions

Such economic challenges can turn into political ones, for instance if unemployment or food security issues lead to local or international migration.

Case study 11: Climate change compounding industrial overfishing in Senegal

Fishing employs c. 3% of Senegal's workforce, and seafood accounts for 43% of the country's animal protein intake, with a per capita consumption of 24kg per year.[49] [50] However, artisanal fishers are being pushed aside by foreign industrial vessels, particularly from the European Union and China.[51] These vessels typically use destructive methods and target fish primarily for export to European and Chinese markets. As a result, 57% of fish stocks in Senegal are in a state of collapse.[52]

Senegal's most vital fisheries, especially sardines, are further threatened by climate change: increasing ocean temperatures and changing wind patterns are likely to disrupt the nutrient-rich Canary upwelling system, undermining the food chain for pelagic fish like sardines.[53]

These simultaneous fisheries crises have become linked to Europe's migration crisis. Former fishers described the treacherous journey to Spain as a last resort when fishing in Senegal could no longer support their families. Memedou Racine Seck, a migrant fisher, stated bluntly: "If I was able to gain enough money in fishing, I would never have come to Europe".[54] Irregular migration to the Canary Islands almost doubled to 46,843 arrivals in 2024, with Senegal in the top three nationalities. This migration route is one of the deadliest in the world, with thousands of deaths estimated in 2024.[55]

Political challenges

Lower seafood production can also lead to increased trade tensions between countries to secure resources due to (sovereign) food security concerns.

As the distribution of species shifts across EEZs and Regional Fisheries Management Organisation (RFMO) boundaries, governance challenges and associated investment risks arise. Since resource allocation policies are vulnerable to climate change, calls for revisions in current quota systems and fishing laws will grow, encouraging reduced quotas for declining species and removal of licences for newly unproductive fishing grounds.[56]

Longstanding disputes around fishing rights, quotas and territories are likely to intensify as a result. This could heighten international tensions as countries gain or lose catch. This particularly affects straddling or shared stocks.

These distribution shifts have already triggered international disputes over major commercial stocks.

Case study 12: Avoiding a collapse of North-East Atlantic mackerel populations

In the Northeast Atlantic, conflicts over mackerel resources intensified due to a climate-driven shift in the population's distribution. Iceland, Norway, the UK, and the EU repeatedly failed to reach lasting deals around quota shares and instead set unilateral, often excessive quotas. Over the past fifteen years, total catches have averaged 39% above the International Council for the Exploration of the Seas (ICES) scientific advice.[57]

The direct result has been a dramatic 42% drop in mackerel biomass, with the 2025 stock now below critical levels and international certification lost. In response, ICES has now proposed a year-on-year quota cut of 77% for 2026 to prevent complete stock collapse and allow only a 50% chance of recovery by year-end 2026.[58] This must be adhered to.

Mapping vulnerable hotspots

Countries with high reliance on seafood exports are particularly exposed to the risks climate change poses to fishing. As climate effects worsen, the credit profile of these countries could come under pressure, particularly those already experiencing fiscal stress. WWF's Oceans Futures platform has mapped some of these hotspots – see Figure 7 (*click to launch the map*).

Figure 7 : Countries that rely heavily on seafood exports are particularly exposed to the risks climate change poses to fisheries. As these climate impacts intensify, the credit profiles of such countries – especially those already facing fiscal stress – could come under pressure. WWF's Oceans Futures platform has identified several of these hotspots. Source: WWF's Oceans Futures.

How climate-driven changes impact financial systems

As climate-related risks cascade through the seafood supply chain to impact local economies, they also represent financial risks for banks, asset managers and asset owners, insurers, and governments exposed to the fishing industry.

This section presents a typology of these risks – see Table 6, whilst the next one will outline the pathways through which they affect financial statements.

Financial risks for banks, asset managers and asset owners

Table 6: How banks, asset managers and asset owners are exposed to the financial risks linked to climate-driven impacts in the seafood industry. Source: Planet Tracker.

Risk type	Risk	Main causes
Credit risk	Seafood company default probability increases	Disruption to fish biomass; aquaculture yield disruption; shift in species disruption; processor margin squeeze
	Disruption to seafood equipment financing	
Market risk	Seafood sector share price performance	Disruption to fish biomass; aquaculture yield disruption; shift in species disruption; increased operational costs
	Asset write-downs	Fishing or aquaculture equipment valuation declines
	Seafood futures contract exposures	Price volatility; basis risk; extreme weather; diseases
	Basis risk from location/quality differentials	Shift in species distribution
Operational risk	Trade finance default increases	Supply chain disruptions
	Settlement and delivery failures	Extreme weather; shift in species distribution
Geographic concentration risk	Coastal region loan concentrations	Extreme weather; sea level rise
Sectoral concentration risk	Direct seafood sector lending	Default probability increases for fishing, aquaculture and processing companies
	Indirect exposure through supply chains	Supply chain disruptions
Collateral value deterioration	Facility location-based devaluations	Sea level rise; climate vulnerability overlap
	Fishing vessel valuation declines	Shifts in species distribution; disruption to fish biomass
Funding liquidity risk	Coastal community deposit flight	Climate vulnerability overlap; unemployment and other economic diversification challenges; depopulation
Financial system inter-connectedness	Bank lending to seafood-exposed institutions	Processing company default probability increases
Property and casualty claims	Extreme weather facility damage	Extreme weather; sea level rise
Catastrophe bond-related risks	Weather-related trigger events	Extreme weather
	Secondary market liquidity challenges	Stranded assets
	Pricing model inadequacies	Basis risk from index-based products

Many of these risks are logical consequences of the physical and economic risks previously detailed. For instance, the default probability of fishing companies could increase if climate change leads to lower catches, higher costs and increased investment needs. Banks with direct lending exposure to fishing operations might therefore face increased credit losses as borrowers struggle with diminished profits. Banks with high exposure to the seafood sector, such as in Scandinavia or East Asia, are likely to be the most affected, although they are also likely to be the best prepared.

Some of the risks listed in Table 6 might be less straightforward.

For instance, settlement and delivery failures in trade finance are becoming increasingly common due to extreme weather disruptions.[59] Settlement failures occur when sellers cannot deliver goods or buyers cannot deliver funds on agreed dates, often caused by infrastructure damage or logistical disruptions. According to Swift network data, one in ten trades doesn't settle as intended vs 2-4% pre-pandemic,[60] with climate-related disruptions contributing to this growing problem. In seafood trade, extreme weather events and shifting species distributions create operational delays that trigger settlement failures in documentary credit transactions.[u]

Financial risks for insurers

For insurers, risks can be different – see below.

Table 7: How insurers are exposed to the financial risks linked to climate-driven impacts in the seafood industry. Source: Planet Tracker.

Risk type	Risk	Main causes
Market risk	Basis risk[v] from location/quality differentials	Shift in species distribution
Operational risk	Cargo insurance claim frequency	Extreme weather
Collateral value deterioration	Facility location-based devaluations	Sea level rise; climate vulnerability overlap
	Fishing vessel valuation declines	Shifts in species distribution; disruption to fish biomass
Property and casualty claims	Extreme weather facility damage	Extreme weather; sea level rise
	Business interruption claim increases	Extreme weather; shift in species distribution
	Marine insurance market hardening	Extreme weather; sea level rise
	Reinsurance capacity constraints	Marine insurance market hardening; cargo insurance claim frequency
Parametric insurance	Weather-related trigger events	Extreme weather
	Basis risk from index-based products	Shifts in species distribution; disruption to fish biomass; extreme weather
	Pricing model inadequacies	

u A secure payment method in international trade, where a bank guarantees payment to a seller (beneficiary) on behalf of the buyer (applicant), provided the seller presents specific documents proving shipment. These are also known as letters of credit and work by substituting the bank's creditworthiness for the buyer's, ensuring the seller gets paid as long as they meet the terms outlined in the credit. This process is based solely on the documents provided, not the goods themselves.

v Basis risk refers to the risk that the financial or insurance instrument (such as a parametric index or coverage trigger) does not perfectly match the actual losses experienced by the insured entity. This can be due to discrepancies in location, timing, or the underlying quality variables. For seafood insurance, this could mean that the index or criteria used to trigger an insurance payout does not correspond with the true impacts suffered by the company.

Parametric insurance

Many businesses in the wider ocean economy and the fishing industry rely on parametric insurance that pays out automatically when certain conditions are met, for example, when water temperatures rise above 25°C or wind speeds exceed 100 mph. Valencia's recent catastrophic flooding sprovides a clear example of how rapid payouts helped maritime operators secure funds quickly after extreme weather events.[61]

Rapid changes in marine environments can cause mismatch between insurance triggers or payout models and the actual losses experienced by fishery operators. This basis risk arises when parametric insurance contracts are linked to environmental parameters (like sea surface temperature or certain weather events) that may no longer perfectly correspond to production losses or asset damage due to shifting ecological conditions.

These dynamics often result in pricing model inadequacies: historical data and actuarial models based on past climate and ecosystem behaviour become less relevant, potentially leading to under- or overvaluation of insurance premiums for fisheries assets. Additionally, increased frequency and severity of extreme weather events can lead to more frequent triggering of parametric insurance policies, sometimes in ways not anticipated by prior models. As a consequence, insurers must continuously adapt their contract structures, risk assessments, and triggers to keep up with the evolving impacts of climate change on fisheries, while also facing the risk of payouts not matching actual losses and challenges in maintaining fair and sustainable pricing.

Climate change reduces the insurability of the seafood industry

In addition, insurers may tighten underwriting standards, increase deductibles, reduce coverage (for example, excluding specific weather conditions or harmful algal blooms) or raise premiums.

Increased climate-related damage are driving up claims and resulting in a hardening of insurance conditions. Uninsured or underinsured operators, especially small-scale fisheries, will remain vulnerable to these extreme weather events and loss.

Financial risks for governments

As economic agents, governments also suffer from the financial consequences of climate change on seafood supply chains. Whilst this is likely to remain a minor source of financial stress for many countries, it can be different for small island nations or other economies highly relying on seafood.

Table 8: How insurers are exposed to the financial risks linked to climate-driven impacts in the seafood industry. Source: Planet Tracker.

Risk type	Risk	Main causes
Credit risk	Drop in seafood-related revenue	Shift in species distribution; Disruption to fish biomass, aquaculture yield or processing output
	Rising adaptation costs	Drop in seafood-related government revenue; Fiscal stress from industry support measures; Seafood facilities or port closures
	Fiscal stress from industry support measures	Disruption to fish biomass, aquaculture yield or processing output; Seafood facilities or port closures
Funding liquidity risk	Unemployment and other economic diversification challenges	Coastal community unemployment increases; Seafood facilities or port closures

Case study 13: Climate change-driven fishery disasters cost billions in the US

From 1989 to 2020, the US approved 71 federal fishery disaster declarations, with direct revenue losses estimated at USD 3.2 billion, leading to USD 2 billion in Congressional financial aid allocations.[62] In recent years, disasters have been driven mainly by extreme environmental events attributed to climate change, such as marine heatwaves that decimated key commercial stocks (e.g., Pacific cod and salmon). These events shrink government tax receipts and licensing revenues, while also forcing increased emergency public spending, demonstrating how governments themselves face real and immediate financial costs as climate change disrupts seafood supply chains.

How physical risks become financial risks

In an increasingly financialised seafood industry,[63] financial incentives must be aligned with ecological sustainability to ensure both profitability and ocean health.

Our typography of climate change-related risks in the seafood industry has shown how physical risks become financial risks for the industry, the wider economy, governments, financial market participants, and local communities. It can be summarised as below.

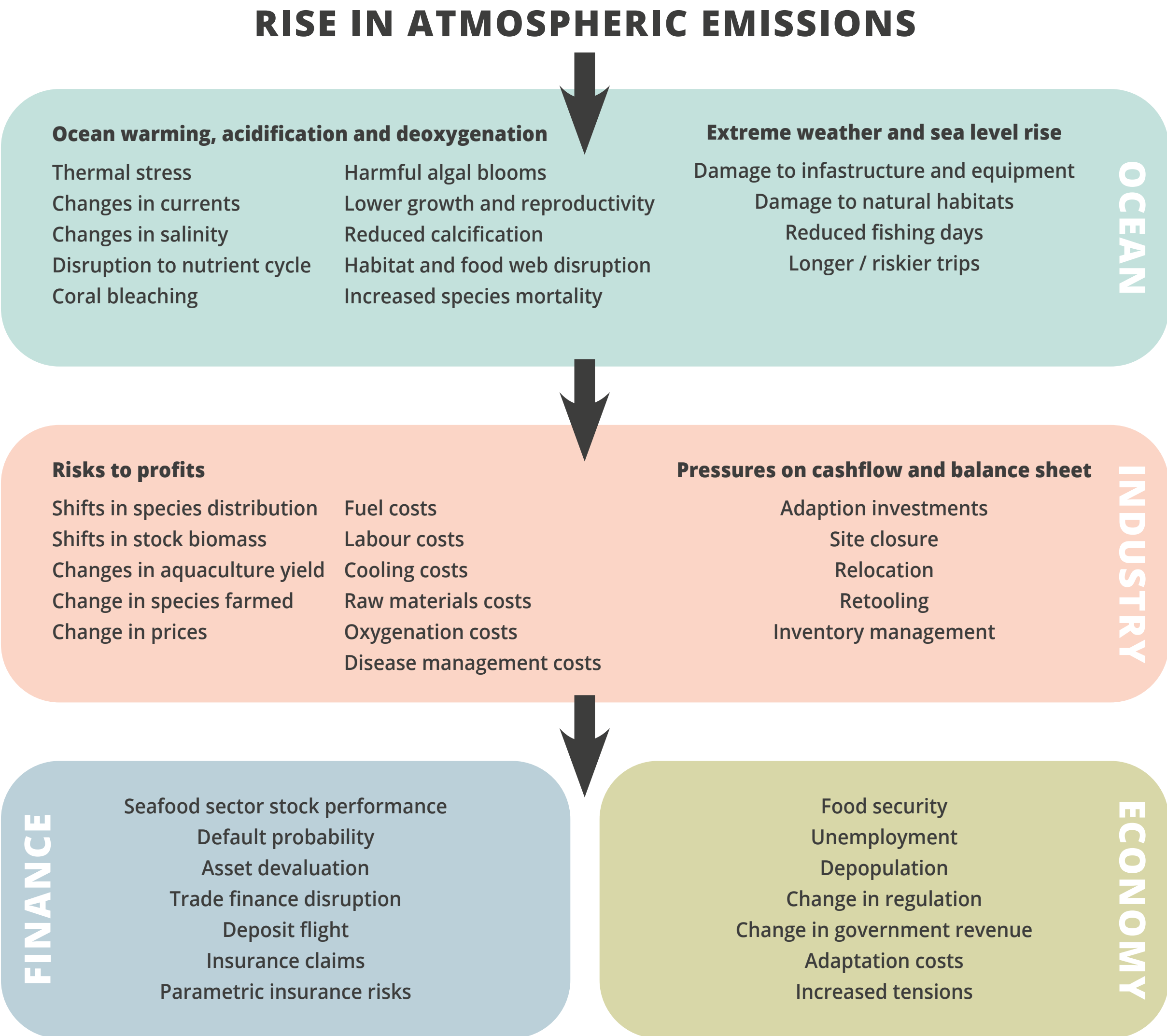

Figure 8: Simplified pathway transmission of climate change risks affecting the seafood industry to the financial and economic system. Source: Planet Tracker.

From physical risks to financial statement items...

We listed 83 risks in total, which directly affect financial statements, from the P&L through to cash flow and to the balance sheet – see Table 9.

Table 9: How climate-driven risks in the seafood industry affect financial statements[X]. Source: Planet Tracker.

Financial statement	Item	Count of risks	Example of risk
		Industry	
P&L	Revenue	17	Change in species farmed
P&L	COGS	7	Fuel costs for longer fishing trips
P&L	Administrative expenses	1	Change in regulatory costs
Cash flow	Working capital	2	Tightening of supplier terms
Cash flow	Capex	8	Equipment adaptation expenses
Cash flow	Business acquisitions	1	Vertical integration acceleration
Balance sheet	Asset value	2	Fishing vessel valuation declines
Balance sheet	Impairment of assets	8	Ports closure
Balance sheet	Inventories	1	Inventory management challenges
		Government, communities and wider economy	
P&L	Tax revenue	2	Drop in fishing related government revenue
P&L	Government expenditures	3	Adaptation costs
Balance sheet	Population count	1	Depopulation
Balance sheet	Income per capita	2	Island economy dependencies
Balance sheet	Consumer spending	1	Reduced consumer spending power
Balance sheet	Tax base	1	Tax base erosion in affected regions
Balance sheet	Unemployment rate	2	Unemployment and other economic diversification challenges
Balance sheet	Access to infrastructure and social welfare	2	Shared infrastructure vulnerabilities
		Financial institutions (including insurers)	
P&L	Net interest income	2	Basis risk from location/quality differentials
P&L	Underwriting capacity	1	Reinsurance capacity constraints
P&L	Claims	4	Business interruption claim increases
Balance sheet	Non-performing loans	4	Fishing company default probability increases
Balance sheet	Loan portfolio	4	Disruption to seafood equipment financing
Balance sheet	Portfolio valuation	3	Seafood sector stock performance
Balance sheet	Interbank loans	1	Interbank lending to seafood-exposed institutions
Balance sheet	Liquidity reserves	1	Secondary market liquidity challenges
Balance sheet	Fair value of financial assets	1	Pricing model inadequacies
Balance sheet	Contingent liabilities	1	Documentary credit complications
Balance sheet	Other liabilities	1	Settlement and delivery failures
Balance sheet	Deposits	1	Coastal community deposit flight

… via physical variables

Whilst quantifying these risks goes beyond the scope of the report, we have also isolated the key variables that directly or indirectly influence each of the financial risks identified (including as direct consequences of economic risks in the industry). See the Appendix for a detailed overview of the different pathways.

By grouping these risks into different categories (e.g. credit risk, market risk, etc.), we show below that physical variables such as fish biomass or sea temperature are not just environmental variables, but also clear drivers of potential financial value destruction if not managed.

Table 10: Proportion of financial risks by category that are affected by a given physical variable. Source: Planet Tracker.

Proportion of risks by category… … affected by a given physical variable	Credit risk	Market risk	Operational risk	Geographic concentration	Sectoral concentration	Collateral value deterioration	Funding liquidity risk	Financial system interconnectedness	Real economy feedback loops	Property and casualty claims	Catastrophe bond risks
Sea temperature	100%	80%	50%	0%	100%	100%	0%	50%	0%	50%	75%
Fish biomass	88%	100%	25%	33%	100%	50%	100%	100%	100%	25%	75%
Species distribution	88%	100%	25%	33%	100%	50%	100%	100%	100%	25%	50%
Sea level	25%	20%	0%	100%	0%	50%	100%	50%	60%	50%	75%
Oxygen level	88%	20%	0%	0%	67%	0%	0%	50%	0%	0%	75%
Extreme weather frequency/intensity	100%	80%	100%	100%	100%	100%	100%	100%	100%	100%	75%
Harmful algal bloom	88%	20%	0%	0%	67%	0%	0%	50%	0%	0%	75%
Jellyfish bloom	25%	0%	0%	0%	33%	0%	0%	50%	0%	0%	75%
Disease prevalence	88%	20%	0%	0%	67%	0%	0%	50%	0%	0%	75%
Weight of seafood caught	50%	40%	0%	0%	0%	100%	0%	0%	0%	0%	75%
Catch volumes	63%	60%	0%	0%	0%	100%	50%	0%	100%	0%	75%
Seasonal availability	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	75%
Aquaculture yield	38%	40%	0%	0%	33%	50%	50%	50%	100%	0%	75%
Infrastructure location	25%	20%	0%	100%	0%	50%	100%	50%	60%	50%	75%
Sea salinity	75%	0%	0%	0%	0%	0%	0%	0%	0%	0%	75%
Sea pH	75%	0%	0%	0%	0%	0%	0%	0%	0%	0%	75%
Storm surge height/ frequency	25%	20%	100%	100%	0%	50%	100%	50%	60%	100%	75%

Table 11: Proportion of financial risks by category that are affected by a given economic variable. Source: Planet Tracker.											
Proportion of risks by category... ... affected by a given physical variable	Credit risk	Market risk	Operational risk	Geographic concentration	Sectoral concentration	Collateral value deterioration	Funding liquidity risk	Financial system interconnectedness	Real economy feedback loops	Property and casualty claims	Catastrophe bond risks
Fish price	75%	80%	100%	0%	100%	50%	0%	50%	20%	75%	75%
Margin	50%	60%	0%	0%	67%	0%	0%	50%	20%	0%	50%
Default probability	50%	40%	50%	67%	67%	50%	50%	50%	0%	0%	50%
Export volume	63%	80%	75%	0%	100%	0%	0%	50%	0%	0%	25%
Fishing-related government revenue	63%	0%	0%	33%	33%	0%	50%	0%	100%	0%	0%
Adaptation cost	25%	0%	0%	0%	0%	0%	0%	0%	20%	25%	0%
Asset value	75%	40%	0%	67%	33%	100%	0%	50%	0%	25%	75%
Trade finance default rates	63%	100%	75%	0%	67%	50%	0%	50%	0%	0%	0%
Port usage (throughput/ volume)	25%	0%	25%	33%	0%	0%	50%	50%	20%	50%	25%
Insurance premiums	50%	20%	50%	33%	33%	50%	0%	50%	0%	75%	25%
Insurance claims	0%	20%	50%	33%	0%	50%	0%	0%	0%	100%	50%
Unemployment rate	75%	20%	0%	100%	67%	50%	100%	100%	100%	0%	0%
Economic diversification index or metrics	50%	0%	0%	33%	0%	0%	100%	0%	100%	0%	25%
Substitution rate between commodities	0%	60%	0%	0%	33%	0%	0%	0%	0%	0%	0%
Basis risk	0%	40%	0%	0%	0%	0%	0%	0%	0%	0%	50%

To overcome this, the entire seafood supply chain needs to adapt.

Climate adaptation and mitigation strategies

Contributing to around 0.83% of GHG emissions in 2023,[64 65] the seafood industry on its own cannot materially change the overall climate trajectory of our planet.

Yet this report showed that it is significantly affected by climate change. Under high emission scenarios (RCP8.5), losses in fishing revenue could reach USD15 billion by 2050 compared to 2000 as per the IPCC.[66] The seafood industry faces an urgent need for comprehensive climate adaptation and mitigation strategies. Many companies have mitigation strategies and detail associated investments, but adaptation investments remain minimal.

Planet Tracker urges companies across the seafood value chain to step up their climate adaptation investments. Large, industrial companies are likely to have more resources and capabilities to do so on an absolute basis and need to lead and support small-scale operators.

Figure 9 shows an array of methods to both adapt to and mitigate the effects of climate change.

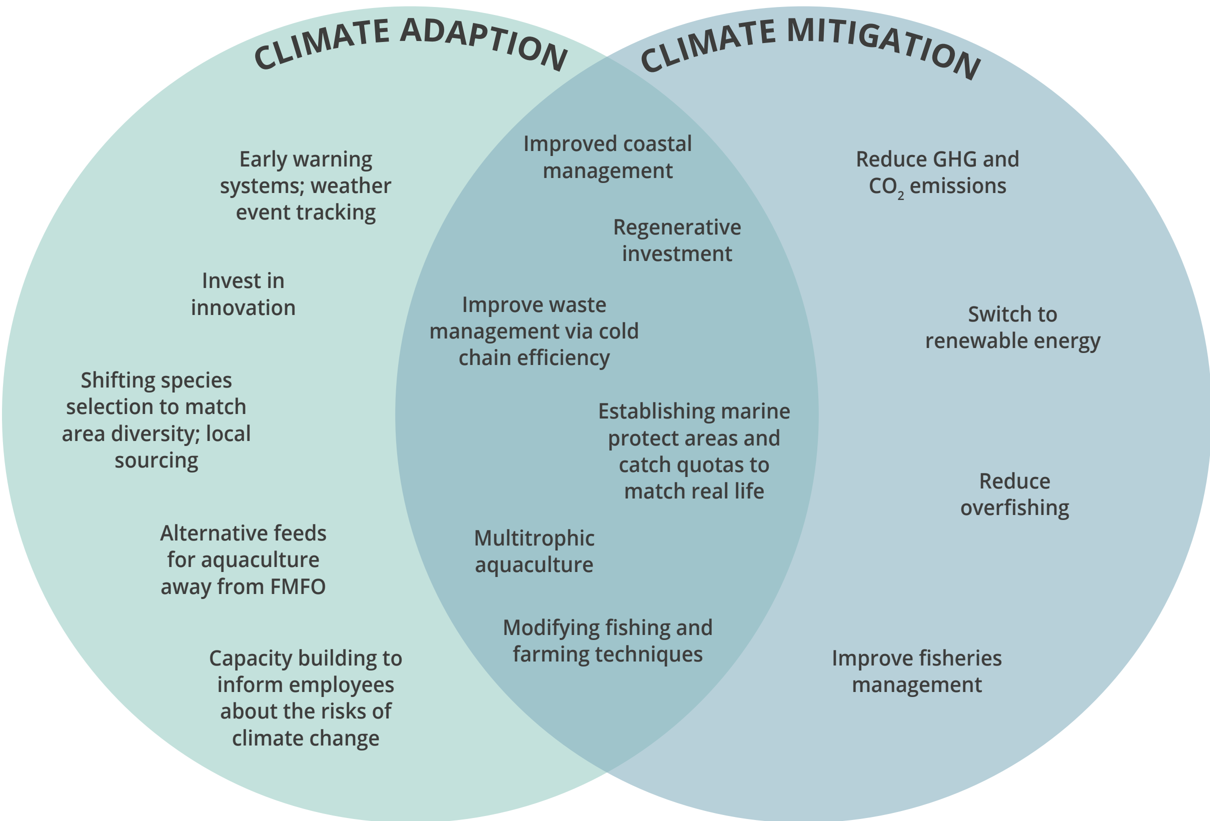

Figure 9: Methods of climate adaptation and mitigation that companies should consider adopting to help with the climate crisis. Source: Planet Tracker.

Call to action

Industry participants

Planet Tracker urges decision-makers in the seafood industry to:

1. **Build capacity and collaborate with scientists and policymakers on the economic and financial cost of climate change on the seafood industry**
   - This report is a good starting point to understand these interactions, but species- and geography-relevant research and analysis is needed.
   - For more in-depth analysis, external resources can be tapped into, but internal capacity is best to ensure integration with existing strategies and operational systems.
   - An accurate quantification of the financial impact of climate change on business operations is needed.
2. **Address the misalignment between economic systems and ecological realities**
   - The impact of the climate crisis on the seafood industry is exacerbated by the misalignment of much of the seafood industry with the ecological realities it relies on.
   - Finding ways to operate in line with nature (including climate impacts) rather than against it is key to addressing that misalignment, for instance by transiting towards truly regenerative production models or integrating nature-based solutions. Tactically, this can be implemented through anything from biomimicry to nature-linked bonds.
   - Evidence of addressing this misalignment can only be publicly validated through clear integration of nature and climate considerations in short term and long term planning, strategy and reporting.
3. **Invest or encourage investment into climate adaptation measures in line with science**
   - The seafood industry must step up and channel capital into robust climate adaptation measures. Current investment levels remain very limited.
   - Connecting with scientists, governments and financial actors is key to drive and fund urgently needed science-based action.
   - Adaptation is not optional. Rising ocean temperatures, acidification, and shifting fish stocks already threaten the finances of the industry.
   - Through a financial lens, the question is whether the net present value (NPV) of maintaining business-as-usual is greater than the NPV of investing in adaptation. Answering this question is likely to show that long-term financial resilience lies in building adaptive capacity now, not later.
   - To meet adaptation needs, the industry should mobilise finance from internal capital allocation, private investors, development banks, sustainability-linked debt and insurance products as well as public–private partnerships.

Financial institutions

For financial institutions, whilst inaction represents a major risk, building the necessary capacity and acting can provide a multitude of opportunities. Planet Tracker recommends the following:

1. Value realignment: as shown in this report, environmental factors are direct drivers of change in financial variables and must be recognised as such.
2. Ecosystem literacy: understanding how marine systems function and respond to climate risks.
3. Integrated risk models: incorporating ecosystem health and its response to climate factors into credit, market, insurance and operational risk assessment.
4. Company engagement: encouraging companies to a) build capacity on the financial impact of climate-related issues, and b) invest in adaptation in addition to mitigation.
5. Company benchmark: assessing companies on their risk exposure, actions or lack thereof.
6. Regenerative investment: supporting strategies that restore ecosystem health, and/or scale nature-based solutions.
7. Collaborative action: working across sectors to address systemic ecosystem-finance risks.

Policymakers, regulators and governments

Finally, Planet Tracker recommends that governments and regulators:

1. Support innovation for gear, vessels, and coastal infrastructure in way that does not create additional risks for the environment or local populations.
2. Foster international data sharing and early warning systems.
3. Integrate climate adaptation in fisheries policy frameworks.
4. Promote inclusive local engagement and social resilience.
5. Create financial incentives and dedicated adaptation funds.
6. Adapt regional fisheries management organization (RFMO) rules.
7. Develop and expand mobile and climate-smart marine protected areas (MPAs).

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ABOUT PLANET TRACKER

Planet Tracker is an award-winning non-profit financial think tank aligning capital markets with planetary boundaries. Created with the vision of a financial system that is fully aligned with a net-zero, resilient, nature positive and just economy well before 2050, Planet Tracker generates break-through analytics that reveal both the role of capital markets in the degradation of our ecosystem and show the opportunities of transitioning to a zero-carbon, nature positive economy.

ACKNOWLEDGEMENTS

Authors: Makeda Davis, Associate Analyst, Planet Tracker
Francois Mosnier, Head of Nature, Planet Tracker

Editor: Niall Considine, Director of Research, Tracker Group

Reviewers: the *FinRisk team* (Stockholm University, Stanford Centre for Ocean Solutions, University of California Santa Cruz, Planet Tracker).

Special thanks to Robert Blasiak (Stockholm Resilience Centre), Paul Conville (Stockholm Resilience Centre), Mark Morales (University of California Santa Cruz), and Ramatoulaye Corréa (Climate and Strategy Consultant) for their contribution.

WITH THANKS TO OUR FUNDER

Walton Family Foundation Grant (00109884) on "Mapping the financial risks of climate change impacts on seafood production" (FinRisk), via the Stockholm University

WALTON FAMILY
FOUNDATION

Suggested citation: Davis, M. and Mosnier, F., 2025. Catch it like it's hot. Planet Tracker.

Planet Tracker

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