PHENIX CAPITAL

APRIL 2025

IMPACT REPORT

Blue Economy

FUNDS AT A GLANCE

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PHENIX CAPITAL

ABOUT PHENIX CAPITAL

CATALYSING INSTITUTIONAL CAPITAL TOWARDS THE SDGS

Phenix Capital Group is an impact investment consultant that enables institutional investors to make impact investments.

We assist asset owners and asset managers in aligning their investments with their values, financial objectives, and the Sustainable Development Goals.

www.phenixcapitalgroup.com

Our Vision

We envision a world in which institutional capital helps to end poverty, protect the planet and ensure prosperity for all

Our Mission

Our mission is to enable and catalyse institutional investments that realise financial, social and environmental returns

What we do

To achieve our mission, we enable institutional investors to allocate capital to impact investments through our Events & Webinars, Impact Databases, Impact Fund Assessment and Investor IQ.

About impact database

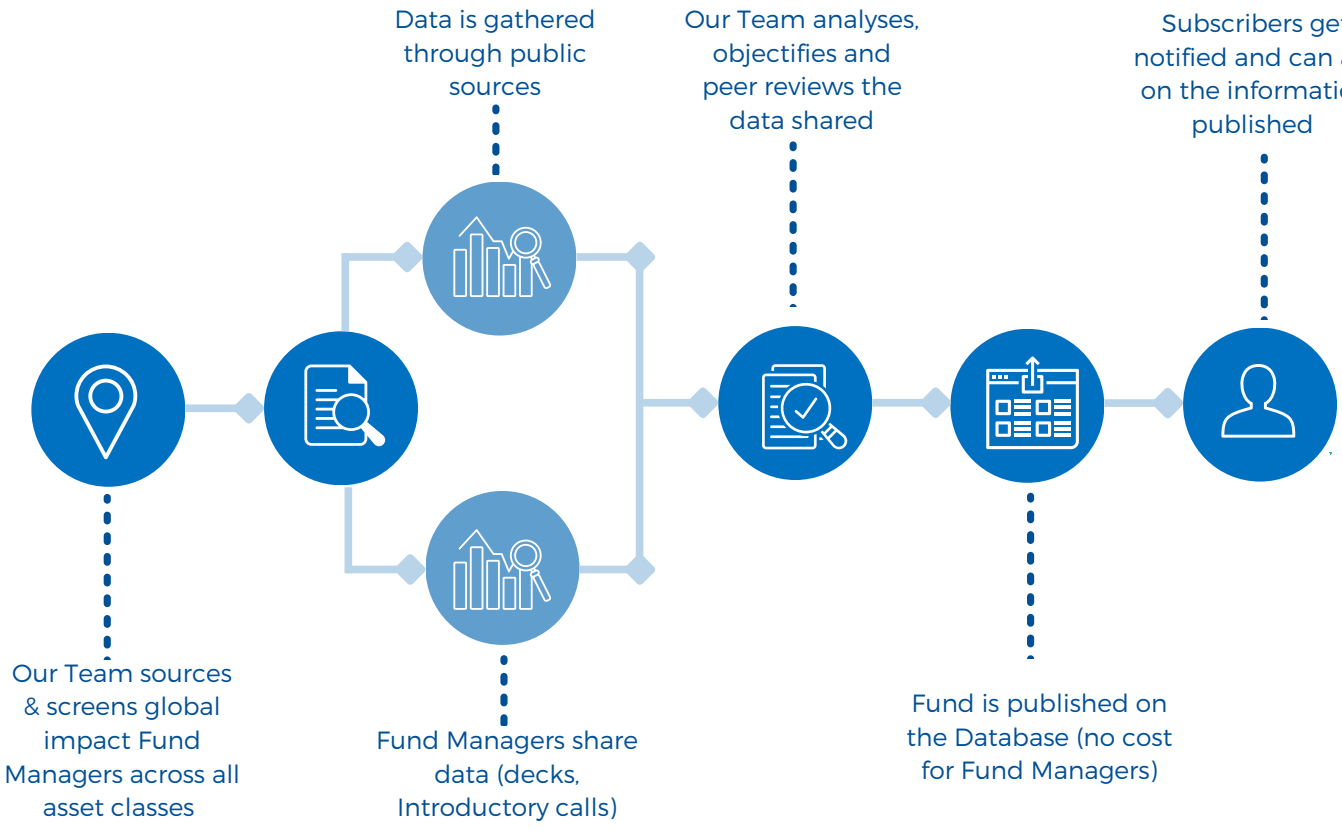
Phenix Capital's mission is to enable the allocation of capital from institutional investors towards social and environmental solutions while supporting the 2030 Sustainable Development Goals (SDGs). With the Impact Database, Phenix Capital aims to provide investors with access to and intelligence on the impact fund market opportunities available to them.

Three main variables have been central to construct, monitor and update the database: **funds considered have an impact proposition, institutional scale, and target market-rate returns.**

Impact Investing goes beyond negative screening and using Environmental, Social and Governance (ESG) integration to reduce harm or avoid risks, to generating intentional positive impact. Phenix Capital defines impact investing as **investing with the dual mandate of financial return and positive societal or environmental impacts**, with the notion of measuring the positive and negative impact of investments, ensuring both **intentionality and additionality** among these.

Phenix Capital's Impact Database features funds that align with this definition through their creation of solutions for global social and environmental issues, whilst prioritising financial returns. This category of impact investments can be referred to as **financial-first impact investments**.

FUND SOURCING PROCESS



Introduction

David Attenborough's film 'Ocean' airs this May championing what he calls "a great age of ocean discovery". From jobs to food via innovation and clean energy, the ocean flows through practically all of the 17 UN Sustainable Development Goals (SDGs).

Oceans and climate are intertwined: the blue economy providing an estimated $2.5 trillion in goods and services annually from ocean-related economic activities; and a climate regulator essential in keeping the system in balance. Oceans generate 50% of the world's oxygen; absorb more than 25% of human-caused carbon dioxide; and also, almost all excess heat.

At the same time, 40% of the world's population relies on fish for more than 20% of their daily animal protein consumption (subject of this month's Deep Dive).

More than 30 million people are directly employed in blue economy jobs, a number that is expected to rise to 40 million by 2030, according to the International Finance Corporation.

Yet the ocean economy accounts for 11% of global CO_2 emissions, with coastal and marine tourism, and shipping contributing an estimated 4% and 2.9% of global emissions, respectively, according to UN Trade and Development (UNCTAD).

Warmer ocean waters disrupt marine ecosystems, ultimately threatening food security, and rising seas and drought threaten ports and shipping routes, while extreme weather delays shipments and inflates insurance costs.

Underfunding is also a threat to the ocean economy. Ocean investments currently amount to only a fraction of the estimated $1.5 trillion in sovereign (and $1 trillion in private) market funding required by 2030. Achieving SDG14: Life Below Water requires $175 billion annually, yet only $30 billion has been disbursed since 2010, making it the most underfunded goal.

As the data in this Phenix Capital report shows, one of the reasons investors' money is not flowing into SDG14 is a dearth of dedicated funds. There are just a handful of pure-play vehicles, including Aqua-Spark, Ocean 14 Capital and ReOcean, featured in Standard Chartered's report *Transitioning the blue economy*.

There are signs that the tide is turning with new financing options, viable investment themes and supportive governance. The blue economy equity deal flow alone has trebled between 2017 and 2023, while blue bond issuance levels have doubled between 2022 and 2023.

Debt for nature swaps (DFNS), which have been covering Marine Protected Areas (MPAs) since 2015, are on the rise too. The Seychelles was the first DFNS specifically for MPAs, while Belize was the first debt conversion refinancing case based on credit enhancement and newly issued bonds.

Common sectors or themes include: blue carbon ecosystem services market, which is expected to grow to $2.93 billion by 2030; pollution, waste and plastics (covered in last year's Deep Dive; marine bio tech, which could reach $12.79 billion by 2030; renewable maritime energy; conservation and preservation; blue foods; sustainable shipping; and tourism.

This year's World Ocean Day theme continues 'Catalysing Action for Our Ocean & Climate' and needs to see the conclusion of the global plastic pollution treaty to cut waste and enable marine-based material use with a legally binding agreement. It is time to put the ocean, a critical natural capital asset, at the centre of any discussions because climate change will undermine both the ocean economy and global trade.

Key Takeaways:

- 6.6% funds dedicated to blue economy
- 5 pure-play SDG14 funds
- 463% growth in No. of funds in a decade
- 76% funds focus on preservation
- 68.8% funds also focus on SDG12

Impact themes mapped against the SDGs

Phenix Capital Group has mapped the SDGs against Impact Themes, which are based on **the most globally endorsed terms used by practitioners in the financial sector** and what's used by generally accepted frameworks, to enable both fund managers and fund allocators to better **understand how the SDGs and it's sub-goals translate into outcome-based investment areas -** by the name that they are commonly known and referred to in the financial industry.

Mapped against the SDGs' sub-goals, our Impact Themes offer a comprehensive way for investors and fund managers in the financial industry to identify what social or environmental outcome is generated by an impact investment and its contribution to the Sustainable Development Goals.

The revamped impact themes are already available in our Impact Database for fund filtering, via the Fund Search function.

Feature in an impact report

Every month Phenix Capital Group publishes a new Impact Report, bringing up-to-date data on impact investments and interviews with impact fund managers and investors from the field.

PAST REPORTS INCLUDE:

Read all our impact reports here

WOULD YOU LIKE TO BE FEATURED IN THE NEXT EDITION?

Showcase your impact investing thought leadership to our audience of thousands of impact investors. We have a range of asset classes and impact themes to choose from below so you can choose your area of expertise.

Talk to our team about opportunities to be featured. Upcoming report topics include:

MONTH	REPORT THEME
May	Deep-dive on Biodiversity Funds
June	Private debt at a Glance
August	Net-Zero Funds at a Glance
September	Real Asset Funds at a Glance
October	Impact Investor Report - The Bigger Picture
November	Gender Lens Funds at a Glance
December	Public Equity Funds at a Glance

Contact us to feature in an impact report!

Blue Economy Funds Data Overview

186

Impact Funds Targeting Blue Economy Themes

134

Fund Managers Targeting Blue Economy Themes

63

Blue Economy Funds Currently Raising Capital

60

Blue Economy Fund Managers Currently Raising Capital

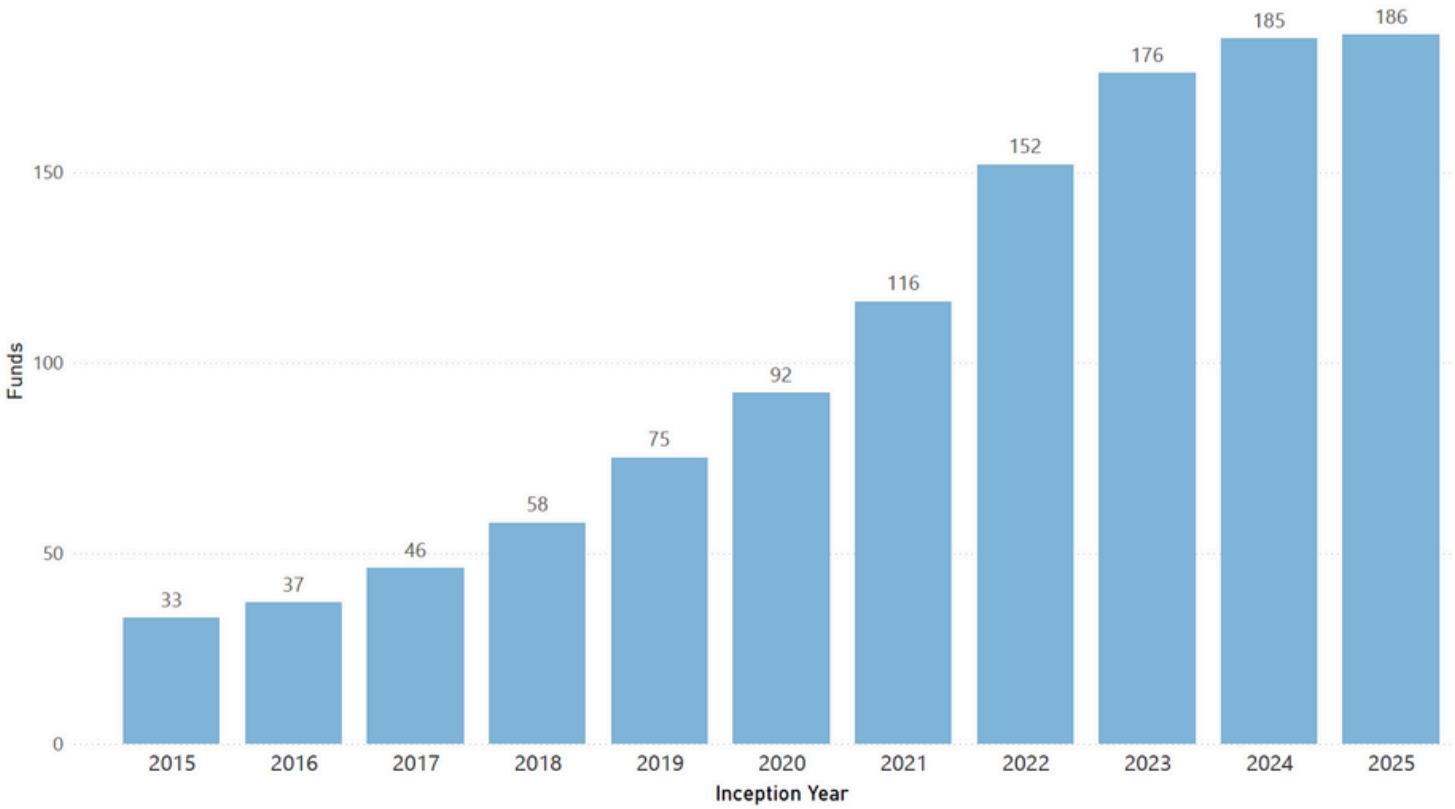
€69 bn

Total Capital Raised by Blue Economy Funds since 2015

€34 bn

Total Target Size of Blue Economy Funds since 2015

Cumulative Number of Funds targeting Life below Water (SDG 14)



*Funds without inception year data have been assigned the value from the reference year (2015)

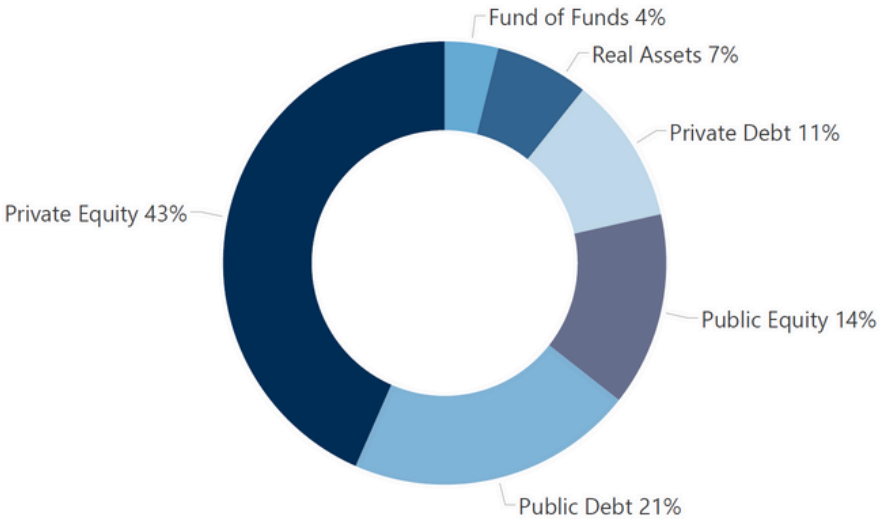
Sustainable Development Goal 14 (SDG 14), which aims to protect the health of the ocean and to 'conserve and sustainably use the oceans, seas and marine resources for sustainable development', was adopted by 193 UN member states in 2015. In 2020, *Marine Policy* published a paper that examined the financial sources and funding required to achieve the Goal by 2030 and concluded that there was a financial gap of $149 billion per year.

From 2015 to 2020, the number of funds focused on the blue economy grew by almost 179%. Over the last five years, the growth rate in number of funds with a focus on SDG14 has grown by 102% to reach 186 funds, managed by 134 managers targeting blue economy themes. The growth rate in number of fund since 2015 is 463.6%, with a 13.4% growth in number of funds since the last *Blue Economy Report*. Funds targeting blue economy themes only make up 6.6% of the Phenix Capital Impact Fund Database.

In 2024, the blue economy fund universe saw the launch of a number of new funds including the Fidelity Funds 2 - Blue Transition Bond Fund and the UBS Rockefeller Ocean Engagement Fund, a listed equity fund focused on the blue economy.

Meanwhile The Prince Albert II of Monaco Foundation, which together with Monaco Asset Management launched the ReOcean Fund, a private equity fund dedicated to SDG14 in 2023, teamed up with ODDO BHF Asset Management and Altitude Investment Solutions to launch the Blue Economy Index to address SDG14, as well as SDG12 (Responsible Consumption & Production) and SDG6 (Clean Water & Sanitation).

Asset Class Distribution of Blue Economy Funds



The universe of blue economy funds is spread across a number of different asset classes with private equity making up the majority, 43%. Of the private equity funds, there are only eight that focus on buy-out opportunities, while 42 are growth-focused funds and 62 are venture capital funds.

Public debt funds, investing in blue bonds issued by governments and development banks to raise capital to finance marine and ocean-based projects, are the next largest asset class for the blue economy.

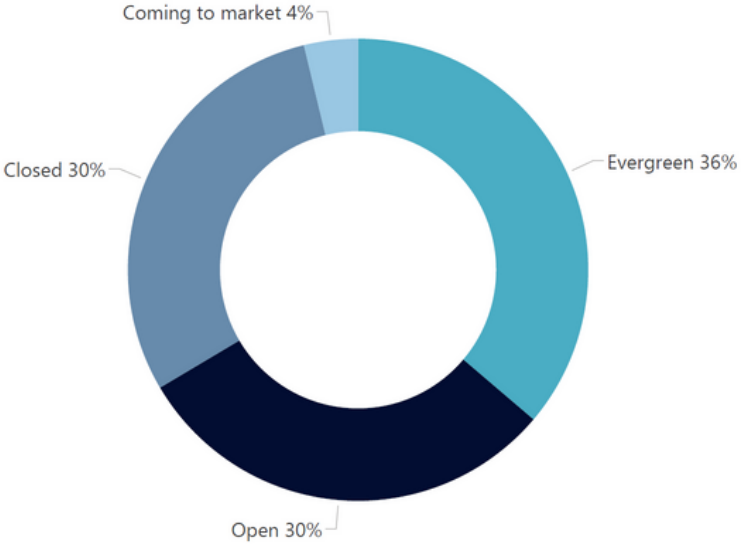
In 2023, with its five-year €100 million issuance, Ørsted became the first energy company to issue blue bonds. Meanwhile, last year with its five-year $100 million offering, DP World became the first company in the Middle East and North Africa to issue a blue bond.

Blue bonds are becoming so popular that the International Finance Corporation, together with the International Capital Market Association, UN Global Compact, UN Environment Programme Finance Initiative, and the Asian Development Bank, developed a global practitioner's guide for blue bonds.

The Ocean Risk and Resilience Action Alliance anticipates the blue bond market could reach $70 billion by 2030. Public focused funds make up 14% of the blue economy universe, while private debt makes up 11%.

Of the 186 funds, 30% are closed while 30% of the funds are open, which together with the evergreen funds, means 66% of the blue economy funds are raising assets. There are also a few new funds coming to market. There are 63 funds run by 60 managers currently open to raising capital.

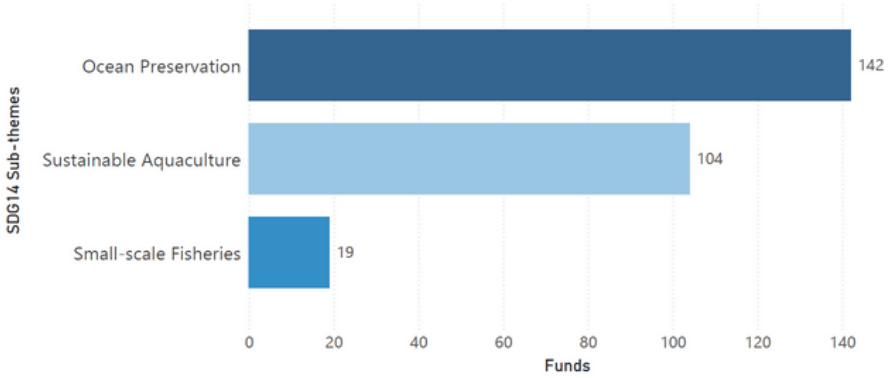
Blue Economy Funds per Status



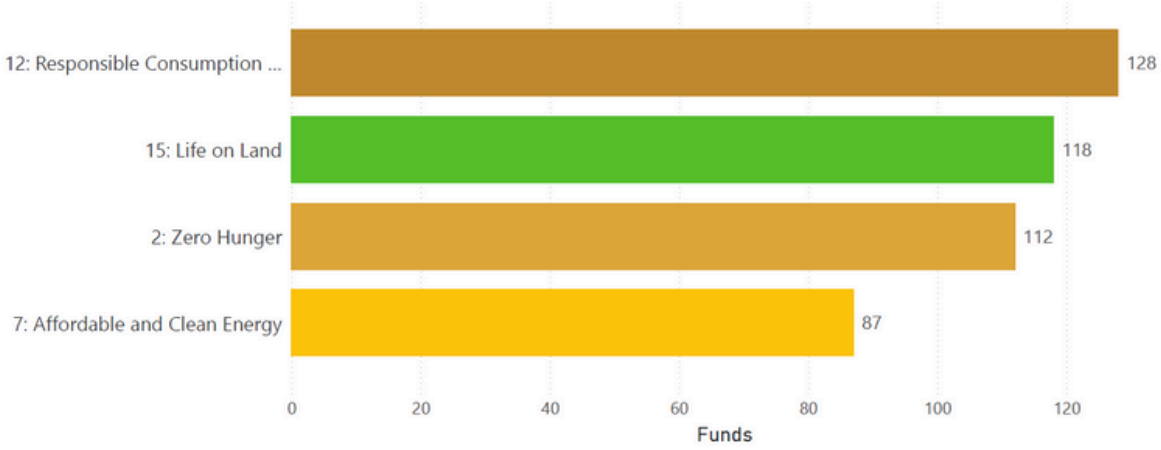
Sub-themes most targeted by Blue Economy Funds

Funds targeting the blue economy often target all or some of these sub-themes: preservation, fisheries and aquaculture. The latter two make up the 'blue foods' theme, which is the topic of this month's Deep Dive.

More than 76% of the funds focus on ocean preservation as a theme, while nearly 56% invest in aquaculture. There are only 19 blue economy funds that target fisheries.



Top SDGs Co-Targeted by Blue Economy Funds



*For clarity, this chart only displays the top SDGs. Other SDGs are not represented.

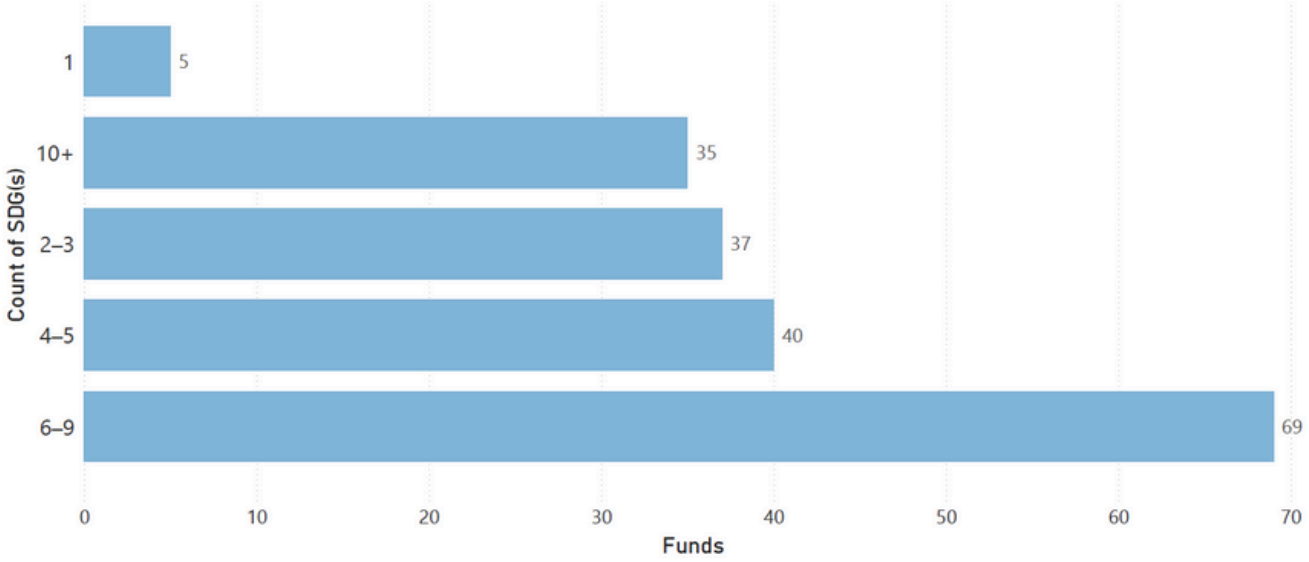
Investing in the blue economy touches almost all of the other SDGS, which means that themes often overlap. For example, blue foods tick the Zero Hunger (SDG2) goal, while ocean energy (including controversial sea wind turbines), can also fall under SDG7: Affordable & Clean Energy.

Plastic pollution and the transformation of plastic into new goods (covered in last year's Deep Dive) is a popular investment theme that sits under both SDG14 and Responsible Consumption & Production (SDG12). Almost 69% of the blue economy funds also target SDG12.

Meanwhile 118 funds some 63% of the blue economy funds also target Life on Land (SDG15). Together with Climate Action (SDG13), SDG14 and SDG15 can be biodiversity plays as well as support the goal of Zero Hunger.

Number of SDGs targeted by Blue Economy Funds

(including SDG 14)



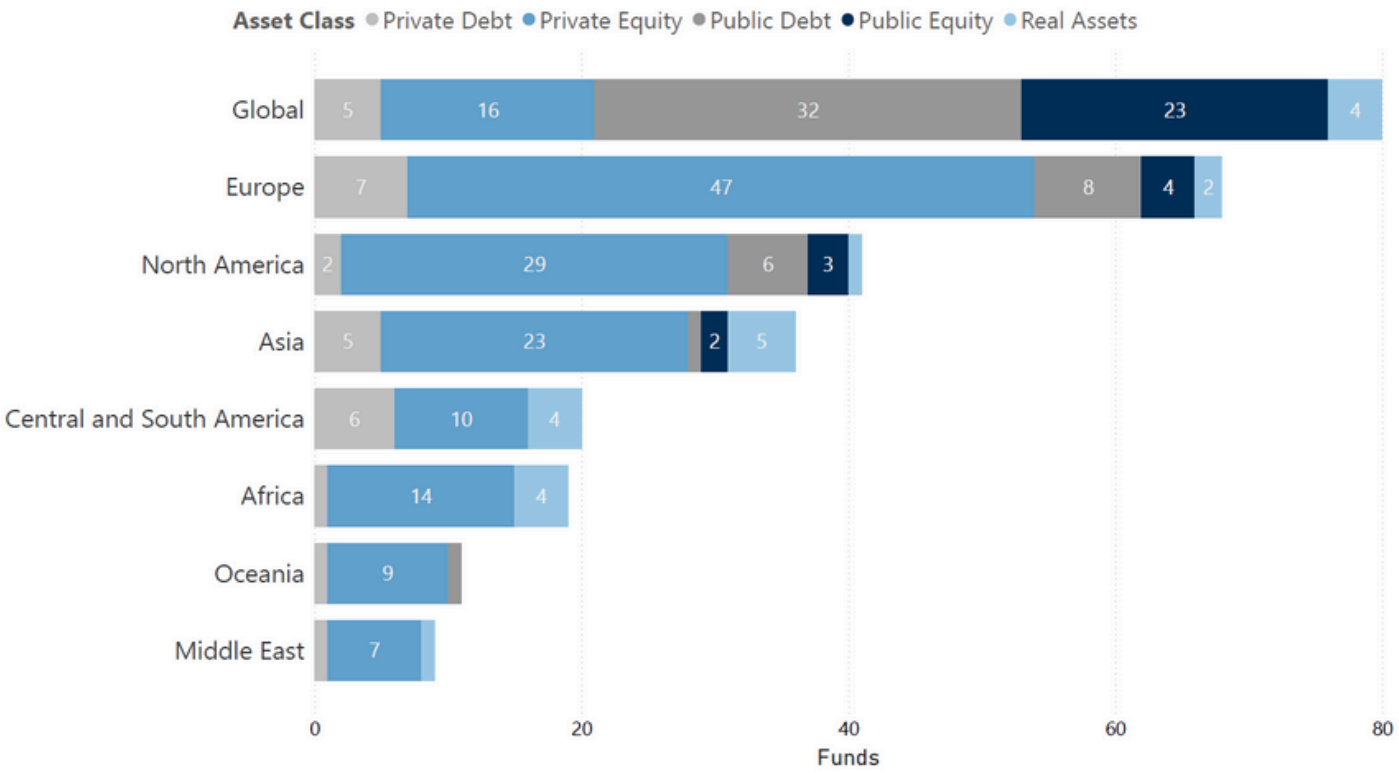
The global blue economy is estimated to be worth more than $1.5 trillion annually, but the scale of investment does not currently match the potential opportunities. A 2020 study titled *The cost of saving our ocean - estimating the funding gap of sustainable development goal 14* estimated that $174.52 billion per year is needed to implement Life Below Water (SDG14) until 2030. Yet, in the period prior to the pandemic (2015-2019), SDG14 had received just below $10 billion in total funding. The 2020 study concluded that there is a financial gap of $149.02 billion per year.

This chart is probably the starkest visualisation of why this underfunding is happening: there are only five pure play investment funds that focus only on SDG14, the rest target two or more SDGs including SDG14 with 35 fund targeting more than 10 SDGs. Some 37% of the funds that target the blue economy also target between six to nine other SDGs, giving a dilution effect to the impact on oceans.

Nearly all of the SDGs are impacted by blue economy focused investing. Just to highlight a few: No Poverty (SDG1) - more than three billion people rely on the ocean for their livelihoods; Zero Hunger (SDG2) - more than 3.3 billion people globally get at least 20% of their daily animal protein from fish; Clean Water & Sanitation (SDG6) and Responsible Consumption & Production (SDG12) - 80% of marine pollution, including fertiliser and pesticides comes from the land with at least 14 million tons of plastic ending up in the ocean every year; and Affordable & Clean Energy (SDG7) - the global ocean energy market is predicted to be worth $4.8 billion by 2030.

The value of the ocean's asset base is $24 trillion, while the annual value of goods and services produced from ocean-related economic activities is $2.5 trillion and it is estimated that by 2030, 40 million people will be employed in ocean-based industries, according to a 2015 WWF report, making it a key driver for Decent Work & Economic Growth (SDG8). Meanwhile ocean innovation in science and technology will be key to driving the investment required to support a thriving blue economy ticking SDG9: Industry, Innovation & Infrastructure.

Regions targeted by Blue Economy Funds



*Data may overlap as funds can target several Regions.

Apart from global blue economy funds and, taking to account that many funds may invest in several regions, private equity is the dominant asset class in every region. Forty percent of the global-focused funds invest in public debt, while only 14.6% and 11.8% of funds targeting North America and Europe, respectively, allocate to blue economy public debt instruments.

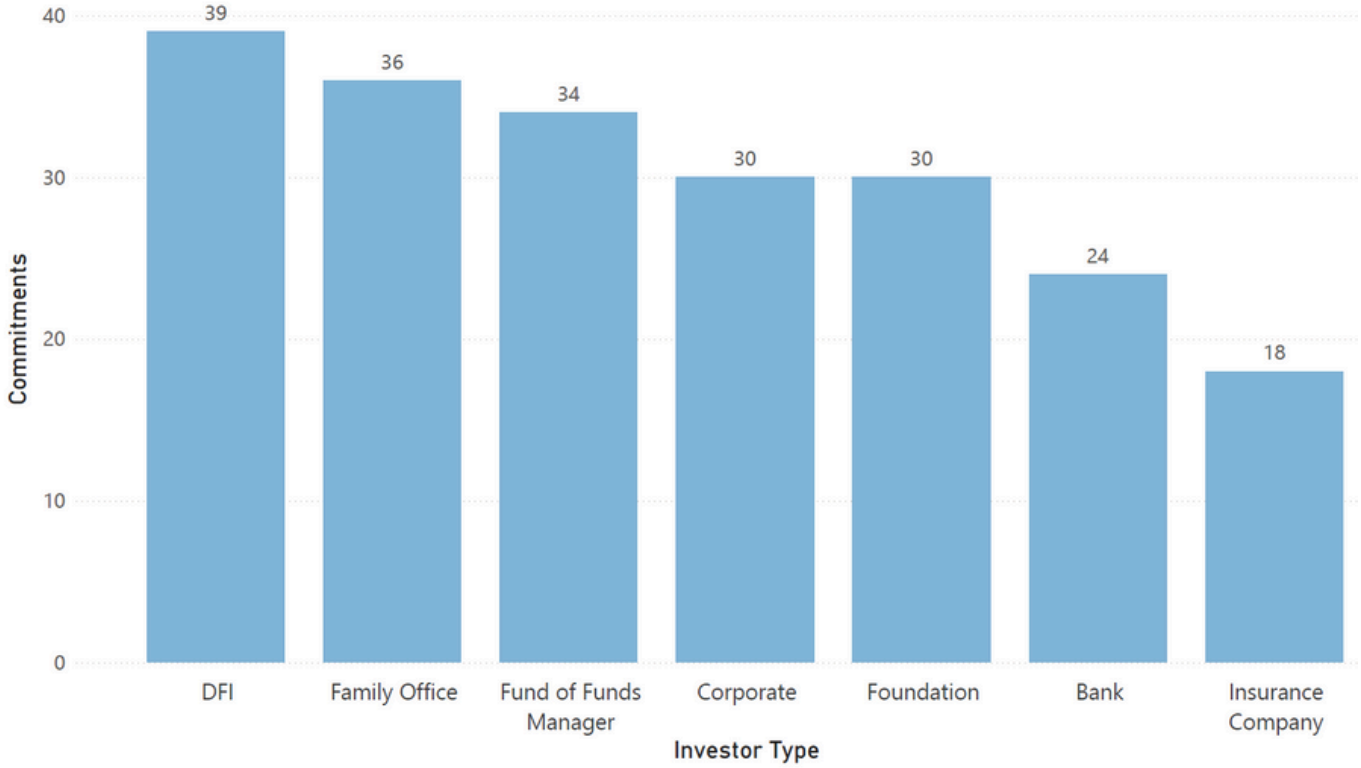
The likely explanation is that many of the blue economy bonds are financed by development finance institutions or are often government driven initiatives such as recent Bahamas debt conversion project. This blue bond will refinance $300 million of the country's external commercial debt to help the country improve ocean conservation and management of its Marine Protected Areas.

The fact that there are almost 70 funds targeting Europe is easily explained by the fact that European Investment Fund (profiled in last year's Blue Economy Report) aims to support first-time fund managers under InvestEU.

Public equity is also a prevalent asset class in global blue economy funds, as highlighted by the UBS Rockefeller Ocean Engagement Fund, making up almost 29% of the asset class preference. For funds targeting Europe, public equity is only almost 6%, while for North America it is just over 7%.

Private debt makes up 30% of the assets in funds targeting Central and South America, while only 13.9% and 10.3% for Asian and European focused funds. Real assets are also proportionately more prevalent in funds targeting Asia and Central and South America, 21% and 20%, respectively. What is interesting to note, of the 14 blue economy funds investing in real assets, nine invested infrastructure and almost all of these focused on ocean preservation.

Investor Commitments to Blue Economy Funds by Investor Type



*For clarity, this chart only displays the top Investor Types. Other Types are not represented.
**Data may overlap as investors can belong to several Types .

The dearth of pension funds as category from this chart is another reminder of how far behind SDG14 is in garnering financing. The most prevalent investors in blue economy funds are Development Finance Institutions, which have invested in 39 funds, followed by family offices and funds of funds that have allocated to 26 and 34 funds apieces.

Corporate investors and foundations, each allocating to 30 funds, are also keen allocators followed by banks and insurance companies, which have invested in 24 and 18 funds each. respectively. In total, there were 211 commitments by investors to impact funds that the blue economy via SDG14.

Well known ocean investors include Builders Vision, the European Investment Fund (profiled last year), the Minderoo Foundation, whose OceanOmics team recently partnered up with the International Union for Conservation of Nature to use environmental DNA to determine when species are under threat of extinction.

Meanwhile, Builders Vision, whose ocean strategy takes a systemic approach to advancing a sustainable blue economy, provided a co-guarantee alongside a multilateral development bank, for the Bahamas $300 million debt for nature swap that aims to improve ocean conservation and management of Marine Protected Areas.

More than 1,800 ocean stakeholders met at European Ocean Days in March to discuss EU-funded initiatives such as the 'Restore our Ocean and Waters' Forum, the BlueInvest Day, the European Blue Forum, which organised the Fisheries and Ocean Dialogue, and the active participation of the EU4Ocean coalition. Last year, the European Investment Fund invested €20 million under InvestEU to Hatch Blue's Blue Revolution Fund, a venture capital fund investing in early-stage aquaculture enterprises.

Deep Dive: Blue Foods

Over the next 10 years, the World Economic Forum's 2025 Global Risks Report identified food insecurity as a significant global risk, highlighting climate change and the interconnectedness of factors such as environmental degradation, geopolitical instability and societal polarisation that will exacerbate the risks.

In addition to food insecurity, food systems are also at the epicentre of two other risks: public-health and greenhouse-gas (GHG) emissions, to which global food production contributes one-third. Food loss and waste alone generates 8% to 10% of annual GHG emissions, according to the *UNEP Food Waste Index Report 2024*.

The report also highlighted that the 1.05 billion tonnes of food wasted in 2022 was equivalent to one billion meals a day. The toll of food loss and waste on the global economy is estimated at $1 trillion, and further more, just by managing the food waste there is already enough food being produced to support the addition two billion mouths expected by 2050.

Without action, the World Bank projects that 950 million people may be severely food insecure by 2030. Right now, that number stands at 343 million, with 733 million people suffering from malnutrition globally. There are 2.8 billion more people that have 'hidden hunger', which means they cannot afford to eat a healthy diet due to rising prices and income inequality, according to the 2024 *State of Food Security and Nutrition in the World* report.

How is this relevant to the blue economy?

The Blue Transformation is a Food and Agriculture Organisation of United Nations initiative to realise the potential of the oceans in supporting global food security. At the United Nations 2021 Food Systems Summit, the potential for fishing and aquaculture in helping to nourish the world's population while protecting nature, was acknowledged with the statement: "the ocean covers 70% of our planet, but currently provides only 5% of our food."

Between 2021 and 2023, some 100 scientists from more than 25 institutions collaborated on the Blue Food Assessment to gain a better understanding of the role of blue foods in feeding the world. It found that sustainable management of the world's wild-capture fisheries is imperative to feeding a growing global population and the research generated by the assessment now serves as a foundation for the Blue Food Futures Program.

The term 'blue foods', or aquatic foods, encompasses aquaculture and fisheries that collectively cover wild-caught or farmed fish from oceans, river, and lakes, as well as sea food and seaweed. Blue foods tick a number of sustainable food system boxes including a lower carbon footprint and land use impact than other sources of land-based proteins as well as providing food and or income for an estimated 800 million people. The following sections look at blue foods and a the SDGs they impact significantly.

SDG2: Zero Hunger

Right now, 3.2 billion people globally get at least 20% of their daily animal protein intake from fish. It is estimated that blue foods can contribute to SDG2: Zero Hunger by providing 13.6 million tonnes more seafood by 2050. In terms of variety, there are more than 2,200 wild species fished and, out of the some 730 farmed species items, 17 staple species represent about 60% of global aquaculture production.

In 2022, global fisheries and aquaculture production surged to 223.2 million tonnes, with 185.4 million tonnes of aquatic animals, an increase of 4% from 2020, and 37.8 million tonnes of algae, according to *The State of World Fisheries and Aquaculture 2024* (SOFIA). Of the aquatic animals produced in 2022, 89% were destined for human consumption, equivalent to an estimated 20.7 kg per capita. The remaining 20.8 million tonnes were for non-food uses; mainly fishmeal and fish oil (83%). Aquaculture supplied more than 57% of aquatic animal foods for human consumption in 2022.

Farming of aquatic animals produced an estimated 94 million tonnes, representing 51% of the total, surpassing, for the first time, capture fisheries that produced 91 million tonnes (49%). Production from marine areas was 115 million tonnes (62% of the total), of which 69% was from capture fisheries and 31% from aquaculture. Inland waters contributed 70 million tonnes (38% of the total), of which 84% was from aquaculture and 16% from capture fisheries. Investing in recirculating aquaculture systems (RAS), such as that pioneered by The Kingfish Company in The Netherlands, is crucial for maintaining optimal water quality and supporting fish health and growth.

The main drivers of the continuous growth in per capita consumption are increased supplies, advancements in preservation and distribution technology, changing consumer preferences and income growth. Historically, Europe, Japan and the USA have accounted for a significant portion of the global amount of aquatic animal foods available for human consumption. In 1961, their collective share was 47% of the world supply, dropping to 18% by 2021.

Meanwhile, China, Indonesia and India saw significant increases in their shares of global consumption of aquatic animal foods. Collectively representing only 17% in 1961, their combined share surged to 51% by 2021, with China alone representing 36%, driven in part by increasing urbanisation and rising proportion of middle-class citizens.

In terms of nutrition, fish and fish by-products provide high levels of essential micronutrients, such as vitamins A, D, B, particularly B-12, as well as minerals such as calcium, phosphorous, iron, zinc, selenium, and iodine. In addition to micronutrients, by products contain high quality proteins and lipids with long-chain omega-3 fatty acids.

SDG8: Decent Work & Economic Growth

Fisheries and aquaculture generate significant employment and support livelihoods in many coastal communities, thereby supporting both SDG1: No Poverty and SDG8: Work and Economic Growth. In 2022, about 62 million people were engaged in the primary sector of fisheries (54% of total) and aquaculture (36% of total) as full-time, part-time, occasional or unspecified workers, with 33 million people are employed directly in wild capture fishing, With respect to SDG5: Gender Equality, women occupy 24% of the workforce in fishing and aquaculture globally, compared to 62% in the postharvest sector.

In 2022, Asia accounted for 85% of the workers involved in fisheries and aquaculture, followed by Africa (10%) and Latin America and the Caribbean (4%), while Europe, Oceania and Northern America combined accounted for just 1%. Considered separately, aquaculture provided employment for approximately 22 million people globally, with 95% in Asia.

The first sale value of the 2022 global production of aquatic animals was estimated at $452 billion, comprising $157 billion for capture fisheries and $296 billion for aquaculture. Seventy million tonnes of aquatic animal products (38% of the total production), worth $192 billion were exported worldwide in 2022, representing more than 9.1% of total agricultural trade (excluding forest products) and about 1% of total merchandise trade in value terms in 2022. This represents a new high, surpassing 2018's record of $165 billion.

More than 230 countries and territories are involved in the international trade of aquatic products. In low- and middle-income countries, the total net trade of aquatic animal products reached $45 billion, greater than that of all other agricultural products combined.

The production of farmed animal species increased in 2022 by 6.7 million tonnes (7.6%) from 2020. This net increase was due mainly to Asia, whose contribution (5.9 million tonnes, 87.9%) was far higher than the next two highest producers: Latin America and the Caribbean (448 300 tonnes, 7.3%) and Europe (232 100 tonnes, 3.5%).

By species group, the net increase was mainly attributed to finfish (3.9 million tonnes, 58.1%), followed by crustaceans (1.6 million tonnes, 24.6%), molluscs (1 million tonnes, 15.6%) and other aquatic animal species (121 800 tonnes, 1.8%).

Global production of farmed algae reached 36.5 million tonnes in 2022, an increase of 1.4 million tonnes (4.1%) from the 2020 production of 35.1 million tonnes. This increase was the result of production expansions led by China, followed by Malaysia, the Philippines, the United Republic of Tanzania and the Russian Federation.

SDG12: Responsible Consumption & Production

The blue food system suffers significant loss and waste challenges too. In 2021, approximately 23.8 million tonnes of aquatic foods were lost or wasted, representing 14.8% of global production, according to World Economic Forum's *Investigating Global Aquatic Food Loss and Waste*.

The biggest sources of food loss and waste come from processing on land and discards from wild-capture fishing (as opposed to fish farms), with each accounting for more than a third of the total figure.

Out at sea, catches not deemed valuable enough are thrown back overboard. For those fish that are kept, processing, such as gutting, de-heading, skinning and trimming on board is the next biggest source of waste. The catch is further processed on land.

Higher income nations prefer easy-to-prepare fillets and ready-to-eat products made from fish like tuna, cod, haddock, salmon, and prawns, leading to further waste. In contrast, lower-income countries tend to eat more fresh whole fish. Once catches enter the retail market, losses occur when food is contaminated, spoiled or exceeds its "sell-by" date.

Tackling fish waste and finding alternatives to aquaculture fishmeal are two popular investment themes. SUPREME, which is funded by the Research Council of Norway, is working to increase the utilisation rate and value creation from residual raw materials from whitefish by developing solutions for on-board handling, logistics and processing of ingredients from residual raw materials from the ocean-going fishing fleet.

The fishing industry produces around 340,000 tonnes of whitefish by-products each year. Marine by-products are rich in proteins, lipids and other valuable components (calcium, phosphorus, etc.) and can be used to produce ingredients such as omega-3 oil, collagen and gelatin, which are high-demand ingredients crucial in the pharmaceuticals, dietary, nutrition and cosmetic industries.

Meanwhile Salinas del Astur, an aquaculture company in Spain, which breeds and sells sea bass and guilthead produces 50% of the fishmeal consumed by its aquaculture activities.

Aquaculture, the fish farming alternative to wild capture, is not without losses either. Innovations like sensor technology and disease detection can help minimise deaths. Ocean 14 Capital, a private equity funds solely focused on SDG14, has invested in a number of aquaculture-related innovations including AquaExchange a technology platform that leverages data analytics on shrimp and fish production to improve productivity and profitability; and WellFish an aquaculture-diagnostics start-up currently offering rapid fish health assessment for the aquaculture industry.

Another aspect in the sustainability of aquaculture is the amount of wild fishmeal and fish oil contained in feed supplies. Generally, a feed conversion ratio of about 1.1 kg to 1.2 kg of feed is needed to produce 1 kg of fish. In 1990, the wild fish-derived component of feeds could be as high as 80%, today, commercial feeds can contain as little as 15% fishmeal and 15% fish oil. Alternatives to wild fish fishmeal include insect meal, plant-based protein sources like meals from soybean, black cumin seed, canola, lupin, rice, rapeseed, guar and almond, as well as single-celled proteins from algae and fungi.

Since 1971, FAO has been publishing regular analyses of the state of fish stocks. The fraction of fishery stocks within biologically sustainable levels has decreased to 62.3% in 2021, which is 2.3% lower than in 2019. In 1974, this fraction was 90%. In contrast, the percentage of stocks fished at unsustainable levels has been increasing since the mid-1970s, from 10% in 1974 to 37.7% in 2021.

When weighted by their production levels, biologically sustainable stocks account for 76.9% of the 2021 landings of assessed stocks monitored by FAO. Biologically sustainable stocks consist of those classified as maximally sustainably fished and underfished, accounting for 50.5% and 11.8%, respectively, of the total number of stocks in 2021. In 2021, among the 15 FAO's major fishing areas reviewed, the Eastern Central Pacific, Northeast Atlantic, Northeast Pacific and Southwest Pacific had the highest percentage of stocks fished at sustainable levels (84% to 76%).

The species with the 10 largest landings in 2021 were: Peruvian anchovy, Alaska pollock, skipjack tuna, Pacific chub mackerel, yellowfin tuna, Atlantic herring, European pilchard, blue whiting, Pacific sardine and Atlantic cod. On average, 78.9% of these stocks were fished within biologically sustainable levels in 2021, significantly higher than the global average of 62.3%.

This demonstrates that the larger stocks are better managed, and that effective fisheries management reaps positive outcomes. However, some stocks of Pacific chub mackerel, Pacific sardine and Alaska pollock were overfished. Globally, 87% of tuna stocks are sustainably fished, and 13% are considered overfished. The UN's second World Ocean Assessment estimates that, with the right management, 98% of currently overfished stocks could return to healthy levels by 2050.

SDG13: Climate Action

Reducing food system GHG emissions is central to meeting global emission targets. In 2017, research suggested that global aquaculture alone accounted for only approximately 0.49% of anthropogenic GHG emissions. Blue foods generally produce much lower CO_2 emissions than most meat production and uses no land and virtually no fresh water. Compared to beef's 238 gCO_2 equivalent per gram of protein, wild fisheries and aquaculture produce 39.5 and 24 gCO_2 equivalent per gram of protein, respectively.

The same research showed that in terms of land use, mutton use 0.64 square metres per gram of protein, while aquaculture and wild fisheries is 0.043 and zero square metres per gram of protein, respectively. Looking at fresh water use, wild fisheries use zero litres of freshwater per gram of protein, whilst aquaculture is the biggest user at 13.15 litres per gram of water, compared to the next biggest user pork at 11.19 litres.

More specifically, according to research published in *Nature*, fed aquaculture emissions result primarily from feed production is responsible for more than 70% of emissions for most groups, while fuel use drives capture fisheries emissions. Across assessed blue foods, farmed seaweeds and bivalves generate the lowest emissions, followed by small pelagic capture fisheries, while flatfish and crustacean fisheries produce the highest.

When looking at wild versus farmed, some farmed seafood, like salmon and trout, has a carbon footprint similar to wild caught (5,101–5,410 farmed versus 6,881 kilograms of CO_2 equivalent per tonne caught). Farmed bivalves and shrimp, however, produce lower average emissions than their wild counterparts: bivalves, 1,414 versus 11,400 $kgCO_2e\ t^{-1}$; shrimps, 9,428 versus 11,956 $kgCO_2e\ t^{-1}$.

Addressing climate impacts on aquatic food systems and leveraging their potential for climate action requires their integration into national climate strategies and UNFCCC processes, which is why the FAO published a standalone book titled *Integrating blue foods into national climate strategies* to provide guidelines for audiences working on Nationally Determined Contributions (NDCs) and other climate strategies on how to employing blue foods in climate solutions.

Seaweed

Seaweed deserves a special mention given it has the potential to contribute to many of the SDGs with its ability to absorb carbon emissions, regenerated marine ecosystems, employ women and acting as a feedstock for biofuels and renewable plastics. Seaweed is incredibly diverse and can be used across a wide range of industries, from food and cosmetics to agriculture and pharmaceuticals, and is an industry that could be worth $11.8 billion by 2030.

According to a report by Standard Chartered, $100 billion of investments in seaweed between now and 2040 may create roughly $313 billion in value and approximately 200 million jobs, as well as help to address global challenges like malnutrition and acting as a disruptor across industries. Despite there being over 12,000 known species of seaweed, only a very small percentage are commercially farmed today and just 10 species make up 99% of global seaweed production.

Recent analyses have found seaweed farms sequester carbon in marine sediment in quantities ranging from 0 to 8.1 tons of carbon dioxide equivalent per hectare (CO_2 e/ ha), with a median net sequestration of approximately 0.5 tons of CO_2 e/ha. Moreover, seaweed can be used to replace carbon-intensive products with bioplastics and bio-stimulants as two of the most promising markets.

Seaweed uses range from food, alternative food ingredient, bio-stimulant, animal feed ingredient, fertiliser, methane reducer, bioplastics and biofuels. Bioplastics, for example, require fewer emissions to produce and are biodegradable, and unlike some bioplastic materials seaweed does not require land, freshwater or fertiliser to grow.

In addition to this, seaweed is also a source of alternative proteins, constituting more than 40% in the case of red seaweed. The seaweed-protein market alone is expected to be worth $1.13 billion by 2027 as a blue food that produces abundant protein with a low carbon footprint.

Although seaweed has been cultivated for centuries, the pace of production has rapidly accelerated over the past 20 years, with the value of the global seaweed market rising 10-fold since 1984 to reach $15.5 billion. Despite this boost, production remains highly concentrated in Asia with China and Indonesia currently accounting for 90% of global seaweed production.

Conclusion

Blue foods are more than just a key to achieving SDG2: Zero Hunger, they are important for economies, livelihoods, wellbeing and cultures, particularly in rural communities., as they are nutrient rich, generate lower emissions and impacts on land and water than many terrestrial meats.

The increasing global consumption of seafood from 9.9 kg in 1960s to 20.2 kg per capita in 2020 up has meant that unsustainable fishing and aquaculture practices are depleting the ocean of fish and other aquatic food species. As highlighted in SOFIA 2024, more than a third (37.7%) of fish stocks have been fished beyond sustainable limits, and the fraction of fishery stocks within biologically sustainable levels decreased to 64.6% in 2019.

Yet as the oceans only provide roughly 5% of all food, maximising potential is a crucial part of reducing food security risks. Developing blue foods, however, needs to be sustainable and regenerative, and the UN's second World Ocean Assessment estimates that, with the right management, 98% of currently overfished stocks could return to healthy levels by 2050.

The aim of the FAO's Blue Transformation roadmap is to create a framework that harnesses aquatic food systems, specifically aquaculture, fisheries and value chains, as drivers of employment, economic growth, social development and environmental recovery, which all underpin the SDGs.

The goal for aquaculture is to achieve least 35% growth in global sustainable aquaculture production by 2030, as well as growth in aquaculture employment and skilled labours improves income and livelihood. Through the effective management of 100% of all fisheries, the framework aims to deliver healthy stocks and secure equitable livelihoods.

For both aquaculture and fisheries, the aim is to achieve full and productive employment and decent work for all women and men by 2030. Upgrading value chains will ensure the social, economic and environmental viability of aquatic food systems. The move will significantly increase in global per capita fish consumption; reduce global fish loss and waste by half by 2030; and make sure current and potential exporters in developing countries can comply with import market requirements of import countries.

Global consumption has the potential to increase from 80 million tonnes in live weight to almost 155 million tonnes across all fish and shellfish categories by 2050. For this reason and many of those outlined above, more capital is likely to flow into blue foods, but for this to happen more awareness of and investment opportunities in this sector needs to happen.

PHENIX IMPACT FUND ASSESSMENT

Phenix Impact Fund Assessment is a proprietary framework developed in close consultation with institutional asset owners and industry leaders, for the purpose of **assessing the robustness of a fund's impact proposition**.

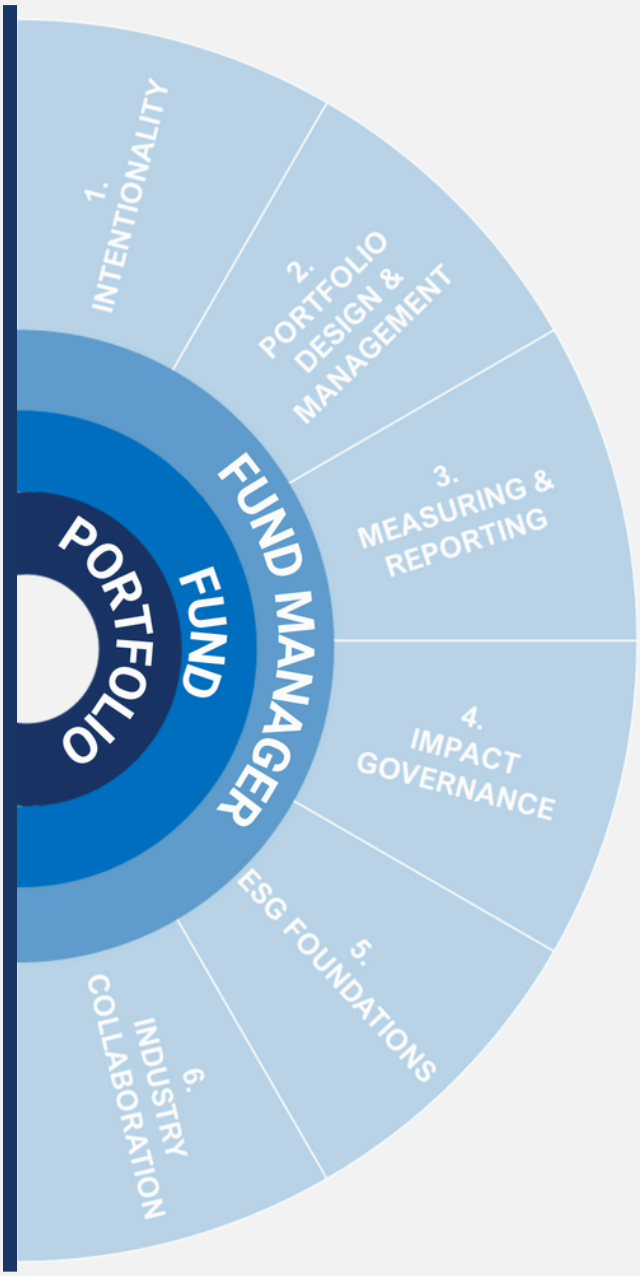
On 6 themes and 45 criteria, it examines to what extent the policies, procedures and human resources are in place to deliver the impact that a fund aims to create.

ASSESSING THE ROBUSTNESS OF IMPACT FUND PROPOSITIONS

Uncover strengths and weaknesses

Adopt industry best practices

Prepare for institutional impact due diligence



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Glossary & Symbols

Committed capital: Amount committed in a fund vehicle by its limited partners / investors.

Developed markets: We include Europe (excl. Eastern Europe), North America, Asia Pacific (Singapore, Japan, and South Korea only), Oceania (New Zealand, Australia) Middle East and Africa (Israel only).

Direct lending: A specialised form of private debt, in which loans are made to middle-market companies. It is the private debt strategy with lower risk, achieved by using collateral.

Emerging markets: We include Latin and Central America, Asia Pacific (excl. Singapore, Japan, South Korea), Middle East and Africa (excl. Israel) Europe (Eastern Europe only).

Fund managers: Organisation managing commingled, pooled and customised vehicles invested by institutional asset owners. Also called General Partner or GP.

Global: Funds that have an investment geographic scope encompassing both developed and emerging markets.

Impact investing: Investments with the dual mandate of financial return and positive societal or environmental impacts, with the notion of measuring the positive and negative impact of investments, ensuring both intentionality and additionality among these.

Institutional asset owners: Outsourced CIOs, pension funds, insurance companies, family offices, sovereign wealth funds, endowments, foundations, banks, fiduciary managers, discretionary investment consultants. Also called Limited Partner or LP.

Market targeted: Markets fund managers target for their investments: We include Global, Developed markets, Emerging markets.

Mezzanine: A specialised form of financing in which loans are subordinated to banks, with no collateral. It is the most equity-like form of private debt.

Microcredit: A common form of microfinance, characterised by small loans to individuals or small companies.

Private debt: Debt instruments to companies: direct lending, mezzanine, microfinance strategies.

Public debt: Publicly traded fixed income securities: investment grade or high yield, focused on green bonds and municipal and community infrastructure and affordable housing issuers.

Regions targeted: Regions fund managers target for their investments: We include Asia Pacific (East Asia, Central Asia, South Asia, South East Asia), Europe (Western Europe, Eastern Europe), Global, Latin and Central America, Middle East and Africa (East Africa, Middle East, Northern Africa, West Africa, Southern Africa), North America, Oceania.

Target fund size: Amount the fund manager is targeting when raising capital.

Vintage: Year where the fund manager first calls capital from investors.

Full glossary: www.phenixcapitalgroup.com/impact-investing-glossary

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