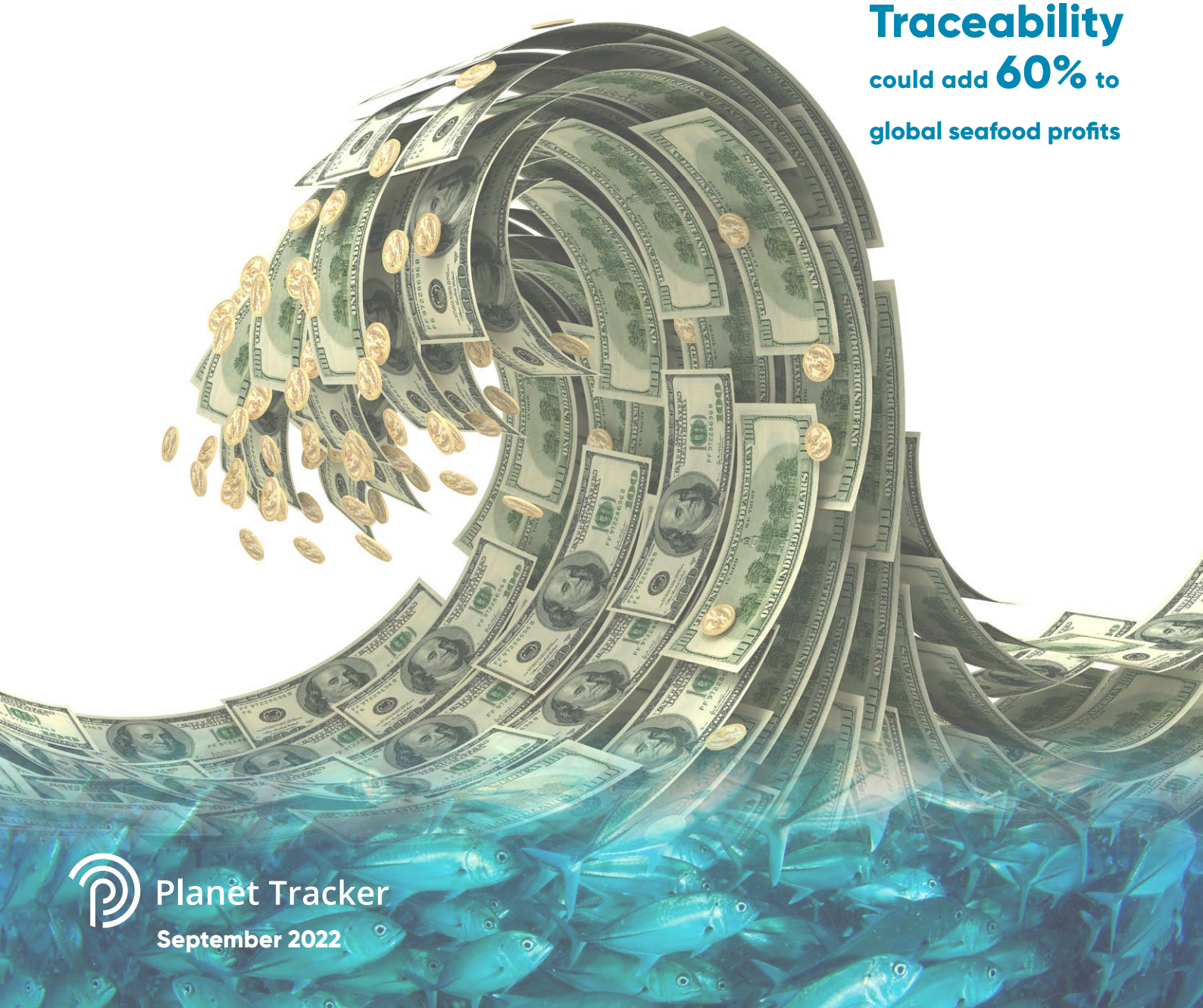
HOW TO TRACE $600 BILLION

Traceability could add 60% to global seafood profits



Planet Tracker

September 2022

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KEY FIGURES

USD 1.8 trillion Planet Tracker estimate of the global seafood supply chain revenue, from fishing and aquaculture to restaurants, via processing, wholesale, and retail. It is equivalent to 2% of global GDP.

+60% the rise in the global seafood profit pool (currently an estimated USD 76 billion), if traceability were implemented for all species/areas where it is doable – mostly attributable to reduced costs of food recalls, food waste, and staff.

+USD 600 billion the forecasted traceability-related increase in valuations of global seafood supply chain corporates.

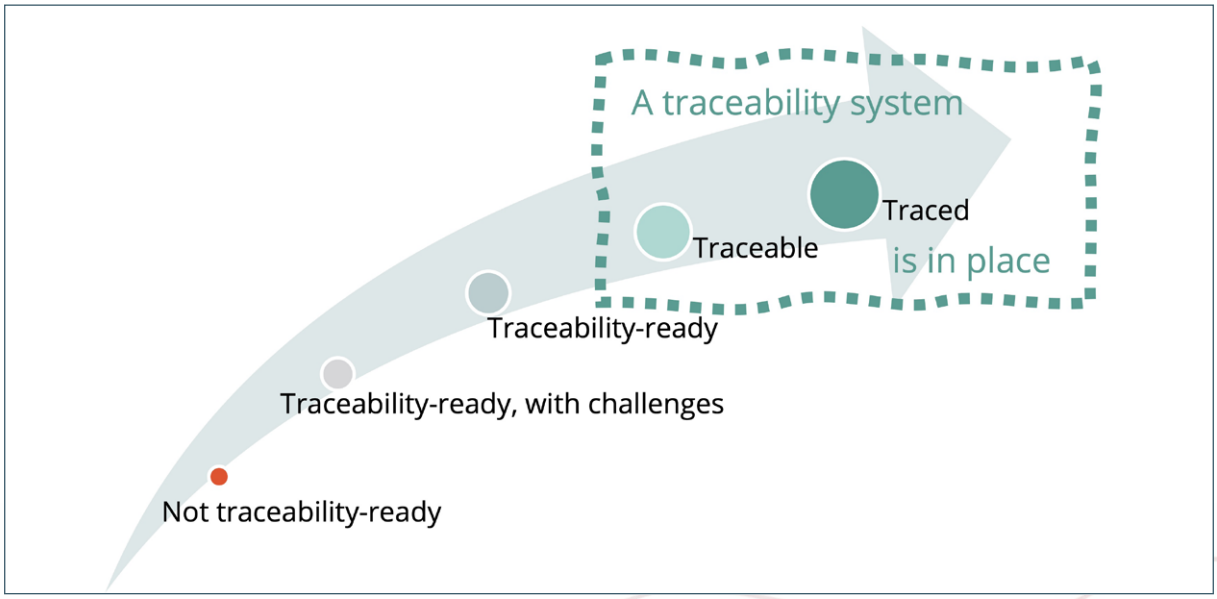
1% of seafood sales the average amount these companies need to invest to unlock this USD 600bn opportunity. For fishing companies, the investment amounts to just 6% of the subsidies received.

6 the number of questions financial institutions should ask companies to unlock this value.

23 the number of investors with ≥5% of their equity portfolio in companies poorly rated for traceability.

CONTENTS

SEAFOOD TRACEABILITY JARGON EXPLAINED



Traceability: the ability to systematically identify seafood products, track their location and reveal any treatments or transformations they undergo.

Traced: seafood product that has been identified, whose location has been tracked, and whose potential treatments or transformations undergone were revealed, using a traceability solution. Only traceable products can be traced.

Traceable: product covered by a traceability solution that allows to systematically identify it, track its location and reveal treatments or transformations it underwent.

Traceability-ready: existing data suggests that there are currently more incentives than disincentives for the harvester of the fish[1] to be associated with its production. Therefore, the fish can be traceable if a traceability solution is in place, and any existing challenges (e.g. corruption, lack of digitalisation, lack of data, etc.) are overcome.

Traceability-ready, with challenges: existing data suggests that there are currently more incentives than disincentives for the harvester of the fish to be associated with its production. Therefore, the fish could be traceable if a traceability solution was in place and if challenges (e.g. corruption, lack of digitalisation, lack of data, etc.) were overcome.

Not traceability-ready: existing data suggests that there are currently more disincentives than incentives for the harvester of the fish to be associated with its production, and therefore for the fish to be potentially traceable. For instance, the fish is caught illegally, or harvested in unsustainable ways[2].

Unclear traceability-readiness: there is not enough data to estimate whether incentives or disincentives exist for the harvester of the fish to be associated with its production, and therefore for the fish to be potentially traceable.

[1] We use seafood and fish interchangeably throughout this report to refer to fish, crustaceans, molluscs and other aquatic invertebrates (we exclude aquatic mammals and aquatic plants).

[2] See the Methodology section to understand how we defined sustainability or lack thereof

EXECUTIVE SUMMARY

Where does your fish come from? Did its production contribute to the destruction of ecosystems? Was it caught illegally, or by slaves? Very often, it is hard to know.

We have imagined a different world, in which every fish can be traced back to a farm or fishing vessel.

Is it realistic? Not for now: our analysis of the entire world's seafood production by species and country reveals that only 29% of it is traceability-ready[3].

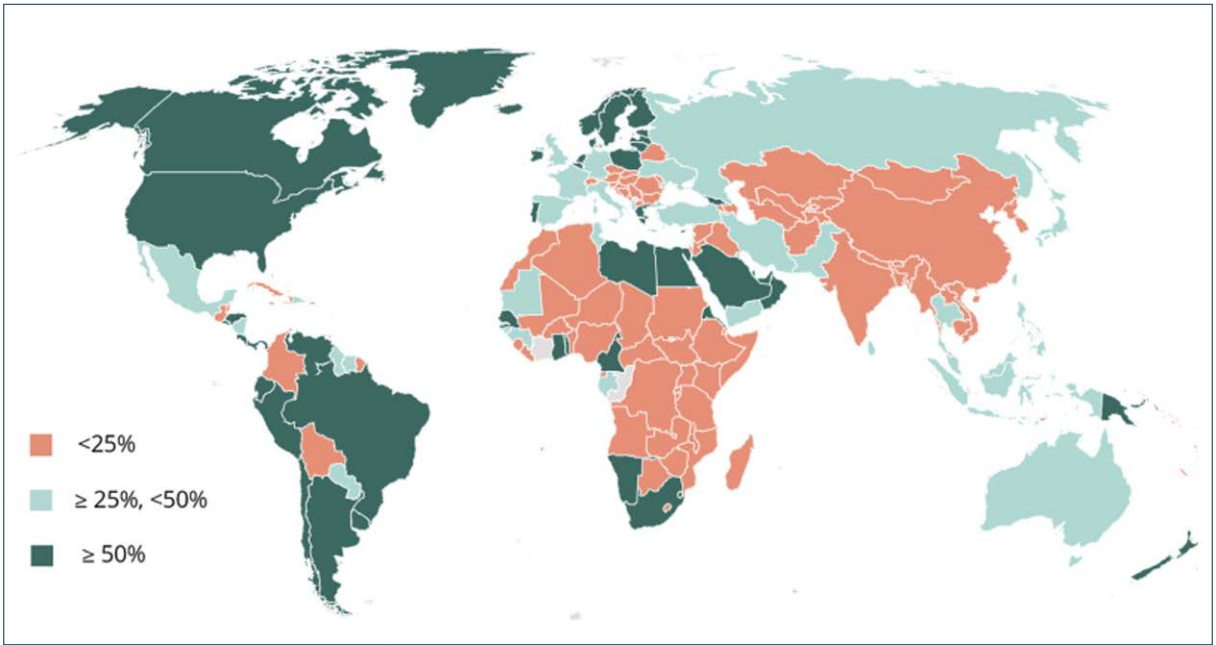


Figure 1: Proportion of National Seafood Production (by Location of Farms and Flag Country) that is Traceability-Ready. Source: Planet Tracker.

We call 'traceability-ready' fish that is:

a harvested in a way that makes it at least acceptable for the harvester to be associated with its production (i.e. it is not too unsustainable or illegal) and

b caught or farmed in an area where the challenges of implementing a traceability solution (levels of corruption and digitalisation) can be overcome.

Key examples of such species are shown in Figure 2.

[3] The proportion rises to 69% of the global seafood production if we only include volumes for which the data necessary to evaluate traceability-readiness exists.

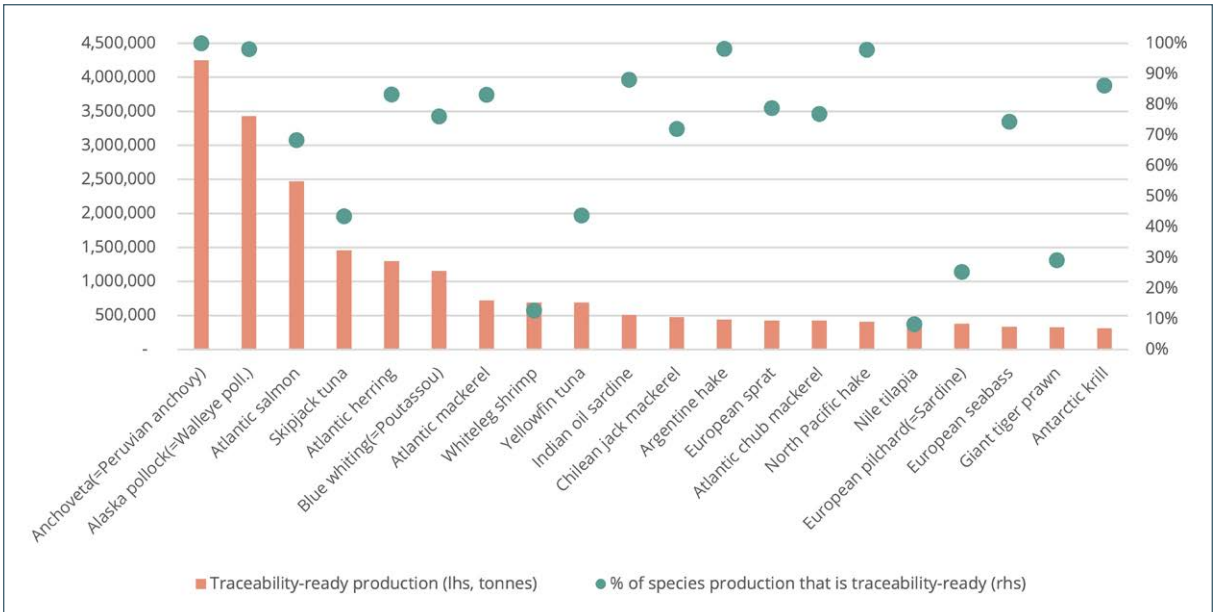


Figure 2: Top 20 Traceability-Ready Species: Annual Production in Tonnes and Proportion of Total Species Production that is Traceability-Ready. Source: Planet Tracker.

Even if only traceability-ready fish that is not yet traceable were to become traceable, the consequences for the seafood supply chain would still be huge. With **a total investment of 1% of its current revenue, its profit would rise by 60%** (to USD 122bn), thanks mainly to the reduced costs of food recalls, food waste, staff and staff overtime, and a general improvement in operational efficiency (detailed below).

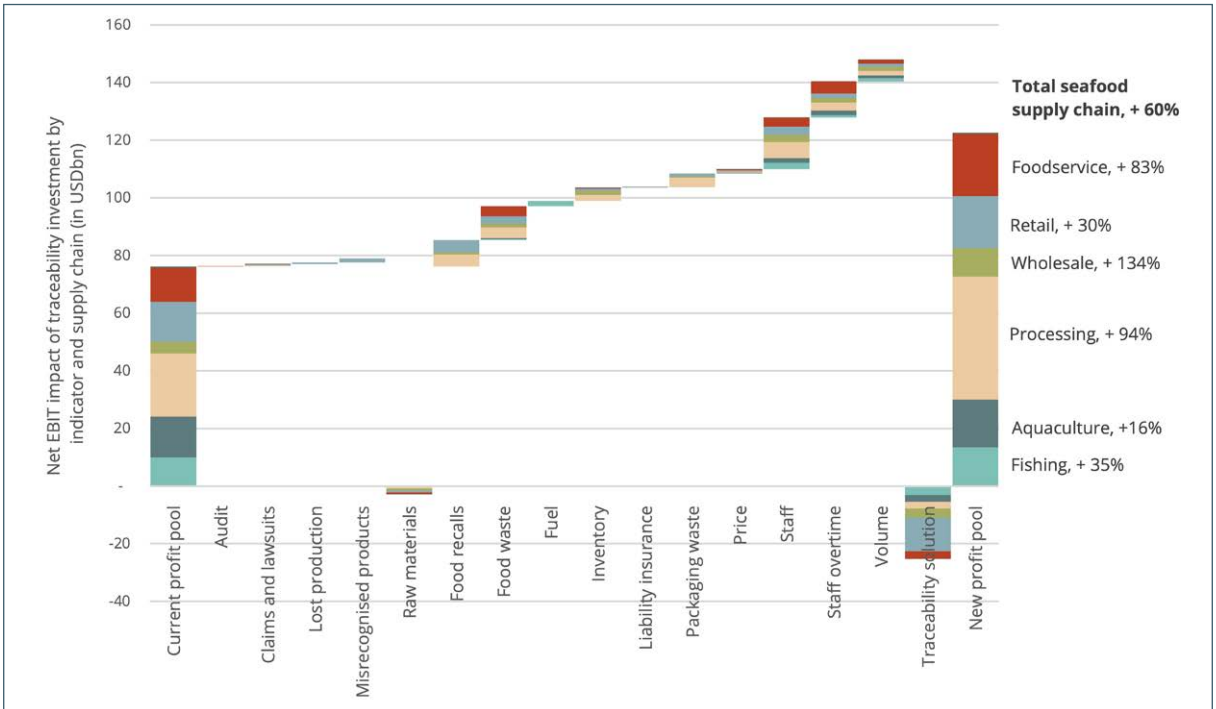


Figure 3: Impact of Implementing Seafood Traceability (on Traceability-Ready Seafood Only) on the Global Seafood Supply Chain Profit Pool by Source and Sector. Source: Planet Tracker, in USDbn.

Assuming no changes in valuation multiples – see top chart in Figure 4, this would lead to a **c.USD 600 bn increase in global seafood enterprise valuations** – see bottom chart in Figure 4.

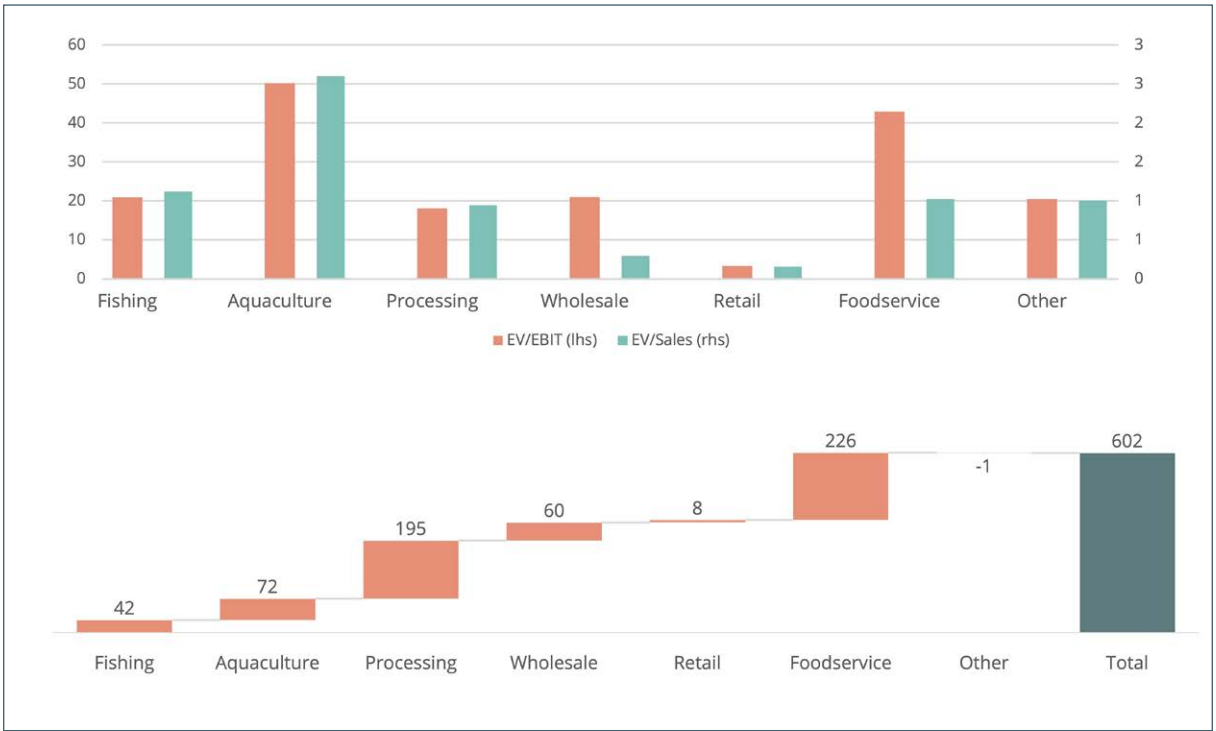


Figure 4: Estimated Traceability-Related Change in Global Seafood Enterprise Valuation (Bottom Chart) based on Unchanged Valuation Multiples (Top Chart). Source: Planet Tracker, Eikon.

Investors and lenders can unlock this potential 30% increase in valuations, by engaging with companies across the seafood supply chain to ask them six key questions:

1 What traceability systems are currently in place at the company?

2 What is their scope[4], precision[5], breadth[6], and depth[7]?

3 How interoperable are the company's traceability systems with those of suppliers and clients? Do they use GDST standards?

4 What prevents the company from implementing robust traceability solutions on 100% of its products?

5 How much would be the investment, costs and benefits to become 100% traceable?

6 How can investors and lenders support the transition towards being 100% traceable?

[4] Proportion of product portfolio covered by traceability solutions

[5] Size of traceable lot (where 'lot' refers to the quantity of fisheries and aquaculture products of a given species of the same presentation and coming from the same relevant geographical area and the same fishing vessel, or group of fishing vessels, or the same aquaculture production unit. A fish box is an example of a 'lot').

[6] Amount of information that can be connected with the lot

[7] How far back or forward in the supply chain the system traces the relevant information

We counted 23 investors with 5% or more of their equity portfolio in companies poorly rated for traceability by the World Benchmarking Alliance[8].

Governments can also contribute: in the fishing sector, we estimate that the investment necessary to make traceability-ready fish 100% traceable equals just 6% of the fishery subsidies received, most of which are deemed harmful anyway. Reallocating some of the harmful subsidies (prohibited by the WTO in June 2022)[i] towards traceability investments would therefore be a double positive.

INTRODUCTION

In October 2020, Planet Tracker published Traceable Returns,[ii] a report demonstrating the financial case for seafood processors to invest in traceability solutions and, in particular, traceability solutions aligned with GDST[9] - the global standard for seafood traceability.[iii]

Since then, progress has been made, and the case for seafood traceability keeps on being strengthened. For instance:

- The number of companies that have stated their intention to implement GDST standards has doubled, to more than 80.[vi]
- Japan has passed a new law to introduce traceability in the fisheries sector.
- The World Benchmarking Alliance has introduced a Traceability score for the 30 companies benchmarked in its revised version of the Seafood Stewardship Index.
- The list of excuses for not investing in traceability has been made thinner.[vii]

Yet an overwhelming majority of global seafood production is still not traceable.

In this report, we examine:

- whether 100% sea-to-plate traceable seafood could be a reality
- if so, what the consequences would be for the entire seafood supply chain
- what is required to materialise this transformation towards 100% traceable seafood

Please turn to Traceable Returns or Implementing Traceability – Seeing through Excuses for explanations of what traceability is and why it is needed.

[8] Companies with a Traceability Score of 7.5/15 or less in the World Benchmarking Alliance's Seafood Stewardship Index
[9] Global Dialogue on Seafood Traceability

ECONOMICS OF A WIDELY UNTRACEABLE SEAFOOD INDUSTRY

To analyse how traceability could change the economics of seafood supply chains in the near future, we first need to map the present.

Revenue and profit estimates for the entire global seafood supply chain, including both reported and unreported seafood, are not available. So we built our own.

We estimate that the **global seafood supply chain** (all companies, of any kind and size) generated **revenue of USD 1.8 trillion** in 2020 - an amount similar to Italy's GDP, the eighth largest economy worldwide (2% of global GDP),[viii] or the global amount of subsidies of all kinds (e.g. on fossil fuels or agriculture) that are driving the destruction of ecosystems and species extinction.[ix]

Out of this, the wild capture and farming of seafood together represented just 25% - see Figure 5.

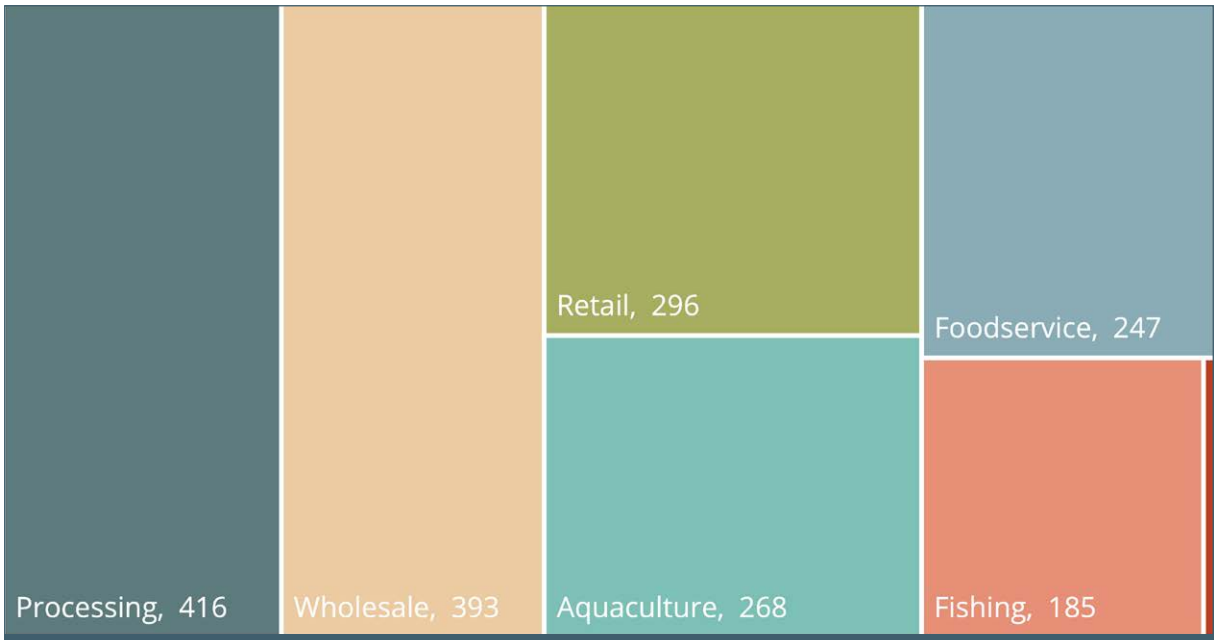


Figure 5: Estimated Breakdown of Global Seafood Revenue by Stage of the Value Chain (2020, USD billion, including IUU fish). Source: Planet Tracker.

The Methodology section explains how we calculated our estimates.

Total profits (EBIT) were much more modest in comparison, at an estimated USD 76 billion (3.6% average EBIT margin) - see Figure 6.

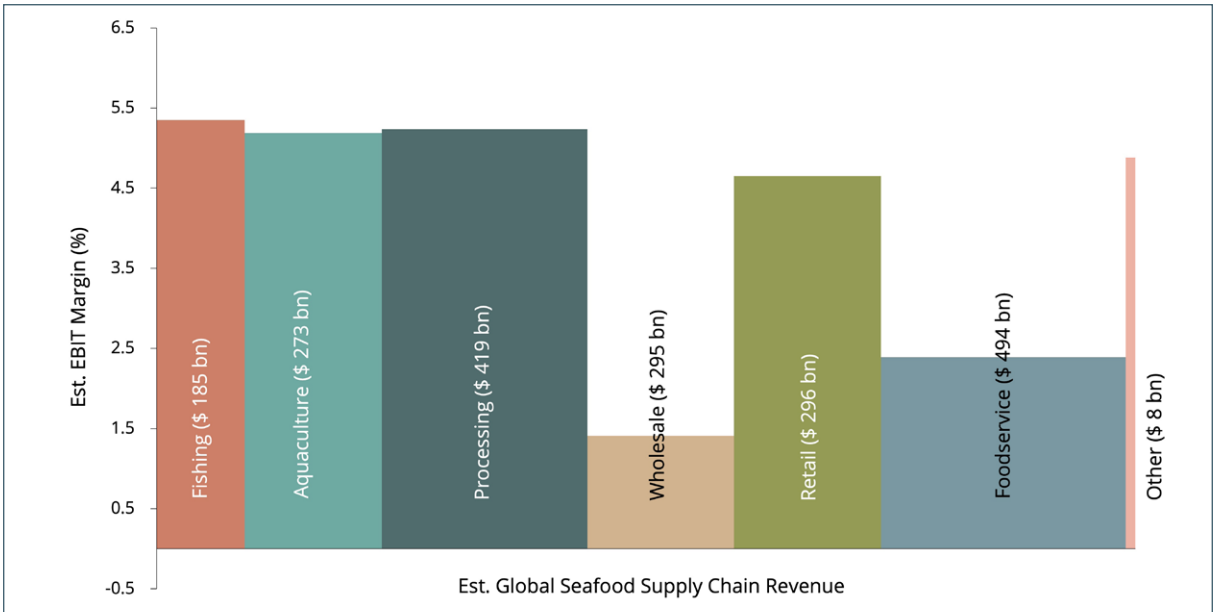


Figure 6: The Global Seafood Profit Pool (2020, including IUU fish) Source: Planet Tracker.

These estimates are significantly above traditional estimates of the global seafood market, as they include all seafood, whether reported or not, sold by a large company or not, traded internationally or not.

With a low average margin generated at every stage of the supply chain, the total cost of production becomes a key driver of end-prices - see Figure 7.

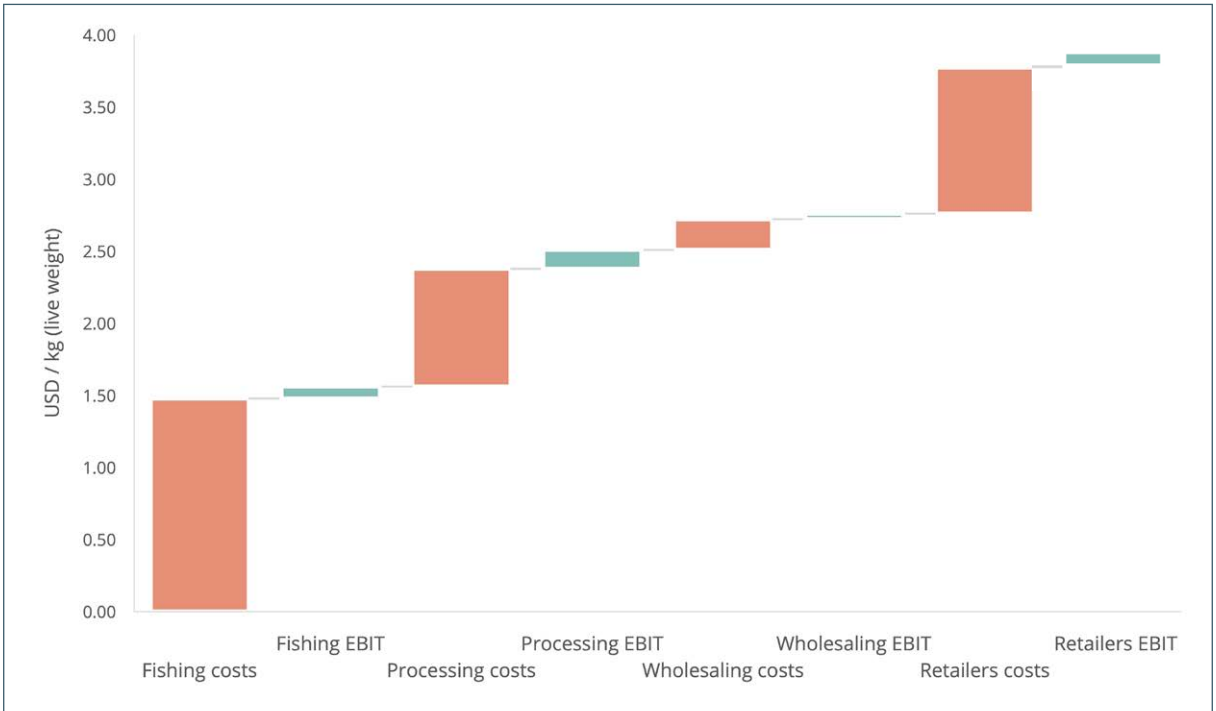


Figure 7: Split of the Global Average Retail Value ex VAT of One Kg of Wild-Caught Fish. Costs are in Red and Profits in Green Source: Planet Tracker, in USDbn.

Any increase in production costs might therefore result in significant changes in profitability or prices throughout the supply chain.

With this in mind, we examine the financial impact that industry-wide traceability implementation would generate on the global seafood supply chain, with a focus on the consequences for production costs, investments and financial returns/losses.

MEASURING THE IMPACT OF SEAFOOD TRACEABILITY

Traceability: seeing through the buzzword

The impact of traceability implementation for the seafood industry is of course a function of the type of traceability solution implemented. Here, we focus on solutions that meet the requirements of the Global Dialogue on Seafood Traceability (GDST) standards[10], mainly to allow for interoperability between systems. For the latter, a minimum number of key data elements (KDE) is necessary and the GDST standards define the technical formats and nomenclatures these KDE should use.[x]

Box1: Avoiding traceability-washing with precision, depth and breadth

Distinguishing between different types of traceability is important to avoid "traceability-washing" - when a company claims to 'have implemented traceability' but does not mention that it is only internal traceability, or only for a few marginal products and/or using inadequate systems.

We believe that information about four metrics is enough to measure the risk of being traceability-washed. These are the scope, precision, breadth and depth of a traceability system.

Scope refers to the number of product lines, or percentage of product portfolio, that is traceable.

Precision refers to the size of a traceable lot[11] or batch that is uniquely identified. It can be a single product package, a whole day of production, or more. It is seen as key to traceability performance.[xi]

Breadth describes the amount of information collected that can be connected with the lot[10].

Depth how far back or forward the system regularly traces the relevant information.

Ideally, a traceability solution should cover the entire supply chain and have enough precision and breadth to optimise its financial and environmental benefits (see below) across the whole supply chain, at a cost that remains reasonable.

[10] Global Dialogue on Seafood Traceability standards are the key standard for seafood traceability. See Traceable Returns or https://traceability-dialogue.org/ for more details.

[11] Where 'lot' refers to the quantity of fisheries and aquaculture products of a given species of the same presentation and coming from the same relevant geographical area and the same fishing vessel, or group of fishing vessels, or the same aquaculture production unit. A fish box is an example of a 'lot'.

Box2: With GDST, interoperability becomes achievable

Interoperability is the ability of different information technology systems or software programs to communicate seamlessly for the purpose of exchanging, interpreting and using data. It is a critical component of full-chain digital traceability. It is rare in the seafood industry, but encouragingly less and less so.

In 2015, analysis of 15 leading traceability technology vendors found that not a single of them performed all of the functions that would allow a seafood company to ensure it is not trading IUU, mislabelled or fraudulent products.[xii]

In 2017, an interview of nearly 120 technology companies and seafood supply chain businesses found very little evidence of interoperability for entire seafood supply chains that were not either extremely short or already vertically integrated.[xiii]

This lack of interoperability was one of the primary issues that the Global Dialogue on Seafood Traceability (GDST) sought to resolve, by developing common standards that every organisation could use to achieve interoperability. Since then, the situation has improved: in our understanding, in early 2022, most technology vendors tested[12] passed the first round of beta testing of the first-ever tool to verify the ability of software solutions to achieve GDST data sharing interoperability.

Traceability: benefits and costs across the supply stage

To estimate the impact of traceability implementation at different stages of the seafood supply chain, Planet Tracker has collected key evidence from multiple case studies and interviewed multiple industry experts. We then estimated the investments necessary to implement traceability solutions and the related costs and benefits, based on the factors shown in Table 1. For each of them, we computed the likely impact at each stage of the supply chain, depending on the geography/species/size of the company.

[12] Six organisations, including e.g. OpsSmart Global, Pacifical, Trace Register, and Wholechain

Table 1: How Traceability Can Affect Seafood Supply Chains. Source: Planet Tracker.	
Category	**Factor**
Benefits	
Revenue generation	Greater ability to meet customer requirements
	Increased average catch quality
	Change in sales volume
	Price premium
	More accurate cost-based pricing
	Increased willingness to pay by consumers
	Enhanced customer confidence/trust
	Reduced credits to customers
	Improved company reputation
Recalls, waste & errors	Improve the frequency of successful trace backs
	Reduce the need for frequent category wide recalls
	Narrow the scope of product recalls
	Reduce packaging waste
	Reduced spoilage and waste
	Reduced loss rate of products
	Reduced misrecognition rate of products
Operational efficiency	Less time spent in production, receiving and packaging
	Increased accuracy and efficiency in operations and data management
	Reduced staff reporting time
	Enhanced ability to manage and record raw materials received from small-scale fishers
	Reduced unproductive vessel trips
	Reduced cost of reading tags
	Reduced number of data errors
	Reduced cost of audits
	Increased ability to track and manage commingled products
	Reduced inventory
	Reduced labour costs
Intangible benefits	Increased assurance in meeting import requirements
	Increased capacity for data analysis and business decision making
	Enhanced captain and crew experience
Compliance, insurance and litigation	Increased ease in complying with national and international market requirements
	Less frequent/less severe claims and lawsuits
	Liability insurance cost reduction
	Enhanced regulatory and legislative compliance
	Litigation risks mitigation or elimination e.g. shift responsibility/share responsibility with others

Category	Factor
Investments / Costs	
Hardware	Servers
	Network
	Terminals
	Scales
	Scanners
	Other peripheral devices or hardware
Software	Activation fee
	Annual license fee
Contractors	Onsite implementation
	Training
	Full chain integration
	Support & maintenance
Trade	Supplier premium
Staffing	New employees

Whilst some of the above factors might be obvious, we provide below some comments on the ones that might not be self-explanatory[13]:

Increased average catch quality: a case study in Indonesia shows that by using Pointrek, a low-cost system that provides mobile and desktop applications allowing vessel owners to track the position and heading of their fleets in real time and communicate via an integrated SMS application, a fishing company can generate a c. 2% increase in catch quality due to co-ordinated efforts and shorter trips.[xiv]

Change in sales volume: traceability can be used to sell 'storied fish', i.e. as a marketing tool to promote the traceable product vs others, and could therefore lead to a rise in volumes and/or a price premium. At fishing companies, there could be a fear that traceability requirements would force vessel captains to publicly divulge their whereabouts in real-time, leading to increased competition for fish, and therefore lower volumes. This partly explains why some vessels sometimes switch off their AIS devices[14]. We see this risk as minimal, since the data captured by traceability solutions is not meant to be available to the public or a competitor's fishing vessel in real-time, and therefore differs from public real-time monitoring (via AIS).

Another key driver of volume loss would be the discovery that part of the sourcing of a given company come from IUU[15] origins. Our estimates reflect that, based on the estimated prevalence of IUU fishing by area.

[13] Detailed modelling available upon request

[14] automated tracking system for marine vessels (AIS stands for Automatic Identification System).

[15] Illegal, Unreported and Unregulated

Increased willingness to pay by consumers: in Japan, a 2021 study conducted by the Ocean Policy Research Institute found that in the Tokyo Bay, **seafood traceability information can increase general consumers' willingness-to-pay by 10%** of the original price.[xv] Whilst this is very encouraging, we have conservatively assumed a c.1% increase only on average, at retailers and restaurants only (slightly more in Europe). Earlier on, an on-site survey in Beijing regarding consumers choices in regards to traceability found that 60% of respondents were willing to pay an average 6% premium for traceable fish products to increase health safety.[xvi] However, in Spain, research found that consumers are willing to pay for superior quality, but not a traceability system since they consider that it is a cost that should be assumed by the producers.[xvii] We have assumed only a c.1% price premium in retail and foodservice for traceability-ready volumes only.

Food recalls: Traceability systems can **reduce the direct costs of recalls by 90%** for short shelf life products (like fresh seafood) and by 95% for longer shelf life products (like frozen seafood).[xviii] This is through improved frequency of successful trace backs and reduced frequency of category wide recalls (the scope of product recalls is narrowed). Enabling a traceability system that warns processors, harvesters etc. when a product is close to spoiling etc. ensures less recalls of these products occur. However, when these recalls do occur, due to spoilage, health concerns etc. an enforced traceability system can ensure these products can be found and dealt with accordingly. We have conservatively assumed only a c. 25% average reduction in food recall costs (depending on the area) at processors (in line with the assumption made in Traceable Returns), wholesalers and retailers.

Reduced unproductive vessel trips: for fishing companies only, traceability solutions can come in the form of / with tools that allow for better fleet management. This benefit will only be realised if fleet management is not yet optimal. When PT. Nutrindo Fresfood (an Indonesian tuna fishing company) trialled Pointrek, a low-cost traceability solution, it experienced a 10% reduction in unproductive vessel trips.[xix]

Reduced staff costs and overtime: By reducing the number of data errors, increasing the ability to track and manage commingled products and also the ease of complying with national and international market requirements, traceability solutions can reduce staff cost, and overtime costs in particular. For instance, as a result of traceability data that directly connects to its operating systems, Norpac Fisheries Export, a Honolulu-based seafood processing and distribution company, reduced overtime from 1,600 hours a month to fewer than 100, a c. 95% reduction.[xx] Staff cost reductions (through internal reallocation of employees) are more difficult to estimate. In what is likely to be a high-end example of benefits realised, PT. Nutrindo Fresfood experienced a 30% labour saving associated with its internal tallying/traceability processes (23 employees) after trialling TraceTales, a software that digitizes paper traceability for processing companies.

Investment in hardware and software: Investing in new servers, networks, terminals, scanners, other peripheral devices (like tablets) and scales might be necessary when implementing traceability. We estimate that these could **increase the capital expenditures of a company by c.2%-5%**, depending on its position in the supply chain and its location. Activation fees, on-site implementation and training are harder to model but our conversations with various industry experts led us to estimate an average of USD 11,000 per company across the supply chain (mindful that the average company is small). This is also the average between the installation and hardware costs of two different traceability solutions, TraceTales and Pointrek.[xxi]

Annual costs of traceability: For most companies, the bulk of it comes from annual license fees. These are a function of the solution retained. We have assumed that the average seafood company would choose a GDST-compliant traceability solution like the one proposed by Wholechain,[xxii] whose pricing starts at c. USD 1,500 a month for large corporate enterprises (USD 299 a month for smaller companies).[xxiii] Another seafood traceability company charges only USD 1,000 per month to a large retailer.[xxiv]

Overall, we have assumed **average annual license costs of c. USD 19,000 per company** (plus USD 2,000 in maintenance and support, and one-offs totalling USD 11,000 in activation fees and training).

These costs are key drivers of the financial benefits of traceability, and yet they can vary widely depending on the provider. For instance, IBM's Food Trust reportedly charged seafood processor Raw Seafoods up to USD 50,000-70,000 *per vessel* in subscription fee.[xxv]

Below we have compared for each stage of the supply chain the maximum cost of the annual traceability license fee that maintains the profit pool unchanged ('breakeven price' in the chart below) vs the one we used in our assumptions ('price assumed' in the chart below).

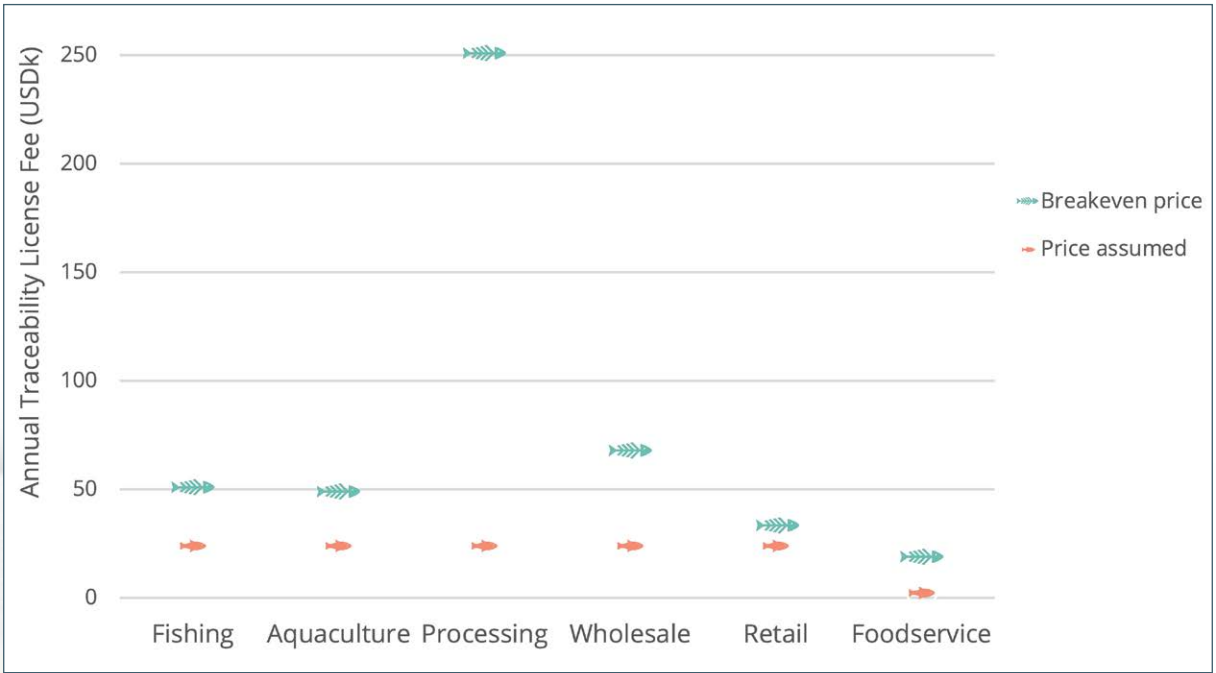


Figure 8: Estimated Maximum Annual Cost of Traceability License Fees Paid Per Company that Keeps the Profit Pool in Each Sector Unchanged ('Breakeven Price') vs Cost Retained in our Assumptions. Source: Planet Tracker, in USDbn.

Supplier premium: this is the cost that a business incurs when its suppliers pass through some of the annual costs of traceability. Based on conversations with experts, we assumed a **0.1%-0.3% increase in raw material costs** (about one cent of a dollar for every five fishes) due to data management costs.

Below in Figure 9, we present the key assumptions retained for each stage of the supply chain, showing the average impact for the entire supply chain and the minimum and maximum impact. For instance, we assume an average 10.7% reduction in food recall costs for the entire supply chain.

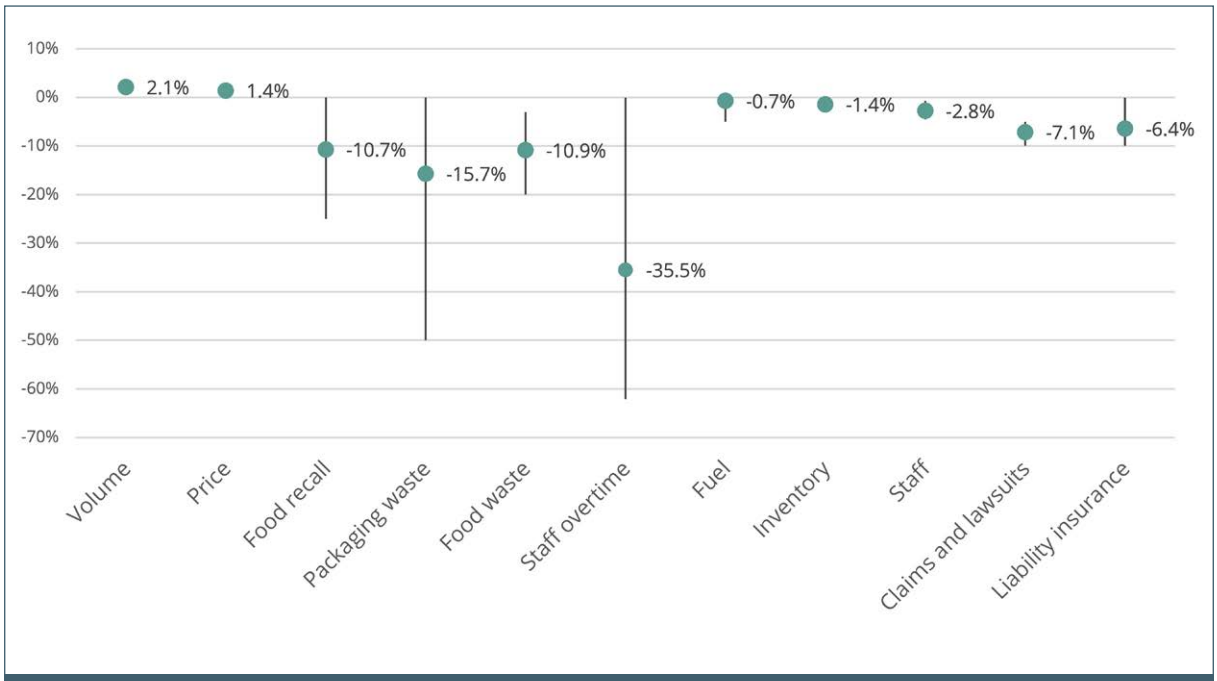


Figure 9: Average Assumed Impact of Traceability Implementation on Global Seafood Supply Chains by Indicator. Source: Planet Tracker, the Lines Indicate the Stages of the Supply Chain Where the Assumed Impact is the Lowest/Highest.

We have modelled the impact of each of these factors in each continent and at each stage of the supply chain to understand what the economics of a fully traceable seafood industry would look like - see page 24. Detailed modelling per continent for each factor is available upon request. But is a 100% traceable industry realistic? To answer this question, we introduce the concept of traceability-readiness.

AN INCONVENIENT TRUTH: NOT ALL FISH CAN BE TRACED

The (sea) elephant in the traceability room is that a very significant proportion of the current seafood production cannot realistically be traceable without a change in the conditions in which it is produced, due to an absence of incentives to become traceable.

This is mainly the case for IUU fish (and especially illegal fish): harvesters of IUU fish and the supply chains that depend on them have no incentives for this fish to be traceable. This excludes c. 20% of the world's seafood production. It is up to both the public and the private sector to eliminate IUU fishing. For more details, including actions investors can take to estimate and minimise their exposure to that risk, please see Do you IUU?.[xxvi]

Fish caught legally but in conditions that are overwhelmingly regarded as being unsustainable can also fit that description.

Figure 10: IUU Fish and Other Very Unsustainable Fish are the (Sea) Elephant in the Seafood Traceability Room. Photo credits: Elephant Seal - Chase Dekker Wild-Life Images.

In making this key assumption that only supply chains of fish species that are not completely unsustainable have an incentive to be traceable, we take the perspective of the harvester, whose actions can easily be associated with the sustainability of the seafood produced. Retailers on the other end could have a more open approach, i.e. they could want traceability on more of their seafood, even those that are not sustainable - but this cannot materialise without the buy-in of harvesters. Please turn to How Retailers Can be Profitable in Seafood for more details on retailers.[xxvii] In the foodservice sector, incentives to be traceable are also likely to be lower than at retailers, given that restaurants have a likely higher rate of IUU or mislabelled fish.[xxviii, xxix]

For these reasons, we introduce the concept of traceability readiness for seafood.

Box 3: Is your fish traceability-ready?

We call 'traceability-ready' fish that is:

a harvested in a way that makes it at least acceptable for the harvester to be associated with its production (i.e. it is not too unsustainable or illegal) and

b caught or farmed in an area where the challenges of implementing a traceability solution (levels of corruption and digitalisation) can be overcome.

We have examined the production of **each seafood species in each country of the world to determine the level of incentives and of challenges to be overcome** for this seafood production to be traceable.

The methodologies and metrics retained to define the different degrees of traceability readiness can be found on page 35.

Analysing c. 45,000 combinations of species/ country of production / country of the producer (e.g. when a Thai-flagged vessel captures fish in Indonesian waters), we calculate that **only 29% of the current global seafood production is traceability ready in volume terms** - see Figure 11. That proportion would rise to 69% of the global seafood production if we only included volumes for which the data necessary to evaluate traceability-readiness exists, but in our opinion production where no data exists is more likely than not to fall in the non-traceability ready category.

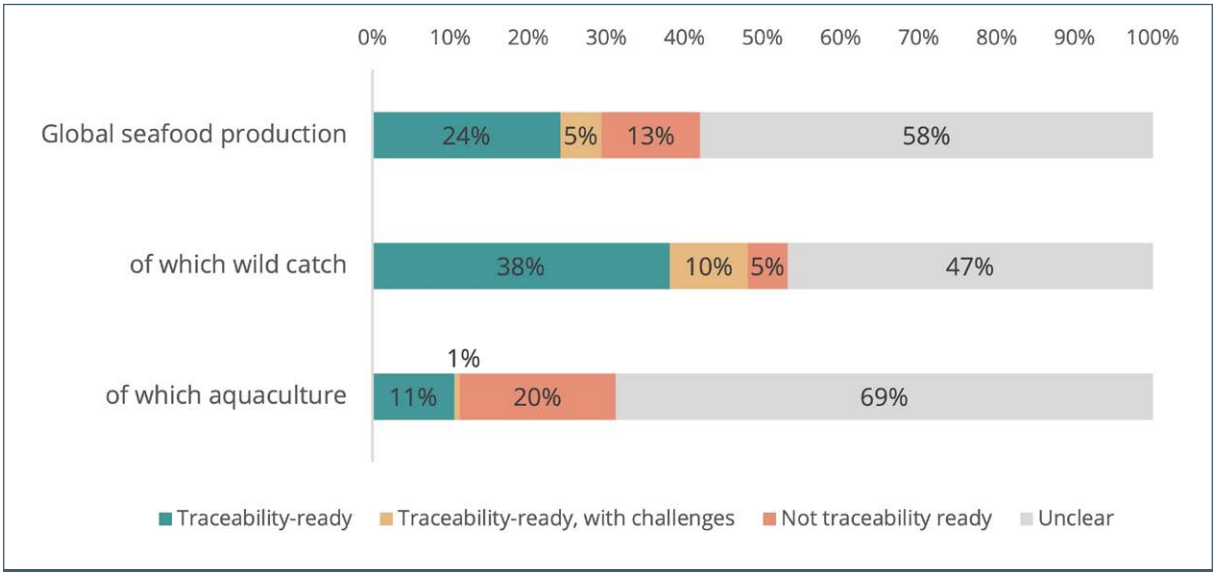


Figure 11: How Traceability-Ready is the Global Seafood Production? Source: Planet Tracker.

Traceability readiness varies by region and is lowest in Asia, where the majority of seafood production occurs - see Figure 12.

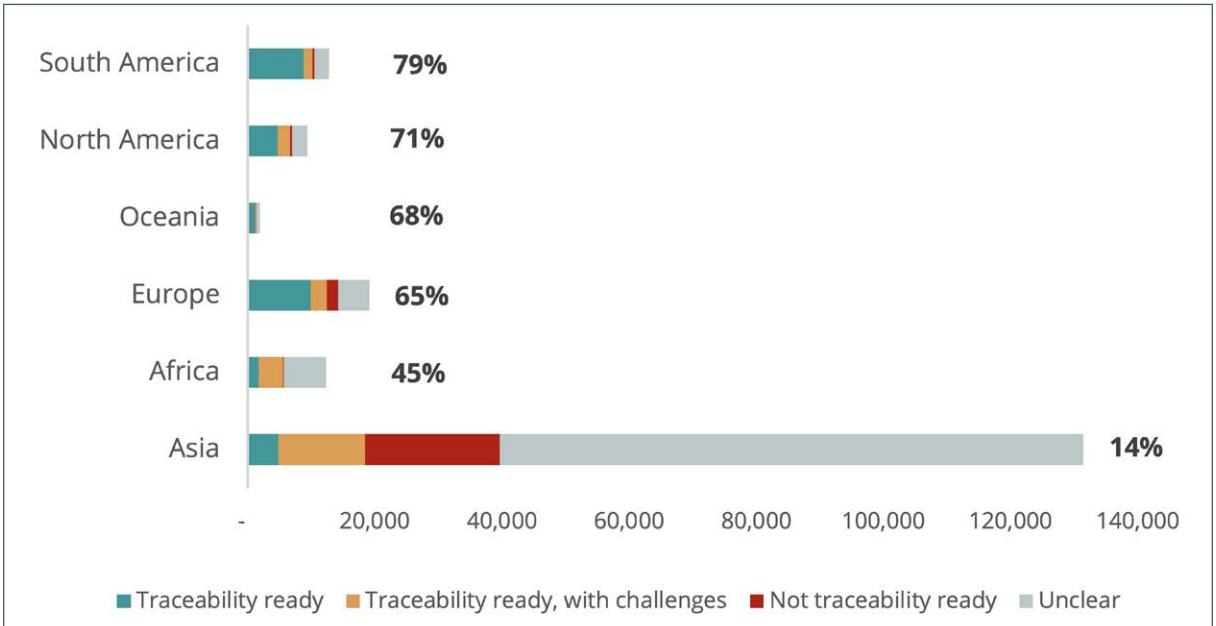


Figure 12: Traceability Readiness of Total Seafood Production by Continent.
Source: Planet Tracker, Volumes In Thousands Tonnes, Traceability Readiness Proportions Include Traceability-Ready Volumes With Challenges.

Traceability readiness is correlated with income level - see Figure 13 (to an extent but not only because some of the underlying indicators retained, digitalisation and corruption are too). This means that in many parts of the world, efforts dedicated to improving income levels could be effective ways to reduce some of the obstacles to traceability readiness, such as incentives to fish illegally or high corruption levels.

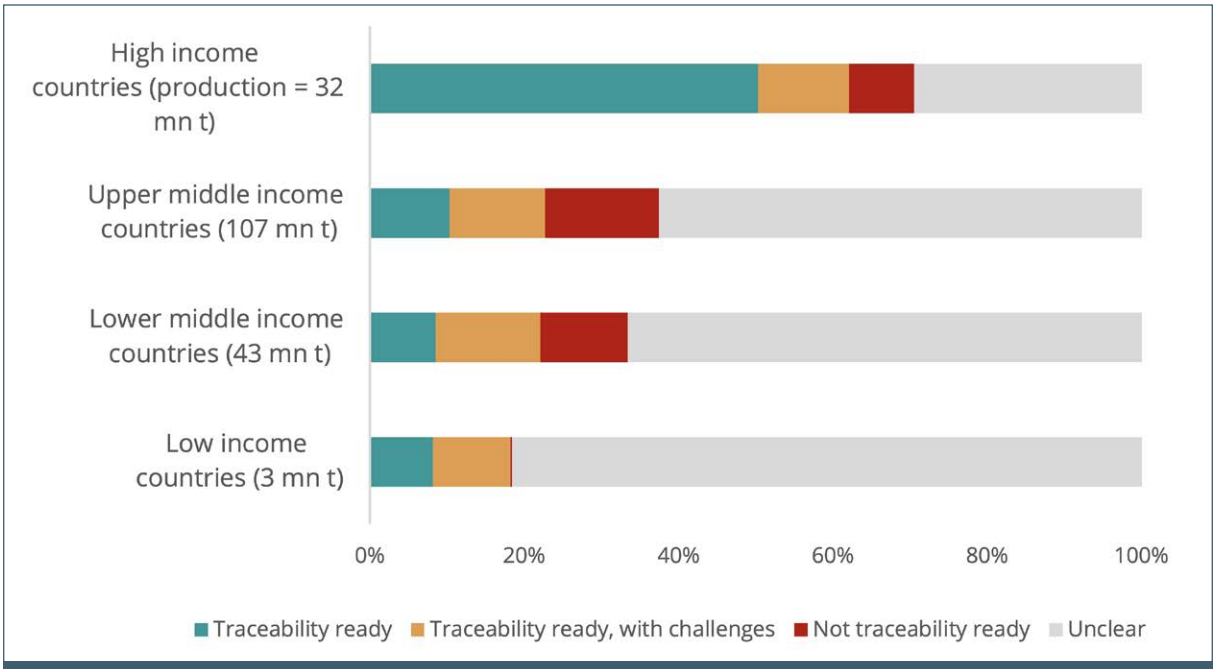


Figure 13: Traceability-Readiness of Global Seafood Production by Income Level of Harvesting Country.
Source: Planet Tracker.

The same pattern can be identified by focusing separately on wild-catch and aquaculture: the proportion of seafood that is traceability-ready is c.7x greater in high income countries than in low income countries.

There are exceptions, though, and this is where the sustainability of the fish produced particularly matters. See for instance Figure 13, showing that more non-traceability-ready fish is produced in the UK than traceability-ready. This is because the average environmental sustainability score of Atlantic salmon aquaculture in Scotland was just below the level we defined as constituting an incentive to be traceable - see Methodology section for more details.[xxx]

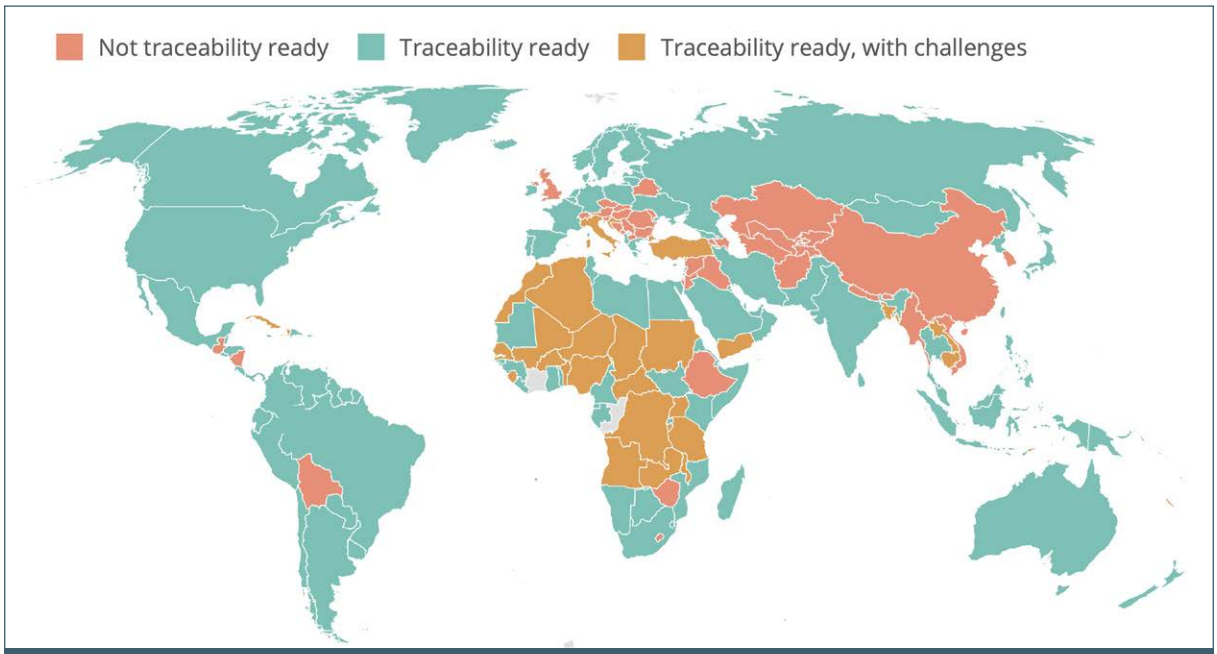


Figure 14: Which of each Traceability-Readiness Category has the Largest Volumes in each Harvesting Country? Source: Planet Tracker, excluding 'Unclear' category.

The proportion of seafood production that is traceability-ready in the Americas is greater than elsewhere - see Figure 15.

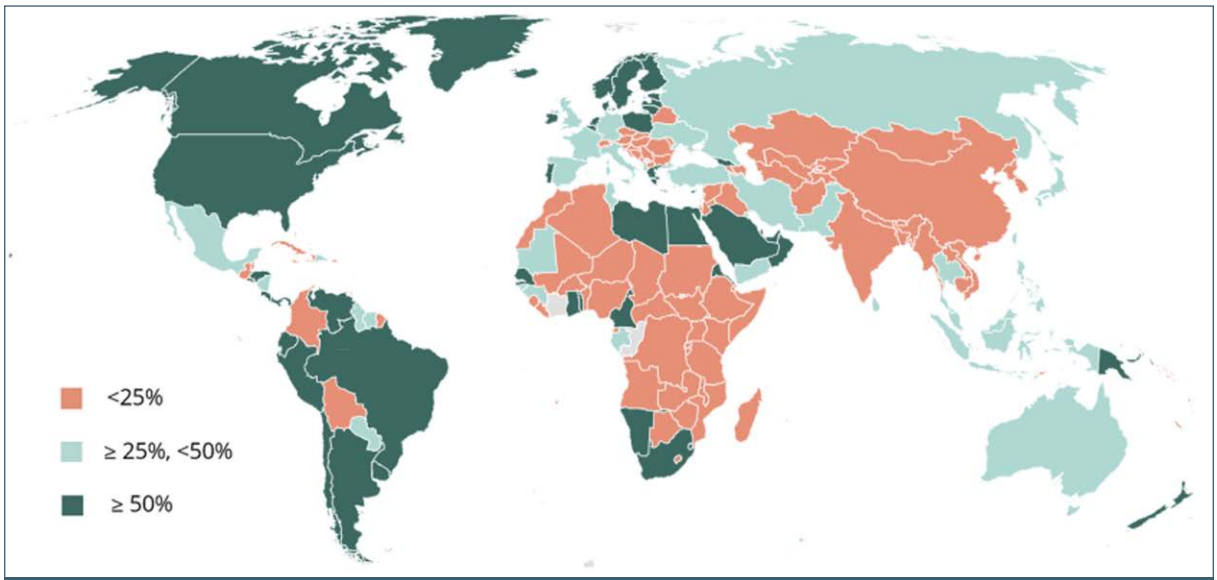


Figure 15: Proportion of National Seafood Production (by Location of Farms and Flag Country) that is Traceability-Ready. Source: Planet Tracker.

Traceability-ready seafood production is less fragmentated than overall seafood production - see Figure 16.

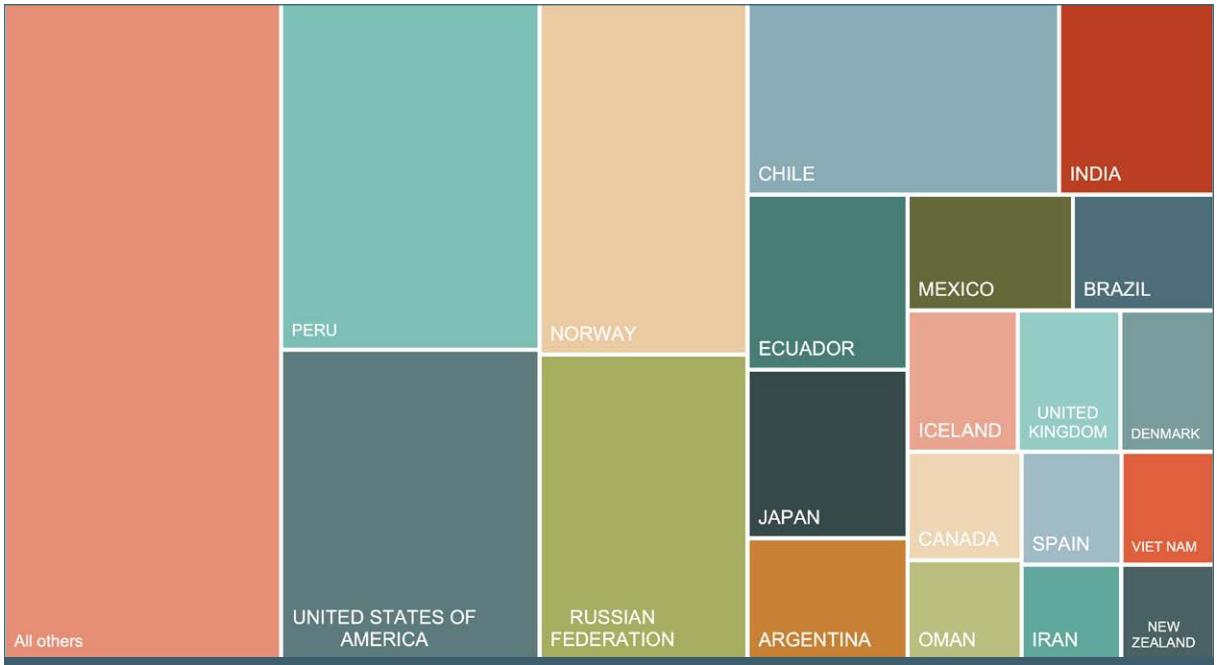


Figure 16: Split of Traceability-Ready Seafood Volumes by Harvesting Country. Source: Planet Tracker.

The top ten producing countries with the highest proportion of traceability-ready fish are: Argentina, Cook Islands, Cyprus, Finland, Grenada, Kiribati, Lithuania, Micronesia, Nauru, and Tuvalu.

Key traceability-ready species (both in relative terms and absolute terms) include Nile tilapia, anchoveta and Alaska pollock - see Figure 17.

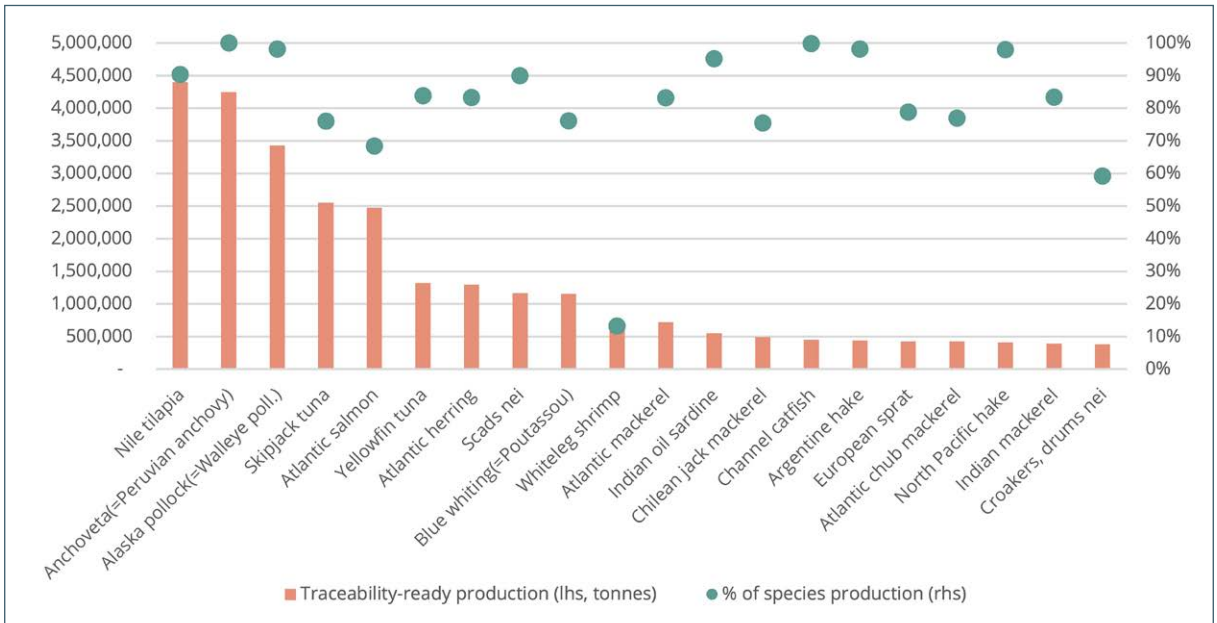


Figure 17: Top 20 Traceability-Ready Species and Proportion that is Traceability-Ready. Source: Planet Tracker.

According to our model, 280 species of seafood are 100% traceability-ready. Out of these, 15 have global production volumes of 100,000 tonnes or more - see details in Appendix page 38.

ECONOMICS OF A HIGHLY TRACEABLE SEAFOOD INDUSTRY

Having identified which parts of the global seafood production could be traceable without major changes in its underlying sustainability, we have then computed the associated costs and returns of implementing traceability.

We assume no investment in non-traceability-ready seafood or for seafood where the traceability-readiness is unclear. For these seafood volumes, we argue that improving the sustainability of the production is even more urgent than investing in its traceability, although it is highly desirable for both to happen.

With a total required investment of USD 21 billion, ensuring that all of the traceability-ready seafood production that is not traceable yet becomes so generates a net EBIT uplift for the global supply chain of USD 46 billion - see Figure 18.

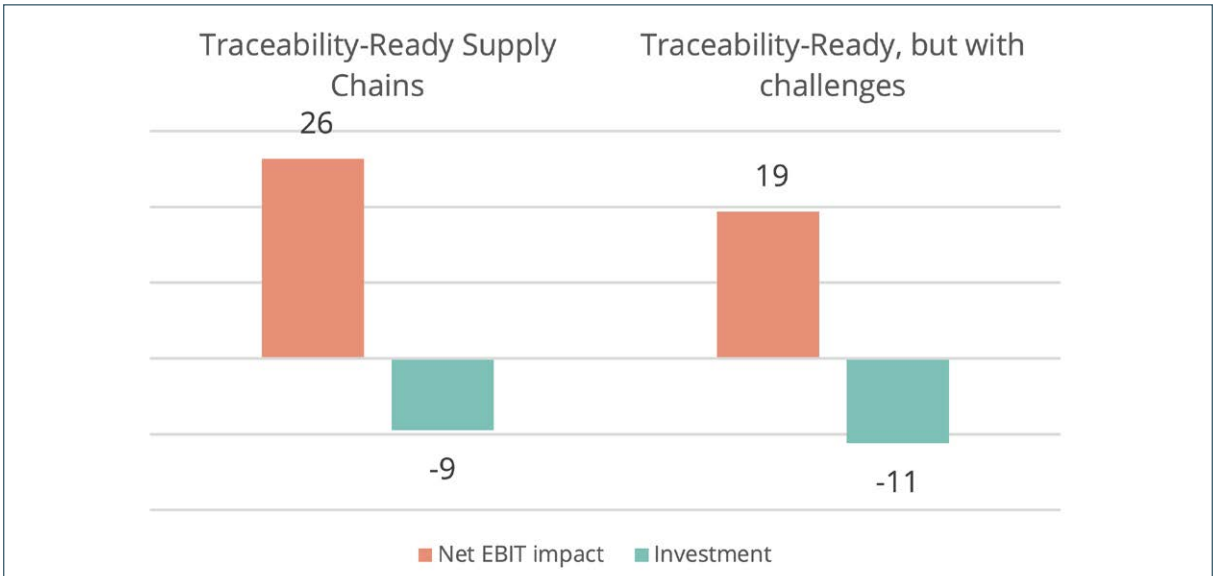


Figure 18: Seafood Traceability - Global Investment Needed and Net EBIT impact of Seafood Traceability by Traceability-Readiness. Source: Planet Tracker, in USD billion.

This margin benefit is most pronounced at seafood processors and wholesalers, where we estimate profitability could double – see Figure 19. This is in line with findings from Traceable Returns that focused on processors only, even after updating the data (we use 2020 data in this report).

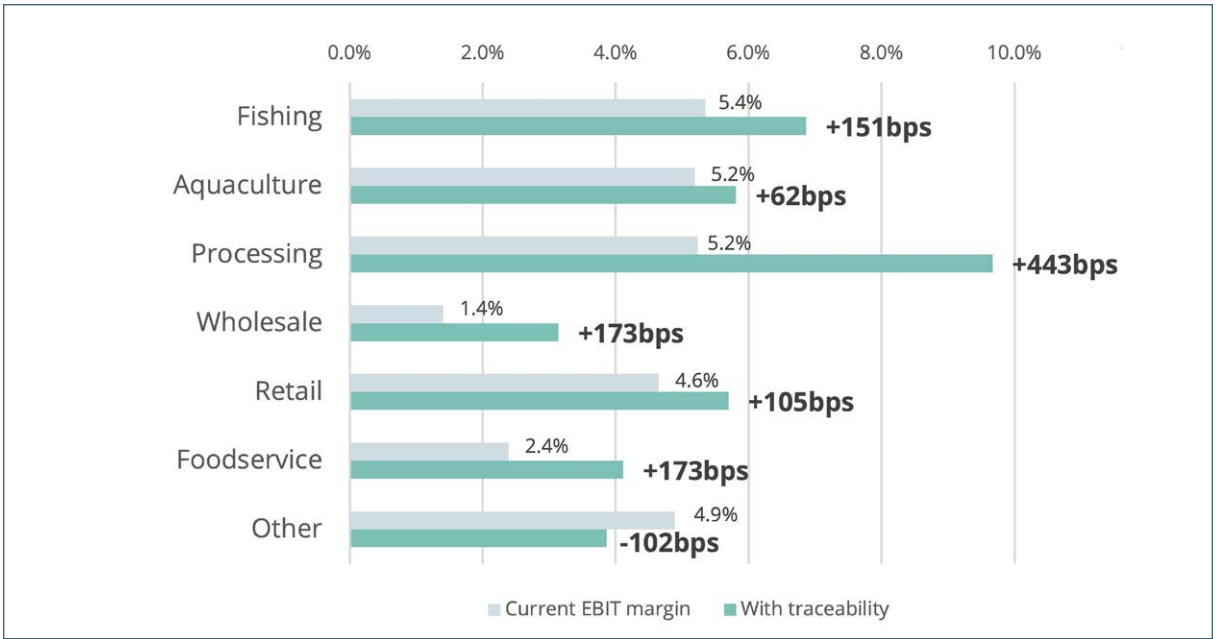


Figure 19: Impact of Seafood Traceability on the Global Seafood Supply Chain EBIT Margin by Sector. Source: Planet Tracker, in basis points - bps, i.e. 100th of 1%.

The lower relative margin uplift for aquaculture vs fishing is mainly due to the lower proportion of traceability-ready production for aquaculture, but also to a lower level of benefits from traceability (for instance, no fuel savings on vessel trips).

Note: these numbers are for seafood only - e.g. the 105bps margin improvement we estimate for the Retail stage of the supply chain concerns only the retailing of seafood (it does not mean that retailers will see a 105bps rise in their group margins).

Overall, **traceability implementation would increase the seafood supply chain profit pool by 60%**. Figure 20 outlines the breakdown of these benefits by stage of the supply chain.

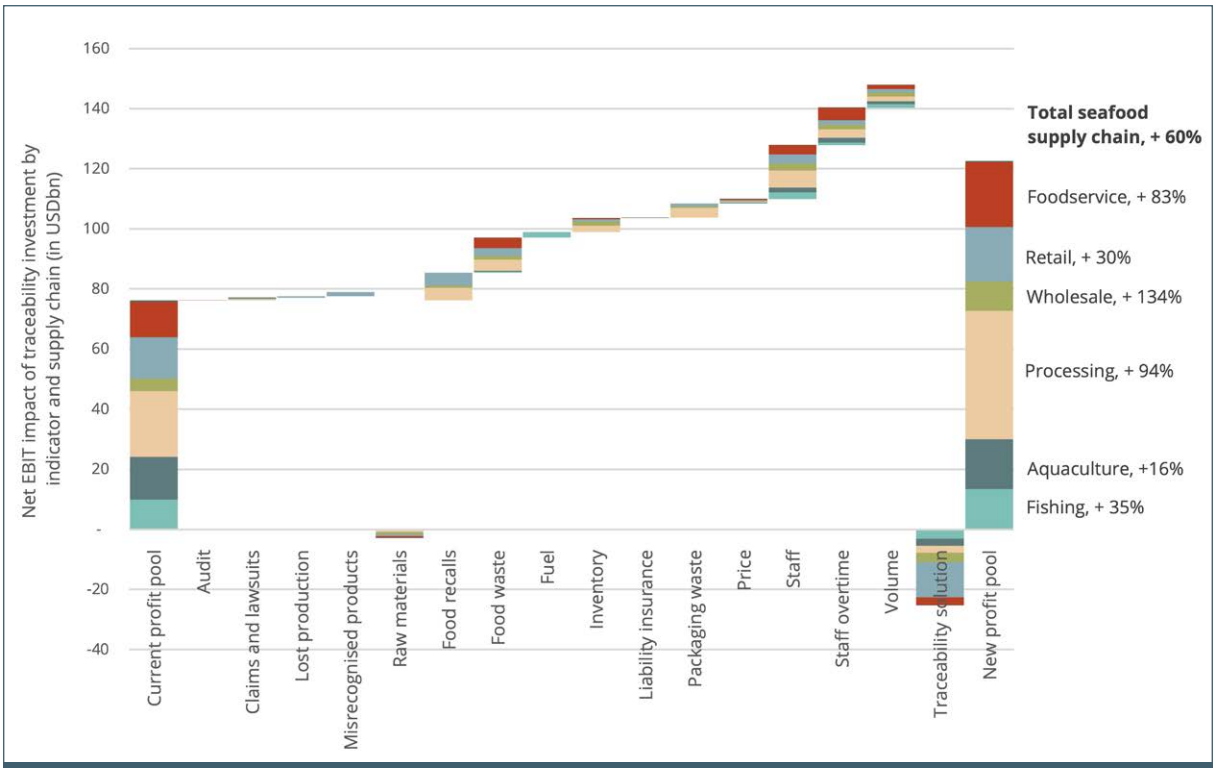


Figure 20: Estimated Net Annual EBIT Benefit of Investing in Traceability for the Global Seafood Supply Chain by Indicator and Sector. Source: Planet Tracker, Excluding Initial Investment). All Indicators are Benefits except Raw Materials and Traceability Solution, which are Costs.

Most of the investment necessary would be needed at the end of the supply chain (retailers and foodservice) - see Figure 21. This is due to the very high number of companies operating in these segments (as a reminder, we include all companies, of any size, in our analysis), and the fact that a significant part of the investment necessary will be per company - e.g., hardware and software costs, activation fee, any training.

Figure 21: Estimated Investment Needed in Traceability for the Global Seafood Supply Chain by Sector. Source: Planet Tracker, in USD million.

Looking at the fishing sector specifically, whilst investment in traceability is very likely to be carried out by fishing companies rather than the public sector, we compute that such investment would be equivalent to only 6% of the total fishery subsidies received by the sector annually - see Table 2. Any reallocation of harmful subsidies (much of which will need to be phased out anyway following the WTO's decision to prohibit them)[xxxi] to support traceability could therefore have a double beneficial effect.

Table 2: Global Fishing Sector - Traceability Investment Needed Compared to Fishery Subsidies. Source: Planet Tracker, in USD million.

Continent	Traceability Investment – Fishing Sector	Fishery subsidies	Investment as a % of fishery subsidies
Asia	952	19,515	5%
Europe	318	6,372	5%
Africa	131	2,099	6%
Oceania	103	807	13%
North America	338	4,866	7%
South America	136	1,688	8%
Total	**1,978**	**35,347**	**6%**

CORPORATES: WHO NEEDS TRACEABILITY THE MOST?

Seafood companies are at varying degrees of traceability-readiness, willingness to implement traceability and actual traceability implementation.

To avoid 'traceability-washing' (i.e. when a company claims to be 'doing traceability' but, for instance, does not mention that it is only internal traceability, only for a few marginal products, and/or using inadequate systems), we invite financial institutions to ask companies the following question:

> What is the **scope** (number of product lines), **precision** (size of traceable lot), **breadth** (amount of information that can be connected with the lot[16]) and **depth** (how far back or forward in the supply chain the system traces the relevant information) of the traceability systems currently in place at the company?

To gauge large seafood companies' progress on traceability, the World Benchmarking Alliance's Seafood Stewardship Index is a very useful tool. It shows that there is very limited disclosure on the kinds of traceability systems some of the largest 30 seafood companies have in place and the progress they are making towards implementing the GDST standards. In particular, **none of the companies in the benchmark provided detailed explanations or evidence of implemented traceability systems that cover 100% of a company's seafood portfolio as of 2020**.[xxxii]

Among the best rated companies on traceability (scores of 7.5/15 or more) are Thai Union, Nueva Pescanova, Nomad Foods, Mowi, High Liner Foods, BioMar, Bolton Group and Labeyrie Fine Foods. The list of poorly rated companies is much longer - see Figure 22.

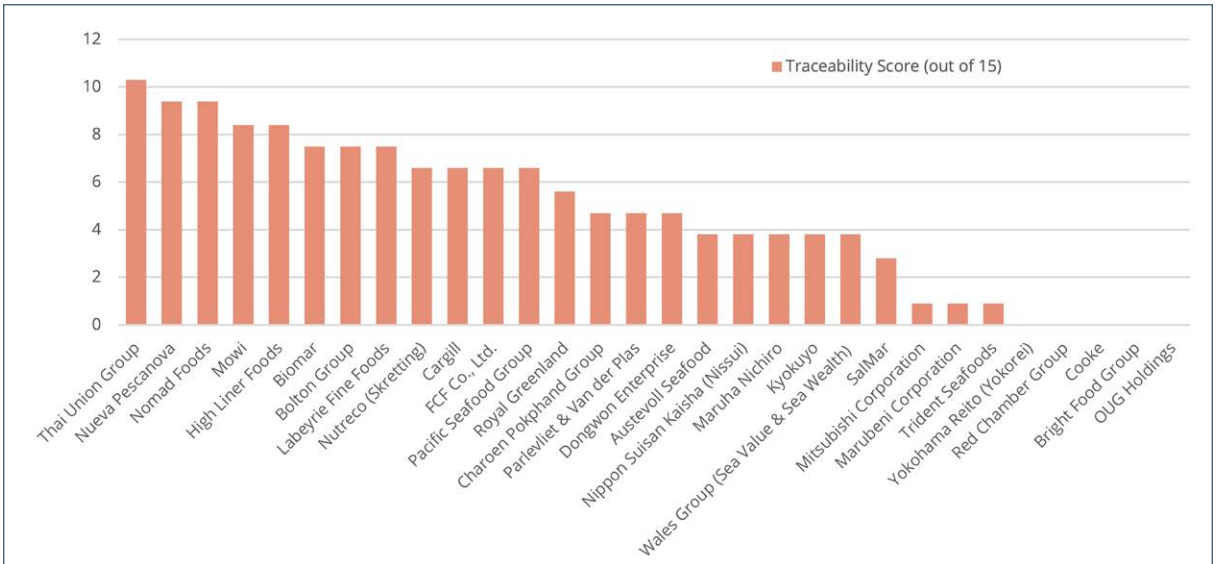


Figure 22: Traceability Score (out of 15, where 15 is the best) of the 30 Seafood Companies Benchmarked by the World Benchmarking Alliance's Seafood Stewardship Index. Source: World Benchmarking Alliance.

[16] A 'lot' refers to the quantity of fisheries and aquaculture products of a given species of the same presentation and coming from the same relevant geographical area and the same fishing vessel, or group of fishing vessels, or the same aquaculture production unit. A fish box is an example of a 'lot'.

The Traceability score by WBA includes four indicators, including Commitment to traceable seafood products and aquaculture feed, Traceability system for seafood products and aquaculture feed ingredients, Risk-based approach to illegal, unreported and unregulated (IUU) fishing, and Disclosure of the source of seafood products and marine feed ingredients.[17] Nomad Food is the best rated company for the second indicator, the most important to evaluate current traceability implementation efforts.

Once it becomes obvious that a company is relatively poorly rated for traceability, understanding why becomes key.

It could be that it sources much of its seafood from species/country combinations that we deemed not traceability-ready. Figure 23 and Figure 24 display the top sources of non-traceability ready seafood (in volume terms).[18]

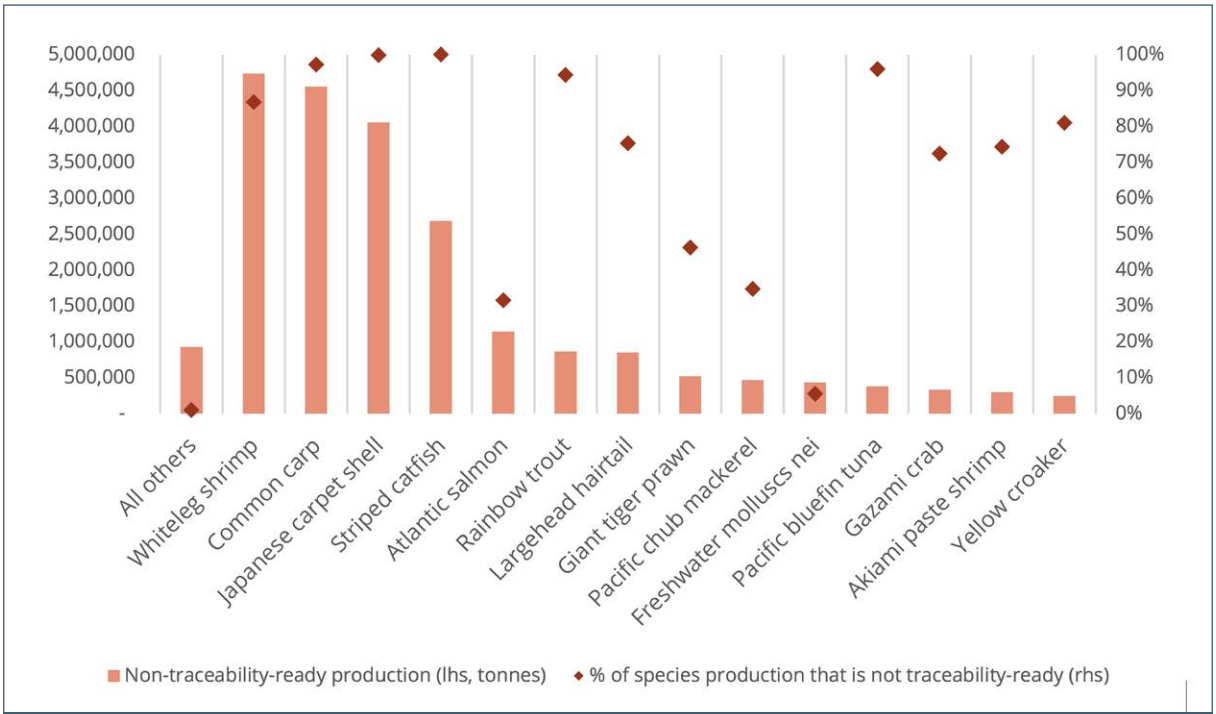


Figure 23: Top 15 Species (in Volume Terms) that are Not Traceability-Ready. Source: Planet Tracker

[17] The first two are the most relevant for our analysis. See https://www.worldbenchmarkingalliance.org/research/seafood-stewardship-index-2021-data-set/ for more details.

[18] Note: the data in both figures refers to countries/species combinations for which there was enough information to make an assessment, explaining why the USA or Russia are at the top

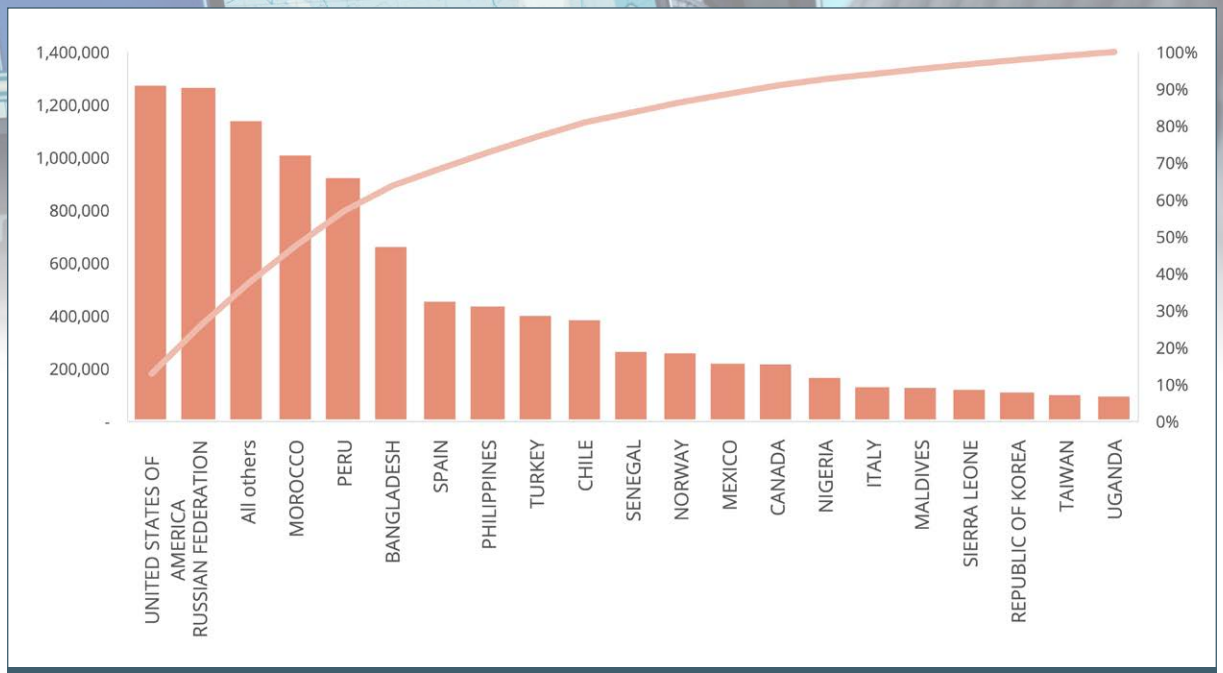


Figure 24: Split of Seafood Volumes that are not Traceability-Ready by Harvesting Country. Source: Planet Tracker.

Due to a lack of sourcing disclosure among the companies that have a traceability score under 7.5/15, we have not been able to identify with confidence companies that source a significant part of their seafood from non-traceability-ready species/areas.

However, we have identified companies that source a significant part of their seafood from traceability-ready supply chains but that still have a low traceability score (lower than 7.5/15) according to the Seafood Stewardship Index. These include: Dongwon Enterprise and OUG Holdings. **These companies should be key targets for traceability-related engagement.**

For companies not assessed, or for which no data exists on traceability systems or traceability readiness, a proxy could be to use our IUU Fishing Detection Toolkit to estimate the IUU Fishing risk score at that company.[xxxiv] A company with a low IUU risk is likely to have a strong incentive to invest in traceability as it can use traceability to advertise their efforts and showcase their low risks. Conversely, a company with a high IUU risk is likely to have a strong need to invest in traceability, to reduce this risk.

Within the 30 companies benchmarked, the ones with the poorest scores on *Risk-based approach to IUU fishing* are Bright Food Group, Cooke, OUG Holdings, Red Chamber Group and Yokohama Reito.[xxxv] To assess any company for their IUU risk, please use our IUU Fishing Detection Toolkit.

[19] Those who do not have a risk-based approach to assess for IUU fisheries issues across their operations and supply chains.

FINANCIAL INSTITUTIONS: 6 QUESTIONS TO UNLOCK USD 600 BILLION IN ENTERPRISE VALUATION

None of the companies benchmarked in the Seafood Stewardship Index provided a detailed explanation[20] of the kinds of traceability systems they had in place as of 2020.[xxxvi] It falls to the financial backers of all of these companies to improve the situation, both to reduce their risk and to improve their performance.

The 60% increase in seafood profit pools we estimate[21] could lead to a **30% increase in enterprise valuations across the global seafood supply chain**. This is assuming constant EV/EBIT multiples for Fishing, Aquaculture and Processing, and constant EV/Sales multiples for Wholesale, Retail and Foodservice– see Figure 25.[22]

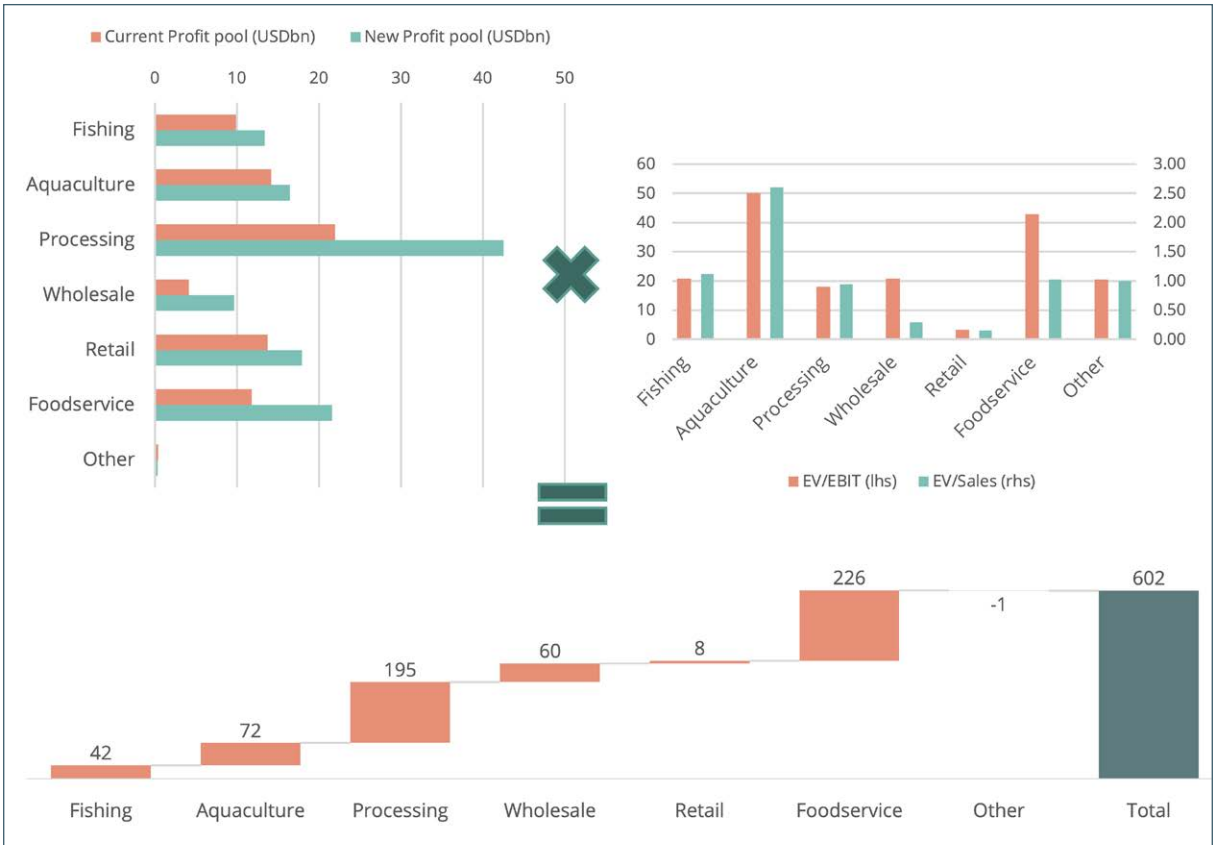


Figure 25: Estimated Traceability-Related Change in Global Seafood Enterprise Valuation Traceability based on Increase in Profit Pools and Unchanged Valuation Multiples. Source: Planet Tracker.

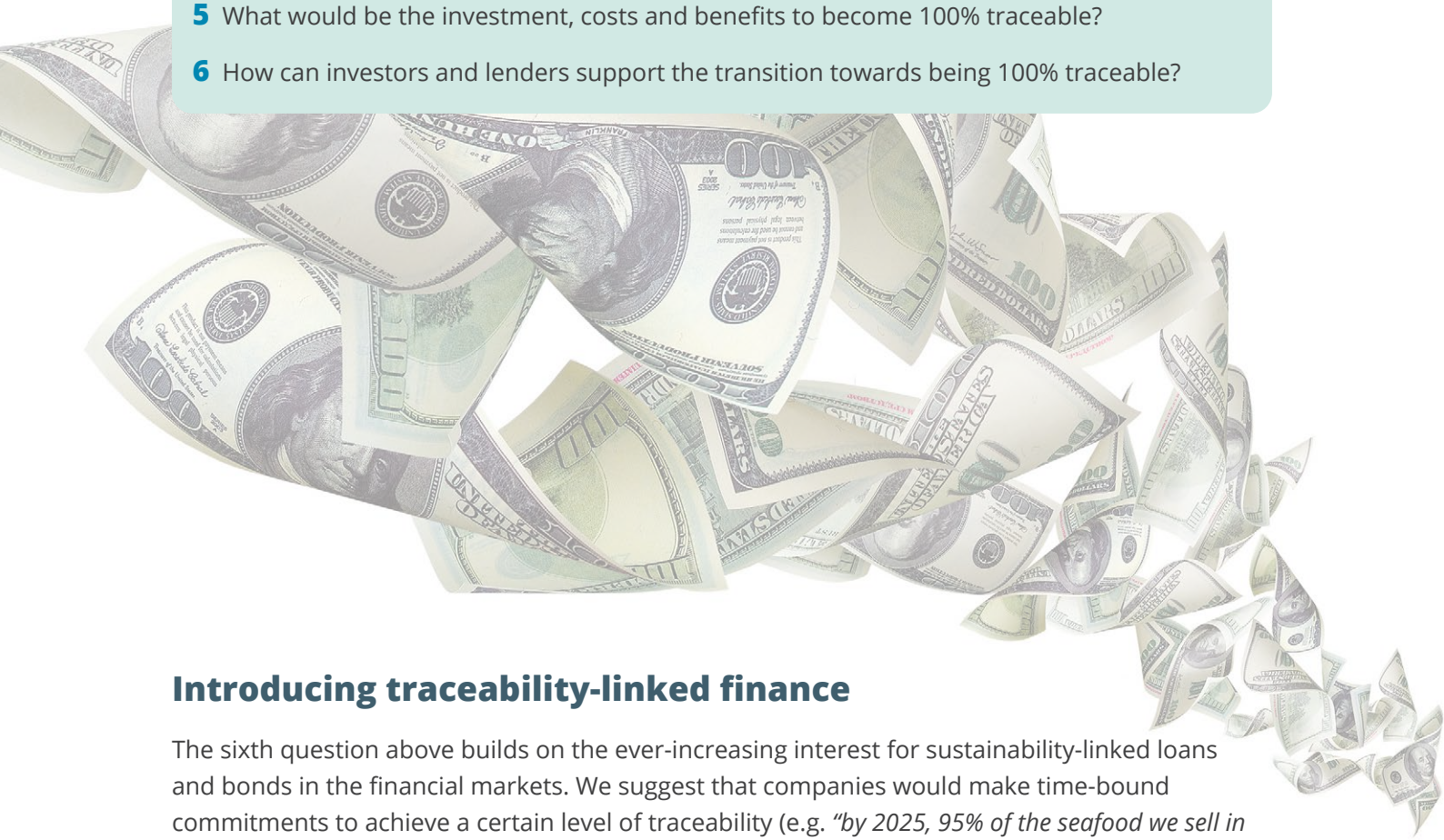
[10] How data is collected, verified and shared along the supply chain

[11] As a reminder, this ignores any traceability-related improvement for the seafood production whose traceability-readiness we have not been able to assess or that is not traceability-ready..

[11] The increase in valuations is lower than the increase in profits as we use EV/Sales multiples for some sectors, and the increase in revenue is much lower than the increase in profits.

To unlock this value, answers to the following questions need to be provided by companies in the seafood supply chain:

1. What traceability systems are currently in place at the company?
2. What is their scope[23], precision[24], breadth[25], and depth[26]?
3. How interoperable are the company's traceability systems with those of suppliers and clients? Do they use GDST standards?
4. What prevents the company from implementing robust traceability solutions on 100% of its products?
5. What would be the investment, costs and benefits to become 100% traceable?
6. How can investors and lenders support the transition towards being 100% traceable?



Introducing traceability-linked finance

The sixth question above builds on the ever-increasing interest for sustainability-linked loans and bonds in the financial markets. We suggest that companies would make time-bound commitments to achieve a certain level of traceability (e.g. *"by 2025, 95% of the seafood we sell in volume terms will be traceable from farm/fishing vessel to plate"*) and use this as a KPI on which to issue a sustainability-linked loan/bond (financing instruments where the interest rate varies if the company meets/ does not meet its targets), which could be called **a traceability-linked loan** (or bond).

In addition to the financial benefits mentioned above, this would also reduce the interest costs paid by the company (if it achieves its target!).

[23] Proportion of product portfolio covered by traceability solutions

[24] Size of traceable lot (where 'lot' refers to the quantity of fisheries and aquaculture products of a given species of the same presentation and coming from the same relevant geographical area and the same fishing vessel, or group of fishing vessels, or the same aquaculture production unit. A fish box is an example of a 'lot').

[25] Amount of information that can be connected with the lot

[26] How far back or forward in the supply chain the system traces the relevant information

Further regulation tightening is likely

If a significant increase in profitability is not enticing enough, financial institutions should note that traceability-related regulation has the potential to seriously disrupt traceability laggards.

For instance, concerning companies selling seafood in the United States, the FDA is proposing the establishment of additional traceability record keeping requirements beyond what is already required.

If approved, the proposed rule will come into effect in January 2025 and require the collection of key data elements along supply chain critical tracking events. This rule will include 16 food types overall, including finfish (e.g. tuna, cod, haddock etc.), crustaceans (e.g. shrimp, crayfish, crab, etc.) and molluscs and bivalves (e.g. oysters, clams, mussels etc.). This rule would require the implementation of traceability through the entire supply chain including harvest, processing, transformation, receiving etc.[xxxviii]

Of note, the FDA assumed that "an affected covered firm would spend between USD 500 and USD 25,000 on all additional capital investments to comply with the proposed rule, with a primary estimate of USD 7,500".[xxxviii]

An expansion of the Seafood Import Monitoring Program (SIMP) to all species was also passed to the US House of Representatives in February 2022.[xxxix] The SIMP program requires traceability for imports until the US border, but not after.

In Japan, the Diet passed a new law to introduce traceability in the fisheries sector in December 2020, which should be effective from December 2022.[xl]

Who should engage with seafood companies on traceability?

Below we provide the list of the largest investors[27] in the seafood companies rated less than 7.5/15 for traceability by the World Benchmarking Alliance. More than half of the combined USD 35 billion investors own in these companies is in the hands of just ten investors. All of the top 20 investors are based in Japan, Norway or the US. For some of them, including Meiji Yasuda Life Insurance Company, JPMorgan Securities Japan Co. Ltd., Mitsubishi Heavy Industries Ltd. and Sompo Japan Insurance Inc, the exposure to companies poorly rated for traceability is greater than 5% of their total equity portfolio.

[27] These can be financial institutions or corporations

Table 3: Top 20 Investors in Seafood Companies Rated 7.5/15 or Below by the World Benchmarking Alliance. Source: Eikon.

Investor	Country	Holdings (USD mn)	Holdings (% of Total)	Number of Holdings in the List	Holdings as a % of Equity Portfolio
Kverva AS	Norway	4,217	12%	1	98.0%
Nomura Asset Management Co., Ltd.	Japan	2,679	8%	8	0.1%
Meiji Yasuda Life Insurance Company	Japan	2,648	8%	2	6.9%
Tokio Marine & Nichido Fire Insurance Co., Ltd.	Japan	1,949	6%	3	18.0%
LACO AS	Norway	1,752	5%	1	100.0%
The Vanguard Group, Inc.	United States	1,544	4%	8	0.0%
Nikko Asset Management Co., Ltd.	Japan	1,184	3%	8	0.0%
Daiwa Asset Management Co., Ltd.	Japan	1,141	3%	7	0.0%
BlackRock Institutional Trust Company, N.A.	United States	1,077	3%	7	0.0%
JPMorgan Securities Japan Co., Ltd.	Japan	916	3%	1	7.3%
Norges Bank Investment Management (NBIM)	Norway	798	2%	6	0.0%
Mitsubishi Heavy Industries Ltd	Japan	629	2%	1	21.5%
Sumitomo Mitsui Trust Asset Management Co., Ltd.	Japan	587	2%	7	0.0%
Mitsubishi UFJ Kokusai Asset Management Co., Ltd.	Japan	493	1%	8	0.0%
Folketrygdfondet	Norway	480	1%	2	0.2%
Geode Capital Management, L.L.C.	United States	453	1%	7	0.0%
Mizuho Bank, Ltd.	Japan	433	1%	4	0.2%
Mitsubishi Estate Co Ltd	Japan	383	1%	2	0.6%
Sompo Japan Insurance Inc	Japan	364	1%	2	11.7%
Mitsubishi UFJ Trust and Banking Corporation	Japan	339	1%	3	0.0%
Top 10		**19,108**	**54%**		**0.2%**
Top 20		**24,067**	**68%**		**0.2%**
Total		**35,303**	**100%**		**0.1%**

Examining the complete list of investors in these companies reveals that as many as 23 of them (excluding corporations and holdings) have a 5% or more equity exposure to companies poorly rated for traceability by the World Benchmarking Alliance[28].

Lenders should also engage with these companies, for instance by conditioning the issuance of new debt to the implementation of traceability targets, or at least by linking the cost of future debt to progress on traceability implementation. The financiers shown below in Figure 26 are the ones with the most influence on seafood companies that need to improve on traceability.

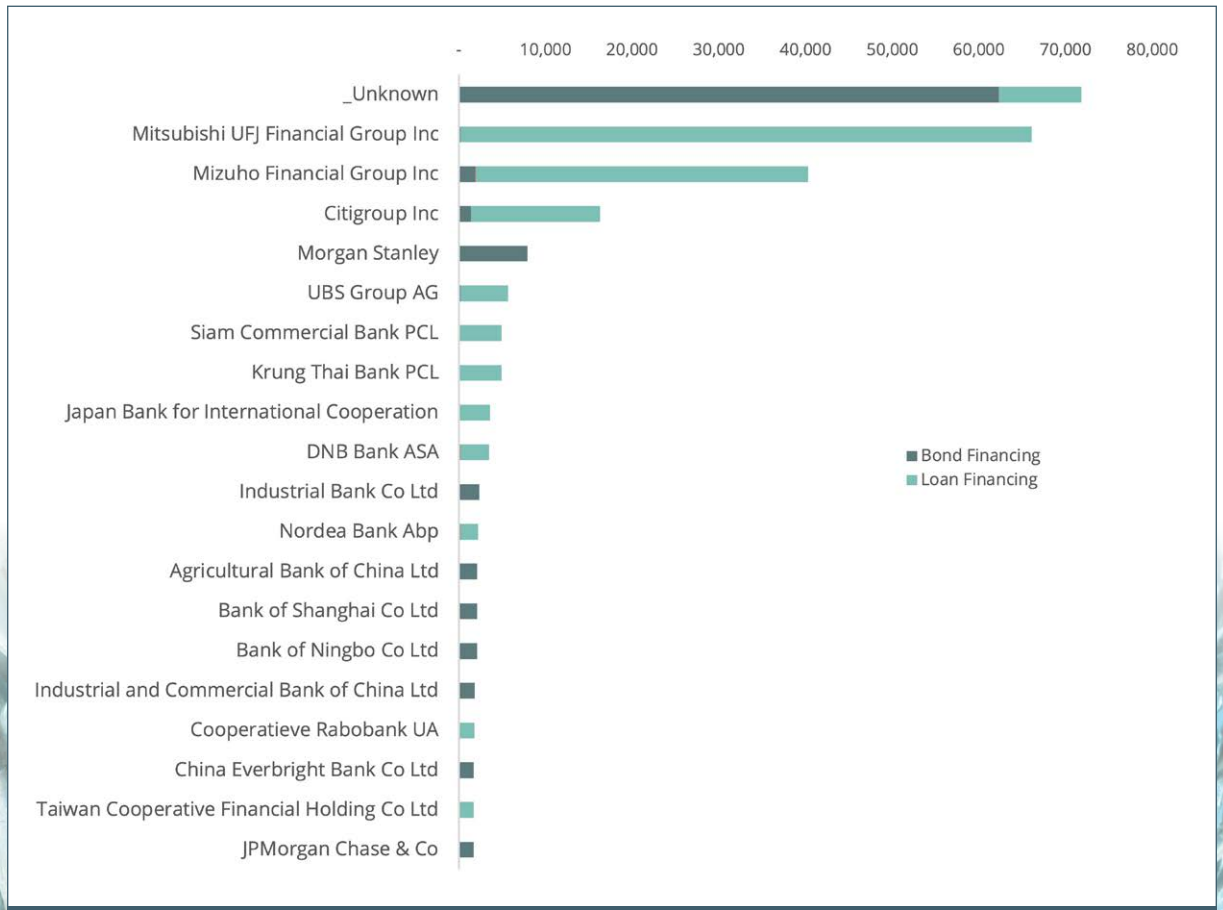


Figure 26: Top 20 Financiers by Amount Underwritten in Last 10 Years for Seafood Companies Rated 7.5/15 or Below by the World Benchmarking Alliance- USD million. Source: Eikon.

[28] Companies with a Traceability Score of 7.5/15 or less in the Seafood Stewardship Index

METHODOLOGY AND APPENDICES

Methodology

How we estimated traceability-readiness

We call 'traceability-ready' fish that is:

a harvested in a way that makes it at least acceptable for the harvester to be associated with its production (i.e. it is not too unsustainable or illegal)

b caught or farmed in an area where the challenges of implementing a traceability solution (levels of corruption and digitalisation) can be overcome.

We further refine between 'traceability-ready' fish and 'traceability-ready, with challenges' based on the level of obstacles to traceability implementation. Fish that is not traceability-ready is simply called 'not traceability-ready'. Fish for which data on incentives or challenges is missing falls into the 'Unclear' category.

To measure sustainability incentives, or the lack thereof, we use SeafoodWatch sustainability scores for aquaculture, and FishSource scores for wild-caught fish - see Table 5. For wild-caught fish, we also use an estimate of IUU fishing prevalence in each EEZ, from the IUU Fishing Index. The implicit assumption made is that harvesters of seafood that are not sustainable or coming from areas with a very high prevalence of IUU fishing, do not have an incentive in ensuring that seafood is traceable under present regulations.

To measure the degree of challenges to implement traceability, we used the level of business digitalisation and corruption (both at country/EEZ level) for aquaculture and added the proportion of unreported landings by species and EEZ for wild-capture, as a proxy for the lack of data - see Table 4.

Table 4: How we categorised the level of incentives and challenges enabling/preventing seafood to be traceable. Source: Planet Tracker.

Item	Source	Metrics used	Categorisation rule
Aquaculture			
Sustainability incentives / disincentives	SeafoodWatch	Overall score	If farming technique/species/country combination score is >3.33/10, incentive, otherwise no incentive
Operational challenges - Digitalisation	Digital Adoption Index (WorldBank)	DAI Business Sub-index (2016)	If country score is in bottom half, challenges, otherwise no challenges
Operational challenges - Corruption	IUU Fishing Index	Perception of level of corruption	If country score is 3 or lower, challenges, otherwise no challenges
Wild-catch			
Sustainability incentives / disincentives	FishSource	1/2 average of all scores excl. current fish stock health, 1/2 current fish stock health	If fishery score is above 5/10, incentive, otherwise no incentive
IUU fishing prevalence	IUU Fishing Index	Prevalence index	If country score is less than 3, incentive, otherwise no incentive
Operational challenges - Lack of data	SeaAroundUs	% of unreported landings by EEZ/ species	If % unreported is above 5% for a given species/ EEZ combination, challenges, otherwise no challenge
Operational challenges - Digitalisation	Digital Adoption Index (WorldBank)	DAI Business Sub-index (2016)	If country score is in bottom half, challenges, otherwise no challenges
Operational challenges - Corruption	IUU Fishing Index	Perception of level of corruption	If country score is 3 or lower, challenges, otherwise no challenges

For each species / EEZ / flag country, we then computed an incentive score and a challenge score, listing the number of challenges and incentives – see Figure 27.

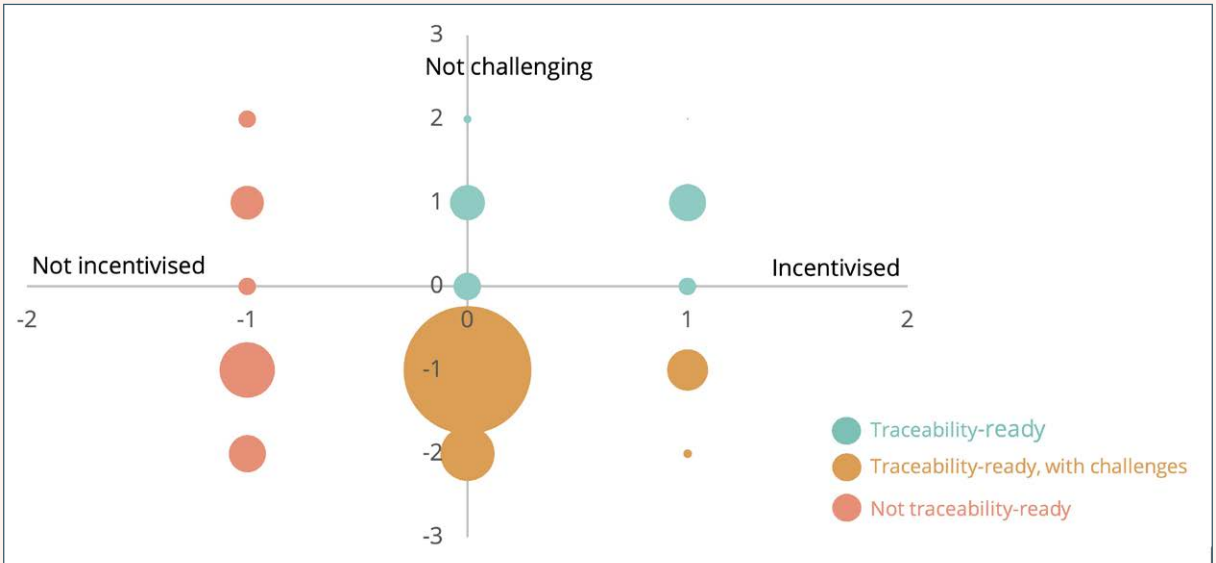


Figure 27: Breakdown of Global Seafood Volumes (area size) by Traceability-Incentive score (x-axis) and Traceability-Challenges score. Source: Planet Tracker.

Finally, we categorised all volumes with an incentive score below 0 as Not traceability-ready, and within the remainder, those with a challenge score below zero as 'Traceability-ready with challenges'. Volumes deemed 'traceability-ready' were those with incentive and challenge scores both greater than or equal to zero.

Traceability readiness by species and area

According to our model, 280 species of seafood are 100% traceability-ready. Out of these, 15 have global production volumes of 100,000 tonnes or more - see Table 5.

Table 5: 100% Traceability-Ready Seafood Species with Production Volumes of 100,00 tonnes or more. Source: Planet Tracker.

Species (English name)	Global production (tonnes)
Anchoveta (=Peruvian anchovy)	4,993,093
Channel catfish	454,477
Antarctic krill	365,712
Cape horse mackerel	323,425
Pacific thread herring	290,431
Bali sardinella	287,993
Argentine shortfin squid	249,260
Pacific anchoveta	242,660
Argentine red shrimp	216,442
Ponyfishes (=Slipmouths) nei	210,072
Southern African anchovy	164,713
Japanese amberjack	135,600
Yellowfin sole	125,115
Blue grenadier	124,853
Yellowstripe scad	122,742

[29]

Focusing on aquaculture only, out of the 10 million tonnes of production that we identified as traceability-ready globally, we identified 17 country/species combinations with volumes greater than 100,000 tonnes, accounting for a combined 84% of global traceability-ready aquaculture production, and 9% of global aquaculture production - see Table 6.

[29] nei stands for 'not elsewhere included'

Table 6: Traceability-Ready Aquaculture Production – Top Species/Countries Combinations. Source: Planet Tracker.

Country	Species	Traceability-ready production (tonnes)
NORWAY	Atlantic salmon	1,364,042
CHINA	Nile tilapia	1,231,162
INDONESIA	Nile tilapia	1,184,700
EGYPT	Nile tilapia	1,081,202
CHILE	Atlantic salmon	701,984
ECUADOR	Whiteleg shrimp	679,985
BRAZIL	Nile tilapia	323,714
CHINA	Channel catfish	297,732
VIET NAM	Giant tiger prawn	261,000
THAILAND	Nile tilapia	213,872
CHILE	Coho (=Silver) salmon	205,386
PHILIPPINES	Nile tilapia	174,212
UNITED STATES OF AMERICA	Channel catfish	153,428
CHINA	Giant river prawn	139,609
TURKEY	European seabass	137,419
JAPAN	Japanese amberjack	135,600
CANADA	Atlantic salmon	118,630
Total		**8,403,676**
Total traceability-ready aquaculture production		**10,041,050**

Focusing on wild-catch, out of the 35 million tonnes of production that we estimate are traceability-ready, we identified 56 species/harvesting countries/EEZ combinations with annual volumes greater than 100,000 tonnes, accounting for a total of 42% of the combined traceability-ready wild-catch production - see Table 7.

Table 7: Traceability-Ready Wild-Catch Production – Top Species/Countries Combinations. Source: Planet Tracker.

Harvesting country	Species (English name)	EEZ of capture	Est. traceability-ready volumes (tonnes)
RUSSIAN FEDERATION	Alaska pollock (=Walleye poll.)	RUSSIAN FEDERATION	1,731,746
UNITED STATES OF AMERICA	Alaska pollock (=Walleye poll.)	UNITED STATES OF AMERICA	1,520,727
CHILE	Anchoveta (=Peruvian anchovy)	CHILE	744,241
INDONESIA	Scads nei		523,130
NORWAY	Atlantic herring	NORWAY	520,432
CHINA	Scads nei		448,739
CHINA	Jumbo flying squid	PERU	331,212
ARGENTINA	Argentine hake	ARGENTINA	314,326
UNITED STATES OF AMERICA	North Pacific hake	UNITED STATES OF AMERICA	310,597
INDONESIA	Short mackerel	INDONESIA	298,520
NAMIBIA	Cape horse mackerel	NAMIBIA	296,338
OMAN	Indian oil sardine	OMAN	275,186
ICELAND	Blue whiting (=Poutassou)	ICELAND	268,357
MEXICO	Pacific thread herring	MEXICO	255,793
INDONESIA	Yellowfin tuna	INDONESIA	241,253
MAURITANIA	European pilchard (=Sardine)	MAURITANIA	234,630
NORWAY	Antarctic krill	UNITED KINGDOM	230,256
NORWAY	Blue whiting (=Poutassou)	UNITED KINGDOM	217,976
ARGENTINA	Argentine red shrimp	ARGENTINA	215,642
MOROCCO	Atlantic chub mackerel	MOROCCO	210,994
UNITED STATES OF AMERICA	Pacific cod	UNITED STATES OF AMERICA	210,448
PHILIPPINES	Scads nei		194,826
RUSSIAN FEDERATION	Blue whiting (=Poutassou)		188,006
UNITED STATES OF AMERICA	Pink (=Humpback) salmon	UNITED STATES OF AMERICA	179,598
INDIA	Indian mackerel	INDIA	164,975
SOUTH AFRICA	Southern African anchovy	SOUTH AFRICA	164,713
ECUADOR	Skipjack tuna	ECUADOR	162,794
INDONESIA	Narrow-barred Spanish mackerel	INDONESIA	160,716
JAPAN	Alaska pollock (=Walleye poll.)		153,800

Harvesting country	Species (English name)	EEZ of capture	Est. traceability-ready volumes (tonnes)
INDIA	Threadfin and dwarf breams nei	INDIA	153,066
INDONESIA	Blue swimming crab		151,925
RUSSIAN FEDERATION	Atlantic mackerel	NORWAY	147,675
INDIA	Indian oil sardine	INDIA	144,079
INDONESIA	Kawakawa	INDONESIA	142,593
CHINA	Japanese anchovy	JAPAN	140,059
UNITED KINGDOM	Atlantic mackerel	UNITED KINGDOM	139,837
THAILAND	Anchovies, etc. nei	THAILAND	137,377
INDIA	Croakers, drums nei	INDIA	136,835
JAPAN	Japanese anchovy	JAPAN	133,000
UNITED STATES OF AMERICA	Sockeye (=Red) salmon	UNITED STATES OF AMERICA	131,540
NORWAY	Blue whiting (=Poutassou)	IRELAND	128,419
ICELAND	Atlantic mackerel	ICELAND	128,084
VENEZUELA	Round sardinella	VENEZUELA	126,400
UNITED STATES OF AMERICA	Yellowfin sole	UNITED STATES OF AMERICA	125,115
NEW ZEALAND	Blue grenadier	NEW ZEALAND	122,937
INDIA	Bombay-duck	INDIA	117,613
PANAMA	Pacific anchoveta	PANAMA	115,747
NORWAY	Atlantic mackerel	UNITED KINGDOM	111,854
MEXICO	Pacific anchoveta	MEXICO	111,035
INDONESIA	Indian mackerel		110,570
INDONESIA	Fusiliers nei	INDONESIA	104,610
INDONESIA	Yellowstripe scad	INDONESIA	103,825
CAMEROON	Bonga shad	CAMEROON	100,678
Total			**14,635,757**
Total traceability-ready			**35,122,917**

How we computed the net financial benefits of traceability

To compute the net financial benefits of implementing traceability, we followed this process:

1 ***Estimate the current global seafood profit pool***. To do so, we :

a Used the latest FAO data for seafood production (for the year 2020)[xli]

b Added estimates for unreported production using Sea Around Us[xlii]

c Applied average seafood prices as per the FAO to the new total[xliii]

d Estimated the proportion of these volumes that is processed, wholesaled, sold in retail and in foodservice[xliv]

e Estimated average prices for each supply chain stages using representative companies

f Listed key companies for each stage of the supply chain to compute their average EBIT margins[xlv]

g Applied that average margins to the revenue of each stage of the supply chain to compute the profit pools.

2 ***Estimate the average existing costs of multiple different factors, such as food waste, food recalls, staff***. To do so, we:

a Analysed the accounts of multiple companies in each stage of the supply chain

b Used multiple research papers, talked to industry experts, and extrapolated results from case studies in order to make our own estimates.

3 ***Estimate the average change in each of these factors in each continent and for each level of traceability-readiness***. To do so we:

a Spoke to multiple industry experts and traceability solutions providers (list available upon request)

b Used multiple research papers, talked to industry experts, and extrapolated results from case studies in order to make our own estimates for benefits.

c Used pricing and costing estimates provided by traceability solution providers to make costs and investments estimates.

d Applied multipliers for each continent and level of traceability-readiness for each of these factors (list available upon request).

4 ***Estimate the proportion of global seafood production already traceable.*** To do so, we used the proportion of seafood with chain of custody certification (such as MSC and ASC) as a minimum threshold, and added an estimate of additional, traceable seafood production not certified.

5 ***Compute the overall net EBIT impact of traceability.*** To do so, we

a computed the impact of traceability on each different factor identified (e.g. food waste, food recall, etc.) in each continent and for each level of traceability-readiness.

b aggregated these impacts to compute new volumes and prices, and therefore revenue, and the impact on margins.

c applied these new margins to new revenue to derive the new profit pools.

Who are the enablers? A selected list of traceability solutions providers

BlueTrace[xlvi] - BlueTrace offers traceability solutions for shellfish harvester, growers, distributors, and dealers. Their tagging and distributor apps enable organisations to optimize their activities, comply with regulations, and keep up with their inventory.

EachMile Technologies[xlvii] - EachMile Technologies is a team working on transforming global seafood & agriculture supply chains through connecting farmers and fishers, capturing data, and achieving traceability along fragmented supply chains through the use of blockchain technologies, market based incentives via the Fishcoin token, and open source Trace Protocol documentation.

Evrythng[xlviii] - EVRYTHNG Product Cloud helps businesses operate with more agility and integrity by providing end-to-end traceability of each product item that customers make and sell through the value chain and makes their sustainable policies a reality.

This Fish[xlix] - ThisFish Inc. was founded by Eco trust Canada, a Vancouver-based enterprising non-profit powered by the vision of people and nature thriving together. It is one of the leaders in seafood traceability and production software that improves efficient and trust throughout seafood supply chains.

Trace Register[l] - Founded in 2005, Trace Register provides in full-chain seafood traceability with clients in 50 countries. It serves processors, fishers, farmers, retailers, importers, and more in the seafood ecosystem. Trace Register produces cutting edge technology that aims to transform seafood supply chains by enhancing traceability throughout it.

Vericatch[li] - Vericatch provide catch reporting and seafood traceability software. They work with fisheries to verify their data and leverage value throughout their supply chains.

Wholechain[lii] - Wholechain is a blockchain based traceability solution that aids in the transparency and coordination within seafood supply chains. It allows producers to differentiate themselves and the unique attributes of their products, while also connecting creating trust and traceability throughout their supply chains.

List of the 30 companies benchmarked by the Seafood Stewardship Index

Company	Country (Headquarters)
Thai Union Group	Thailand
Mowi	Norway
Nueva Pescanova	Spain
Nomad Foods	United Kingdom
Nutreco (Skretting)	Netherlands
Cargill	United States of America
Austevoll Seafood	Norway
Biomar	Denmark
Charoen Pokphand Group	Thailand
Royal Greenland	Greenland
Bolton Group	Italy
High Liner Foods	Canada
SalMar	Norway
Parlevliet & Van der Plas	Netherlands
Labeyrie Fine Foods	France
FCF Co., Ltd.	Taiwan
Nippon Suisan Kaisha (Nissui)	Japan
Mitsubishi Corporation	Japan
Maruha Nichiro	Japan
Dongwon Enterprise	South Korea
Pacific Seafood Group	United States of America
Kyokuyo	Japan
Marubeni Corporation	Japan
Wales Group (Sea Value & Sea Wealth)	Thailand
Trident Seafoods	United States of America
Yokohama Reito (Yokorei)	Japan
Red Chamber Group	United States of America
Cooke	Canada
Bright Food Group	China
OUG Holdings	Japan

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ABOUT PLANET TRACKER

Planet Tracker is a non-profit financial think tank producing analytics and reports to align capital markets with planetary boundaries. Our mission is to create significant and irreversible transformation of global financial activities by 2030. By informing, enabling and mobilising the transformative power of capital markets we aim to deliver a financial system that is fully aligned with a net-zero, nature-positive economy. Planet Tracker proactively engages with financial institutions to drive change in their investment strategies. We ensure they know exactly what risk is built into their investments and identify opportunities from funding the systems transformations we advocate.

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Seafood Tracker investigates the impact that financial institutions can have on sustainable corporate practices through their funding of publicly listed wild-catch and aquaculture companies. Our aim is to align capital markets with the sustainable management of ocean and coastal marine resources.

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ACKNOWLEDGEMENTS

Authors: François Mosnier
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Editors: John Willis, Dominic Lyle
With thanks to: Jayson Berryhill (Wholechain), Rik Beukers (World Benchmarking Alliance), Dane Chauvel (Organic Ocean), Guy Dean (Organic Ocean), Alistair Douglas (EachMile Technologies), Blake Harris (Institute of Food Technologists), Julian Hawkins (Vericatch), Mark Kaplan (Wholechain), Maggie Lee (GDST), Traci Linder (WWF), Niall Murphy (EVRYTHNG), Helen Packer (World Benchmarking Alliance), and those that preferred to remain anomymous.

WITH THANKS TO OUR FUNDERS

THE FINANCE HUB

GORDON AND BETTY MOORE FOUNDATION

This report is funded in part by the Gordon and Betty Moore Foundation through the Finance Hub, which was created to advance sustainable finance.

Suggested citation: Mosnier, F. How To Trace $600bn. Traceability Could Add 60% to Global Seafood Profits. Planet Tracker (2022).

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