KPMG

You Can't Go Green Without Blue

The Blue Economy is critical to all companies' ESG ambitions.

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One Planet, One Economy

Why do we talk about green without referring to blue?

The planet is comprised of natural systems, on which humanity has layered social, economic and technological structures. But the economic systems supporting humanity cannot grow indefinitely, and neither can the resultant environmental impacts. The 'green' agenda recognizes that the problems of poverty, biodiversity decline and climate change cannot be tackled in isolation.

Oceans are a critical part of this balancing act: they influence all natural cycles, but are also directly or indirectly involved with all economic sectors. Oceans produce up to 80% of the oxygen we breathe, while nearly 40% of the world's population depend on marine and coastal biodiversity for their livelihoods[1]. The 'blue' component of the 'green' transition to a more sustainable global economy cannot be overlooked.

But the 'blue economy' has not been prioritized to date. Perceived 'trade-offs' in the use of its common resources — and disconnected costs of its continued degradation — continue to pose a complex social, economic and environmental governance challenge for policymakers.

We believe that by adopting a planetary-wide (or 'blue-green') approach, business leaders can help close this gap in governance. In the following pages, we consider how leading corporates and investors can take action to capture the value that can be found in a healthy, sustainable ocean economy.

[1] 'How much oxygen comes from the world's oceans?' (2021) National Oceanic and Atmospheric Administration. The comparative role of oceanic and terrestrial sinks remains an area of study, with estimates ranging from a consistent 31% (with absolute volumes increasing over time) to up to 70% of anthropogenic (i.e. originating in human activity) CO_2 being absorbed by the oceans each year ['Marine Biogeochemistry' (2019) Encyclopaedia of Ocean Sciences]. 'SDG 14: Life Below Water' (2020) UN.

Why does the Blue Economy matter?

A Blue-Green Agenda

The 'green economy' is "one that results in **improved human well-being and social equity**, while significantly **reducing environmental risks and ecological scarcities.**"[2] — UN Environment Programme

The world is scrambling to 'go green'

All around the world, countries and territories are looking to transition to a 'green' economy that is low in carbon, socially inclusive and resource efficient. To limit the increase in global temperatures to 1.5 degrees, **economic growth must be further decoupled from environmental degradation and the emission of global greenhouse gases** (GHGs)[3]**.** This requires the sustainable management of natural capital[4], including the decarbonization of business activities[5].

Implementation challenges notwithstanding, over 68 percent of global GDP[6] is already covered by a net zero target. Some of the world's largest companies are setting the bar even higher with restorative strategies, pledging to become 'carbon negative' and 'resource positive'[7].

Although public and private momentum has largely focused on the connection between the economy and the environment, the 'green' agenda is also central to achieving the broader social equity ambitions in the UN's Sustainable Development Goals (SDGs)[8]. These promote socioeconomic development, within planetary boundaries.

In its simplest form then, 'green' has become short for a sustainable social, environmental and economic future. By definition, it should include the sustainable use of oceanic resources — but in practice, **the world's attention has been caught by the direct terrestrial implications** of the green agenda, with governance systems developing accordingly.

Meanwhile, the pivotal role of the oceans in limiting temperature rises and stimulating socioeconomic development has been comparatively absent from the transition towards a green global economy.

No blue without green — nor green without blue

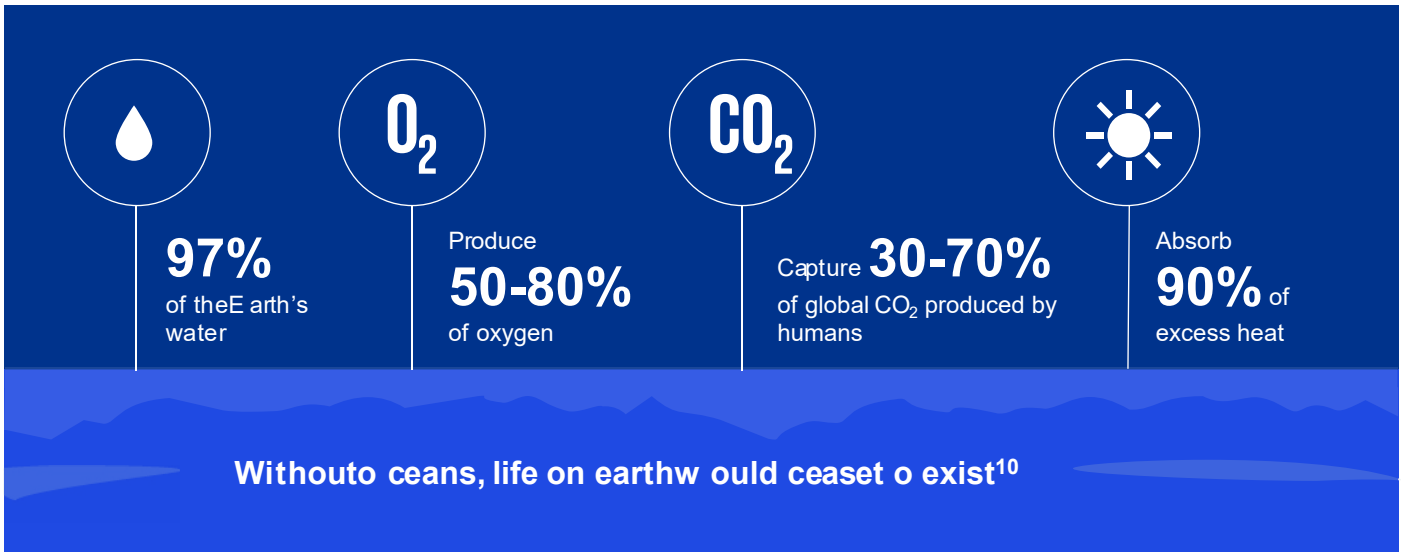
When viewing Earth from space, the overriding colour we see is blue — it is the colour that enables life on earth. Not only was terrestrial life spawned from the seas[9], but the oceans are responsible for our continued survival.

As we explore in the following pages, **the 'blue economy' is central to the green ecosystem.**

It offers both socioeconomic and environmental value, from ocean-based food and jobs, to biological and geological 'blue' carbon sequestration. Its centrality to global supplies of renewable energy, critical metals, water and food stocks, as well as its contribution to cultural values, mobility and economic growth, underpins the success of many of the SDGs:

[2] 'Green Economy' (2011) UN Environment Programme.
[3] As agreed at the Paris Climate Agreement in 2015.
[4] The world's stock of natural assets, including geology, soil, air, water and all living things [World Forum on Natural Capital].
[5] Reduction of carbon emissions.
[6] 61% of GHG emissions and 56% of the world's population are covered by national net zero commitments ['Taking stock: a global assessment of net zero targets' (2021) Oxford Net Zero & ECIU].
[7] 'Including, for example, removing more CO_2 than is emitted by the company, eliminating waste and providing more clean freshwater than the company uses.
[8] 'How can a green economy power the SDGs?' (2017) Green Economy Coalition.
[9] Photosynthesis by oceanic primary producers first enabled the necessary shift in the amount of oxygen in the atmosphere from less than 5% to around 21% today [Ocean Exploration and Research].

The blue economy refers to "the sustainable use of ocean resources to **promote economic growth, social inclusion, and the preservation or improvement of livelihoods,** while at the same time ensuring **environmental sustainability** of the oceans and coastal areas." — The World Bank



But like climate, we are living through a continuous and unsustainable deterioration of this (limited) global common due to human interference. More effective management of the oceans is essential to achieving the speed and scale needed for a transformation to a sustainable, low carbon world. Even more importantly, **without explicit recognition of the environmental, social and economic contribution of the blue economy, we face a very real risk of reversing progress on green ambitions.**

This report showcases the symbiotic importance of the oceans to 'green' business ambitions — across maritime and land-based sectors alike. In the following pages, we cover:

01 **The basics of the blue economy and its contribution to the green agenda.** This is the business case for change: oceanic resources must be revalued as we evolve business to take care of the green agenda. We cannot achieve net zero targets nor the SDGs without considering blue natural capital, but equally the ocean economy must be governed by green principles.

02 **The issues around sustainable management,** such as ownership, accountability, visibility and development. With limited national jurisdiction and often 'invisible' costs to overconsumption, the transition to a blue economy will require an even greater degree of multilateral collaboration than the green agenda. But achieving political coordination will remain challenging — particularly in a G-Zero world[11] that struggles with international governance even in well-established realms.

03 Finally, and perhaps most importantly, we consider **opportunities for business leaders** to bridge the governance gap and capture the significant growth opportunities that can be found in the protection, preservation and promotion of the blue economy. We identify practical steps for 'Learners' and 'Leaders' across multiple sectors to contribute to the blue transition, from nature-based reporting and valuation, to 'blue' financing, carbon sequestration and circular business models.

[10] 'How much oxygen comes from the world's oceans?' (2021) National Oceanic and Atmospheric Administration. The comparative role of oceanic and terrestrial sinks remains an area of study, with estimates ranging from a consistent 31 percent (with absolute volumes increasing over time) to up to 70 percent of anthropogenic (i.e. originating in human activity) CO_2 being absorbed by the oceans each year ['Marine Biogeochemistry' (2019) Encyclopaedia of Ocean Sciences].
[11] Coined by Eurasia Group, it refers to a world with plenty of leaders, but no real global leadership.

What is the Blue Economy?

Life below Water

Despite its uptick in popularity in recent years, **the term 'blue economy' is not well defined or understood**[12]. Conceived as the underwater version of the green economy, the concept balances the socioeconomic development of oceanic resources with the protection of its natural capital.

From the Ocean Economy…

Human development has always been closely linked to the exploitation of the oceans, and **they remain a growing hub for trade, transport and tourism.** Many megacities are located in coastal zones, with over a third of the world's population living within 100km of the sea[14].

Most sections of the ocean economy are growing faster than the global economy in terms of value add and employment. Pre-COVID-19, the workforce was projected to grow by 30% over a 20 year timeframe, significantly outpacing global growth (at 19%).

Ocean-based industries are anticipated to directly contribute to 40m jobs in 2030 (1% of the global workforce). This excludes informal employment in artisanal practices, which could include up to 350m jobs in fisheries alone[15].

3bn people depend on marine and coastal biodiversity for their livelihoods

80% of international trade in goods carried by sea[13]

$24tn estimated value of 'blue' assets

… to the Blue Economy

The 'ocean economy' is often used interchangeably with the blue economy, although the latter is based on the sustainable or 'green' use of oceanic resources. Socioeconomic valuations of the blue economy vary widely depending on:

01 **Sectors:** Due to the inconsistent inclusion of 'newer' industries, such as marine biotechnology and renewable energy, as well as high-carbon or environmentally contentious industries, such as oil and gas and deep-sea mining (DSM).

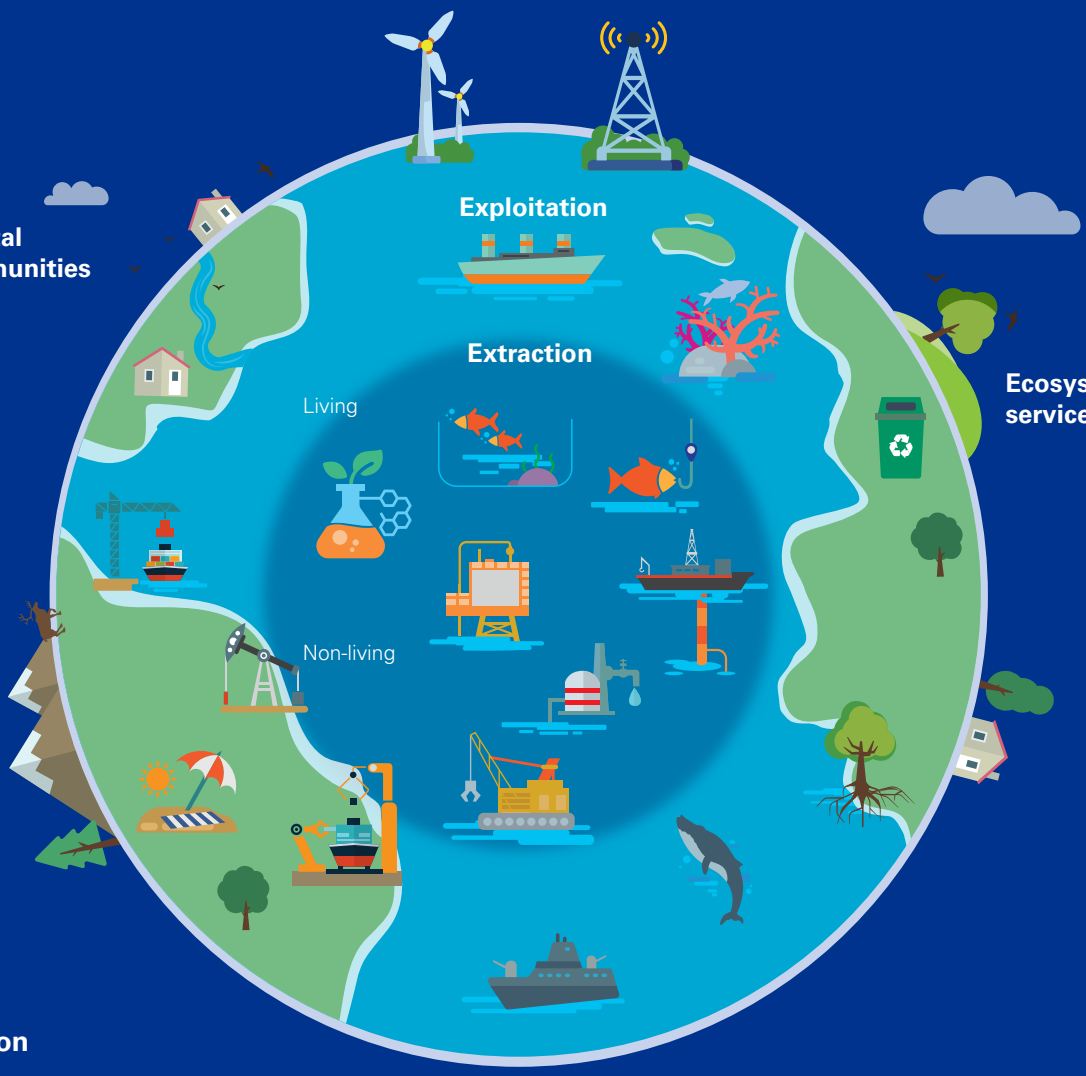
02 **Geographic reach:** Some conceptions extend to all liquid ecosystems (such as rivers and lakes) and related communities[16].

03 **Ecosystem services:** With the inclusion of non-market environmental benefits. For example, economic contribution of carbon absorption by the oceans, combined with traditional marine and coastal industries like trade and transport can be tallied together to provide a more accurate valuation of blue economy assets.

For this report, we adopt the broadest, ecosystem-based approach to conceptualizing the blue economy. We combine non-market environmental services with the full industrial scope of oceanic and liquid ecosystems. Greater visibility and inclusion in the 'conversation' should help the necessary **transformation of socioeconomically significant, but environmentally less sustainable maritime industries,** such as shipping, non-renewable energy and fisheries.

[12] 'Shades of Blue: what do competing interpretations of the Blue Economy mean for oceans governance?' (2018) Australian National Centre for Ocean Resources and Security.
[13] Pre-COVID-19 estimates. 'The Ocean Economy in 2030' (2016) OECD; 'Declaration of the Sustainable Blue Economy Finance Principles' (2018) UN; 'World Oceans Day' (2020) WEF; UN (2020); 'Action Group on Sustainable Blue Economy' (2021) The Commonwealth Blue Charter.
[14] 'Toward a Blue Economy: A Promise for Sustainable Growth in the Caribbean' (2016) The World Bank Group.
[15] 'OECD (2016); 'Contribution of Marine Fisheries to Worldwide Employment' (2013) New York Academy of Sciences; The Commonwealth Blue Charter (2021).
[16] The Commonwealth Blue Charter (2021).

What is the Blue Economy?[17]



Extraction

Non-living

- Deep sea mining
- Offshore hydrogen
- Dredging
- Desalination
- Oil & Gas

Living

- Biotechnology
- Aquaculture
- Fishing

Exploitation

- Offshore renewable energy
- Shipping/ transport
- Defence
- Telecommunications

Coastal communities

- Ports
- Shipbuilding
- Marine & coastal tourism

Ecosystem services

- Geological and biological carbon sequestration
- Ecosystem protection
- Waste disposal
- Biodiversity

[17] Adapted from The Economist (2015). Although not explicitly referenced for simplicity, includes seafood processing, safety and surveillance, high tech marine services, recreational fishing and boating, ocean-based sport, ecological research, protection and restoration, marine transport equipment manufacturing, ship repair, marine construction, port infrastructure and services, marine education and R&D, bioprospecting, surveillance and maritime security.

The 'green' contribution of the oceans

The centrality of the blue economy to the green agenda is not a new concept. The UN Environment Programme opened a report in 2012 with the plea that "a worldwide transition to a low-carbon, resource-efficient green economy will not be possible unless the seas and oceans are a key part of these urgently needed transformations".

So why does the blue economy matter so much to the 'green' agenda? Oceans influence all natural cycles, but all you really need to know is that **oceans perform valuable (albeit less recognized and appreciated) functions in the mitigation of climate change.** They capture carbon, provide protection from extreme weather events and regulate global temperatures — in many cases, more effectively than their terrestrial counterparts. Oceans also help achieve the SDGs (as a source of food, water and jobs).

But to learn more of the interesting scientific detail:

Temperature regulation: Oceans balance the global climate and regulate temperatures on land. The ocean has prevented even more rapid changes in climate as it has absorbed most of the excess heat from GHGs — the world could have warmed by 36°C if this heat had gone into the lower 10km of the atmosphere instead[18].

Ecosystem services: the ocean provides environmental services critical to the achievement of the SDGs, including:

- **Food:** with spawning grounds for aquaculture.
- **Water:** desalination of seawater can help secure adequate supplies of clean water in the face of decreased water availability. This may have potentially profound implications for public health and economic development, particularly for coastal and island developing nations. The oceans also support the filtering of contaminants to contribute to healthy marine water quality.
- **Communities:** protection from more severe weather events including storms, floods and erosion.

Carbon sequestration: Carbon forms two of the most important GHGs — carbon dioxide and methane. The global carbon cycle includes exchanges within and between four major reservoirs — the atmosphere, the oceans, land and fossil fuels[19].

Oceans capture up to 70 percent of anthropogenic[20] CO_2 circulating in the global carbon cycle. 'Blue' carbon[21] is captured through intertidal and shallow water environments and by oceanic organisms. It is stored in biomass and sediments from mangroves, salt marshes, sea grasses and algae.

These coastal and oceanic ecosystems are more efficient than their terrestrial counterparts — around 200 times more productive than land plants with respect to their mass, and capable of sequestering up to five times the amount of carbon absorbed by tropical forests[22]. As a conservative estimate, the UK's seabed captures at least 10.5 million tonnes of CO_2 equivalent a year, with a value of £57.5bn — compared to £55bn captured by the UK's woodlands[23].

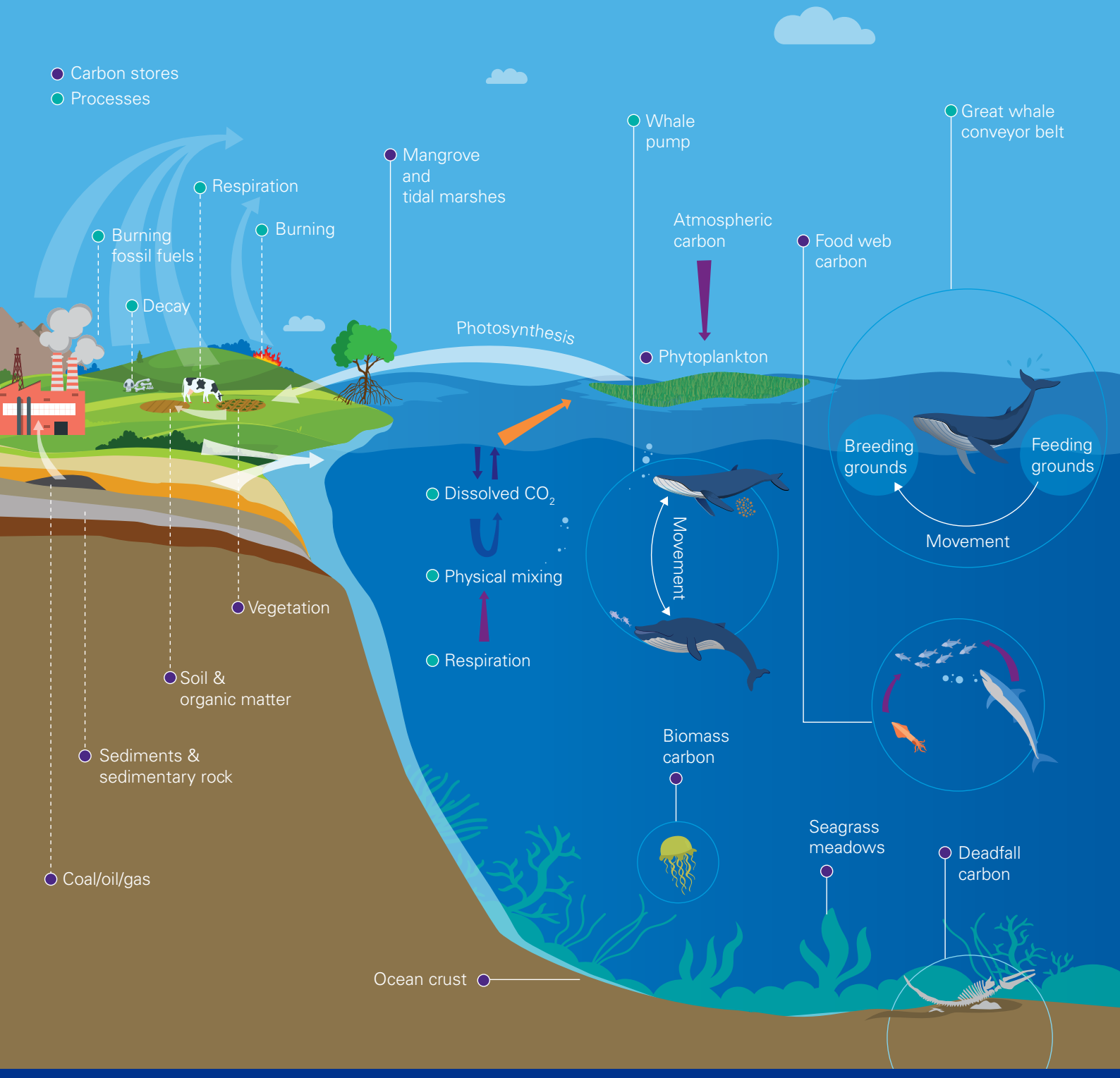
The biological sequestration process of the oceans is complex. For example, a great whale can accumulate 33 tonnes of carbon on average in their bodies over the course of their life — the equivalent of eight 100 year-old trees. But their contribution to the nutrient and nitrogen cycle is such that even a 1% increase in phytoplankton resulting from greater whale activity is estimated to capture additional carbon to the equivalent of 2 billion mature trees[24].

The ocean crust also offers significant potential for geological carbon storage. Though not all areas of the seabed could be used, scientists estimate that just the 200-mile economic zone of the US coastline is capable of storing thousands of years of current US CO_2 emissions[25].

Much like land, the capacity of the oceans to take on anthropogenic CO_2 is not limitless; it would take several hundred to several thousand years to absorb its full potential of 95% of CO_2 emissions to the atmosphere[26]. The rise in surface temperature is also threatening productivity due to increased stratification, with less exchange of nutrients from the ocean depth.

[18] 'Ocean heat uptake and the global surface temperature record' (2015) Imperial College London.
[19] 'Biogeochemistry' (2014) Treatise on Geochemistry; 'Marine Biogeochemistry' (2019) Encyclopaedia of Ocean Sciences.
[20] Anthropogenic means originating from human activity.
[21] CO_2 in particular is taken up by the ocean more effectively than other anthropogenic GHGs because of its solubility and reactivity. 'The Carbon Cycle and Atmospheric Carbon Dioxide' (2018) IPCC.
[22] FAO; Ocean Exploration and Research.
[23] ONS.
[24] A tree absorbs around 48lbs per year, so approximately 4.2 tonnes in total. 'Nature's Solution to Climate Change' (2019) IMF.
[25] 'CO_2 Hydrates could provide secondary safety factor in subsurface sequestration of CO_2' (2010) Journal of Environmental Science and Technology.
[26] With the adoption of the Paris Agreement, countries must prepare NDCs containing climate related targets, policies and measures in response to climate change.

Ocean Carbon Cycle



What's the problem?

The tragedy is all too common

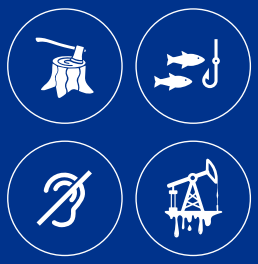
The 'tragedy of the commons' analogy used by ecologist Garrett Hardin can be aptly adapted to the blue economy. The oceans are a global 'common' resource. We are extracting more and more from the oceans (in an economically rational manner). Benefits accrue to the individual, business or government alone, while the 'costs' of these actions are shared collectively and can be 'invisible'. This leads to overconsumption — the shared cost of which could reach $428 billion annually by 2050[27].

Human activities threaten marine life, coastal habitats and biodiversity. This includes the impact of land-based practices: not just plastics, but excess nutrients from fertilizer, wastewater and fossil fuel burning lead to air, water, soil and marine pollution.

Most importantly, **the continued degradation of these resources risks reversing progress on the climate agenda.** The ocean stores approximately 50 times more carbon than the atmosphere[28]. When ocean and coastal ecosystems are damaged, they can release CO_2 trapped in the soil back into the atmosphere — a reversal of their role as carbon sinks. It is estimated that over two-thirds of mangrove coverage, over a third of tidal marshes and 29% of seagrass have been lost globally, with up to 980,000 hectares destroyed annually[29].

We are already experiencing the difficulties of managing the global common of the atmosphere in a more sustainable manner on a global scale. Unfortunately, the transition to a 'blue' ocean economy faces even more hurdles.Issues around ownership, accountability, visibility and development give rise to **four perceived 'trade-offs' in the use of its common resources.**

The impact of overconsumption



Overfishing, pollution, litter, deforestation, erosion, ship strikes, noise pollution, and the introduction of invasive species has led to:

Environmental changes: ocean acidification, warming, changes to major currents, and eutrophication.

Biodiversity loss: these changes affect marine species and ecosystems (like coral bleaching), which then lead to a loss of breeding grounds for fish and mammals, threatening food security.

Direct human impacts: increased prevalence of zooticd iseases, rising sea-levels, more extreme weather events, and loss of protection for coastal communities.

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"As the next industrial frontier after terrestrial resources are exhausted — while considering the absence of discrete governance frameworks in place to manage them — **blue economy resources are poised to raise geopolitical tensions as both environmental and economic interests in oceans grow."**

— Gerald Butts (Vice Chairman, Eurasia Group)

[27] WEF (2020).
[28] IPCC (2018).
[29] 'What is Blue Carbon (2021)' US National Oceanic and Atmospheric Administration.

#1 Ownership: National vs. Transnational

'Blue' geopolitics are only poised to become more important to individual nations and those collective bodies looking to balance access, advantage, and increasingly, the environment.

Interest in oceanic resources has increased as terrestrial resources have depleted. National marine jurisdictions (i.e. territorial seas plus Exclusive Economic Zones, or EEZs) can be larger than a country's land mass, containing an array of living and non-living resources. Jurisdiction over these resources can be geopolitically contentious — particularly where territory is disputed[30].

But nearly two-thirds of the oceans lie beyond national jurisdiction — representing 95% of the world's total habitat[31]. The 'law and order' of the oceans is enshrined in the UN Convention on the Law of the Sea (UNCLOS). Regulatory authorities (such as the International Seabed Authority [ISA] and International Maritime Organisation [IMO]) govern subsets of marine activities.

Meaning the blue economy is managed through a patchwork of international and state organizations. The policy response varies greatly from one country to the next, and across levels of government. Even within a nation, there may be a plethora of federal and local laws with overlap in some areas and an absence in others.

And **while more of the oceans fall under an established global governance structure than the atmosphere, this in itself poses a challenge with respect to compliance and enforcement.** For example, the ISA has legislative and enforcement jurisdiction, but no ships — it relies on sponsor nations to share this responsibility. The ISA intends to establish a staff of inspectors once DSM commences, but it will likely pale in comparison to terrestrial regulatory resources for the sector.

#2 Accountability: Developed vs. Developing

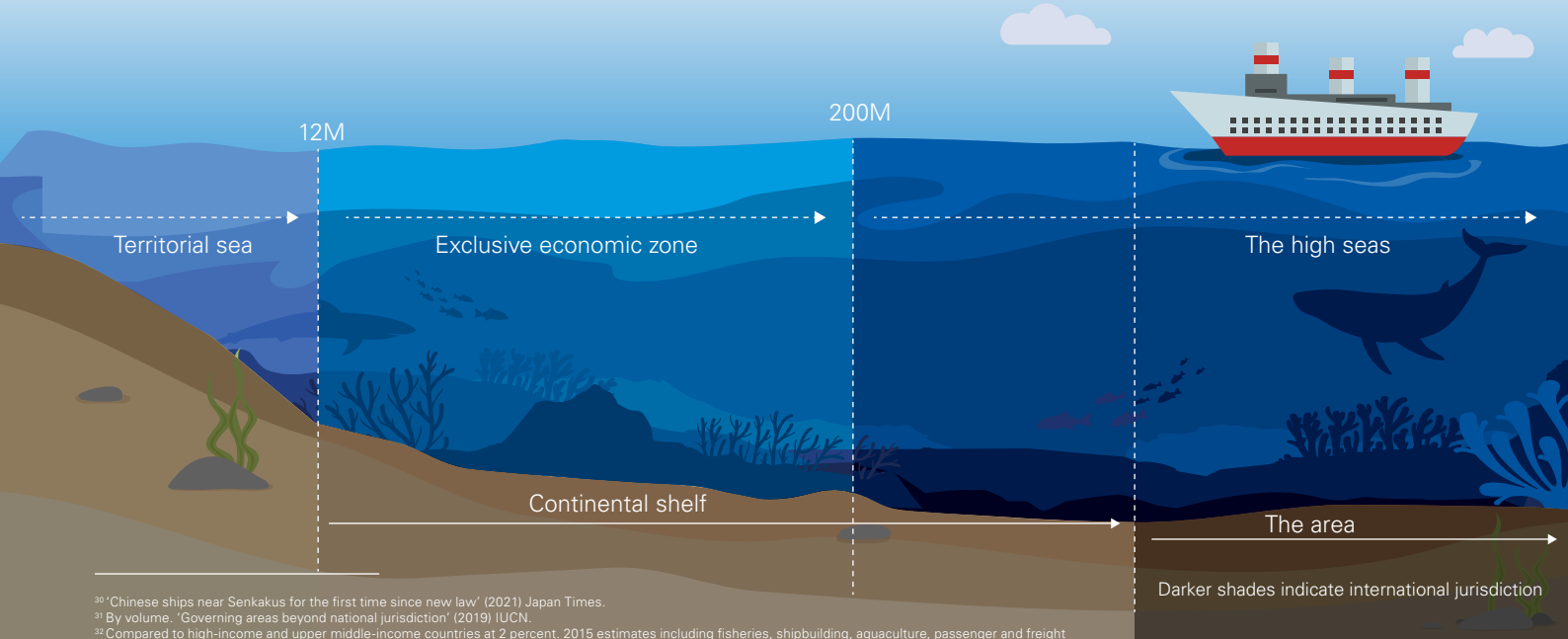
Lower income countries tend to rely more extensively on their natural assets to develop industries. Sovereign seas often outsize corresponding land mass for Small Island Developing States (SIDS) — like Tuvalu, where the EEZ is more than 26,000 times larger.

The relative contribution of the blue economy is therefore higher in coastal and island states with large ocean areas. Critically, ocean-based industries also account for a higher share of GDP across low-income (6%) and lower middle-income (11%) countries[32].

As a result, the externalities posed by unsustainable activities tend to hit developing markets the hardest - and **there is generally less incentive for developed nations to curb contributing terrestrial activities.** Coastal communities and nations that are reliant on the ocean for food and economic growth are the most affected — or 'pay the most' — for the impacts of pollution, overfishing and overdevelopment.

For many SIDS, the land-based impact of climate change will also begin with the oceans; it is anticipated that up to a billion people will be living in low-lying coastal zones by 2050[33]. These areas will bear some of the first and most drastic impacts of climate change given their sensitivity to rising sea levels and increases to ocean temperature and acidity — particularly those lacking appropriate infrastructure and safeguards.

The warming of the ocean is also causing more severe hurricanes and the intensification of El Niño events[34], which could disproportionately impact developing countries given their reliance on primary production.



[30] 'Chinese ships near Senkakus for the first time since new law' (2021) Japan Times.
[31] By volume. 'Governing areas beyond national jurisdiction' (2019) IUCN.
[32] Compared to high-income and upper middle-income countries at 2 percent. 2015 estimates including fisheries, shipbuilding, aquaculture, passenger and freight transport, and fish processing. 'Sustainable Ocean for All' (2020) OECD
[33] UN (2020).
[34] 'El Niño and Global Warming — What's the Connection' (2016) Earth Institute.

#3 Development: Economic vs. Environment

The sustainable management of the oceans can balance both economic and environmental priorities. For example, restoration has been shown to allow marine ecosystems to support more life and provide more food for coastal communities.

But like climate, achieving global consistency and momentum towards a sustainable ocean economy can be challenging due to the perceived economic cost. The oceans are often framed in two ostensibly competing ways — as areas of growth and development, or threatened and vulnerable spaces in need of protection.

Within national zones, the trade-off between potentially lucrative activities (such as offshore oil and gas exploration or DSM) and the extent to which they preclude other uses of marine resources (such as sustainable fisheries) is decided by each country.

Governments will 'pick winners' in ocean-based development plans. This will require a balanced approach to social equity, economic viability and environmental sustainability concerns. Some industries offer direct benefits at a smaller environmental and economic scale (ecotourism and aquaculture), while others offer greater benefits that can be exported to foreign investors (shipping and ports).

Economic considerations are likely to be given more weight in the wake of COVID-19, with tourism, fisheries, aquaculture and shipping heavily impacted. COVID-19 disproportionately harmed small-scale business, women, low-skilled, indigenous and younger workers — a profile applicable to many maritime industries[35].

That said, it is often 'terrestrial' economic interests that are prioritized. Only a small proportion of government stimulus was directed towards already-vulnerable coastal communities. And despite the widespread mantra to 'build back better', even less was focused on the transition towards a sustainable ocean economy[36].

#4 Visibility: Climate vs. Nature

The oceans are increasingly a source of natural capital for:

- **Renewable energy:** The housing and extraction of inexhaustible (wind, tidal, hydro, geothermal, wave and floating solar), living (biomethane) and non-living (hydrogen) sources of renewable energy. The energy demand of a net zero world will only be achievable through the use of blue assets; offshore wind capacity is forecast to become the leading power generation technology by 2030[37].
- **Renewable technologies:** Governments and companies are looking to secure the very beginning of the supply chain for solar panels (titanium), wind turbines (nickel, copper) and electric batteries (zinc, bromine, manganese, cobalt). Higher-grade deposits, rising commodity prices and geopolitical control over terrestrial sources may make the extraction of non-renewable critical minerals from the seabed an attractive proposition at face value.
- **Carbon capture and storage:** Countries are increasingly seeking to include the contribution from Nature-Based Solutions (NBS), including blue carbon sequestration, into their Nationally Determined Contributions (NDCs)[38].

Many of these activities are critical to achieving net zero ambitions, but arguably **less attention is being paid to the nature risks posed by these green technologies.**

Whereas living resources are dependent on environmental conditions, the exploitation of these non-living resources can cause pressure on marine ecosystems, without being dependent on their state of health. 'Green' renewable energy technologies can still cause environmental degradation: habitat loss, collisions, sound and electromagnetic pollution, sediment suspension, introduction of non-indigenous species and changes to migratory patterns.

Any resultant biodiversity loss can limit the carbon services provided by marine ecosystems — and potentially slow down or reverse progress towards climate change mitigation. On the flip side, these technologies offer a far smaller footprint compared to our historical reliance on fossil fuels. They can also be 'nature positive'; for example, wind farms provide biological 'stepping stones' that spread biodiversity along coastlines, or 'safe havens' for marine populations and the seabed floor to recover.

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As with any other industrial area, the political and policy response to emerging blue economy industries will tend to skew toward the prioritization of economic development over sustainability. But **a divergent path will develop — those developed, environmentally-orientated nations will likely limit an industrial boom, while lesser developed regions will look to harness what economic activity they can.** Tensions are likely to result, domestically and internationally, as these approaches result in inconsistent valuations — in terms of both economic and environmental factors — across a common resource.

[35] 'COVID-19 Crisis Will Deepen Gender Inequalities in the Seafood Sector' (2020) Seafood Source.
[36] 'A Sustainable and Equitable Blue Recovery to the COVID-19 Crisis' (2020) A Sustainable Ocean Economy; 'Using the Ocean as a Tool for Global Economic Recovery' (2020) WRI.
[37] IRENA (2016).
[38] With the adoption of the Paris Agreement, countries must prepare NDCs containing climate related targets, policies and measures in response to climate change.

How will the Blue Economy change the way you do business?

Blue is the new Green

The future of the net zero agenda rests on its potential, yet we know more about space than we do about our oceans. The mere 5%[39] of the oceans that we have explored has uncovered an array of precious resources, from the largest animals on earth which feed on some of the smallest, to the towering mountain ranges, deep-sea waterfalls and underwater volcanos that create both life and critical metals.

The oceans support a greater variety of biological life than on land, but also sustain livelihoods. Traditional maritime sectors such as fishing, international trade and tourism are now expanding to include new sources of minerals, energy and biological compounds. The oceans have become a very real (and growing) economy — but to last, it must be **one based on green principles of decoupling economic activity from environmental and ecosystem degradation.**

To achieve this, the continued exploration, exploitation and excavation of the oceans needs to be revalued in our global economy. The actions of governments at a national and multilateral level will be critical in establishing the appropriate policies and market structures to facilitate the transition towards a blue economy. Private investment, activities and projects across the value chain that contribute to a blue economy should be rewarded, whilst the development of emerging technologies that support ocean health should be incentivized.

But **the purpose of this report is to mobilize the power of the private sector:** to map out the role that business leaders can play (and the growth opportunities that can be found) in the 'blue' component of the green agenda. Critically, these contributions go beyond traditional maritime industries to land-based sectors that are reliant on (or impact) the blue economy — but perhaps don't realize it yet.

There are actions that investors and corporates can take along the full spectrum of 'ESG'-compliance. 'Learners' will need to make the minimum, but important incremental change towards sustainability to create 'safe space' to operate in the blue economy. 'Leaders' will gain first-mover advantage in defining comprehensive sustainable management models that address the full scale of risks and opportunities inherent in the blue economy.

Sectors that...

Rely on the oceans for business…

Traditional maritime sectors have largely been left out of the spotlight of net zero ambitions to date. But as investor pressure and momentum towards a blue transition grows, these industries will increasingly be expected to 'pull their weight' as part of the decarbonization and broader ESG agenda.

Oceans are changing the way they do business…

'Terrestrial' companies are already under pressure to consider net zero pathways, and many have taken steps in this direction. But as these industries expand into the maritime arena, companies should expect to be part of an emerging conversation around nature risks and the (unknown) biodiversity impact of their activities.

Rely on the oceans, but may not know it…

As the consequences of ocean degradation become more well-known, a broad range of terrestrial industries will need to reassess their impact along the interlinked land and ocean value chain, and revalue the environmental services that oceans provide.

[39] 'Why does so much of the ocean remain unexplored and unprotected?' (2020) Oceana.

If you rely on the oceans for your business…


FISHING


PORTS


SHIPPING


TOURISM


AQUACULTURE

Coastal urbanization, as well as growth in populations and related consumption, has fueled the development of the 'traditional' ocean economy. Marine and coastal regions will likely continue to experience an uptick in investment in tourism and infrastructure (including climate-defensive) as global migration to the coastal cities continues.

Traditional maritime industries, particularly fisheries and maritime transport, are highly energy-intensive. Although the IMO has set a 50% decarbonization target by 2050, shipping was absent from the Paris Climate Agreement, and no country addressed the decarbonization of the industry in their national climate plans. There is even some indication that efforts by the IMO to reduce air pollution may have had the unintended consequence of increasing black carbon emissions, which can accelerate melting in the Arctic[40].

Ocean transport accounts for 2.9 percent of global GHG emissions. This could climb to 10% with a near tripling of maritime trade volumes by 2050[41].

These industries also pose nature-related risks — from the overexploitation of living resources, to oil spills and other impacts from the heightened incidence of climate events (with a 46% rise in weather-related maritime disasters since 2000[42]).

Of first and foremost priority is the blue transition of the traditional ocean economy. It is widely expected that companies operating in the oceans will begin to receive significantly more scrutiny around their environmental, social and governance practices, supply chain and performance from investors and the wider stakeholder community.

Traditional maritime sectors will need to undergo a radical transformation to 'qualify' as part of the blue economy — without limiting the equally important socioeconomic development of coastal and island developing nations.

Whilst some areas will be set aside strictly for conservation — in pursuit of the 30% by 2030 global target[43] - more sustainable and regenerative practices will be required for maritime activities. Alongside slower transnational regulatory measures, indirect pressure from both investors and developed countries will push these industries and related supply chains to become resource:

- **Efficient:** The decarbonization challenges faced by maritime sectors are those faced by terrestrial industries — mainly, the technological adaptation of new and existing assets to allow for low or zero-emission fuels or more efficient energy use[44]. This can also be partially achieved through operational improvements, such as data sharing between parties along the supply chain.

- **Sustainable:** The 'S' and 'G' of ESG will also come under increasing scrutiny for these industries, as the interests of the most vulnerable (such as small-scale artisanal fishers) are often marginalized for more visible sectors.

As a Learner:

01 **Strategy:** Operate on a 'do no harm' principle — or as close to it as possible — or risk being screened out by consumers and investors. In the shipping industry, over 20 financial institutions (or 50% of the global ship finance portfolio) have signed up to principles that promote climate-related disclosures. Investor engagement will also become more common: a global pension fund has provided guidance to investee companies on ocean sustainability and blue investments[45].

These industries will also be exposed to new regulatory measures (such as the potential expansion of the EU's Emissions Trading System to the maritime sector).

02 **Reporting:** The basic expectation will be for medium to large-scale maritime companies to set measurable goals, aligned to science-based targets where possible, set out in a clear decarbonization pathway. Climate-related financial disclosures and broader ESG metrics will be expected to allow for comparable assessment and communication on ESG performance.

[40] 'IMO under pressure to regulate new ship fuels over Arctic warning' (2020) Climate Home News; 'Green groups dismayed as IMO sidesteps Arctic black carbon limits' (2021) Lloyds.
[41] 2018 figures. 'Fourth Greenhouse Gas Study' (2020) IMO; 'Transport Outlook' (2019) International Transport Forum.
[42] 'Marine insurance sector faces turbulence from climate change' (2020) Standard P&I Club.
[43] Set by the Global Ocean Alliance and applying to both national and international waters. The UK is also seeking the final agreement of a new Treaty under UNCLOS to enable the latter.
[44] UNEP (2021).
[45] 'Investors and the Blue Economy' (2020) Credit Suisse.

As a Leader:

03 **Climate valuation:** Develop enhanced climate risk modeling to identify various intensities of Intergovernmental Panel on Climate Change (IPCC) scenarios on weather patterns, and the resulting impact on the sector[46]. The quantification of physical and transition risks should be integrated into relevant business processes, including strategy, risk management, and investment decisions.

04 **Circular business model:** This could then improve the business case for the adoption of circular economy principles, to transform business practices in 'resource positive' ways.

In identifying circular and regenerative business models, the preservation of ocean resources should be a primary focus — but these models can also secure future revenue streams.

As a simple example, aquaponics is a growing industry that combines fish farming and hydroponics, using the wastewater of farmed fish as fertilizer for crops. Alongside social and environmental advantages such as low and recirculated water usage and increased food stock, the practice generates dual (higher) revenue. Adopting a planetary-wide view, this practice also confers terrestrial benefits — as usable land for crops declines, aquaponics offers a self-sufficient, sustainable alternative to hydroponics.

In the case of shipping, the 'circular' prevention of waste should focus on the end-of-life process of ship dismantling. The preservation of material use and value will prevent direct contamination of water sources, and under appropriate regulation, should also reduce health and safety fatalities in local regions. Using circular metrics to track reuse of shipping material is an ambitious and leading initiative that promotes a circular economy, not just in shipping but across all sectors.

05 **Supply chain resilience:** Be prepared for 'terrestrial' multinationals to utilize their supply chain relationships to influence downstream (ports and shipping) or support upstream (small-scale fisheries) industries.

As 'blue' businesses face increasingly codified marine sustainability standards, indirect businesses further along the supply chain will likely conduct an internal review as part of achieving a 'blue' resilient supply chain. For example, a large supermarket chain (the UK's biggest fishmonger) has a sourcing policy requiring 100% certified sustainable sources.

Therea ren'tp lentym oref ishi nt he sea

Oceans area critical componento ft he global food system: billionso fp eoplew orldwide rely on wild-caughta nd farmed seafooda st heir main source of animal protein, buta round3 0% of fish stocks areo verexploited,d epletedo rr ecovering, with af urther 57% fullye xploited[47].

If manageda ppropriately,t he oceans could contribute to more than tw o-thirds of edible meat required to feed thep rojected global population (10bnb y2 050)[48].A roundh alfo ft he world'sf isha nd seafoodc onsumption alreadyd erives from aquaculture, much of whichi ss ustainable andc an be replicated with ther ight investment.

Thesec ompanies will increasingly face competitionf roma lternative seafoodp roviders,w itht he development of bothp lant ands tem-cell basedp roductsf or humanc onsumption.

[46] Including related industries, such as insurance.
[47] FAO (2016).
[48] 'The Future of Food from the Sea' (2019) High Level Panel for A Sustainable Ocean Economy.

If oceans are changing the way you do business…

RENEWABLE ENERGY

DEEP-SEA MINING

BIOTECHNOLOGY

WASTE MANAGEMENT

Demand for new sources of minerals, energy and biological compounds has driven 'terrestrial' industries into the maritime arena. Off-shore renewable energy is increasingly competitive with fossil fuel resources, while marine invertebrates produce more antibiotic, anti-cancer, and anti-inflammatory substances than any group of land-based organisms[49]. These industries are of increasing interest to small coastal and island nations, given the potential for job creation, local value chains, and linkages to other blue economy industries.

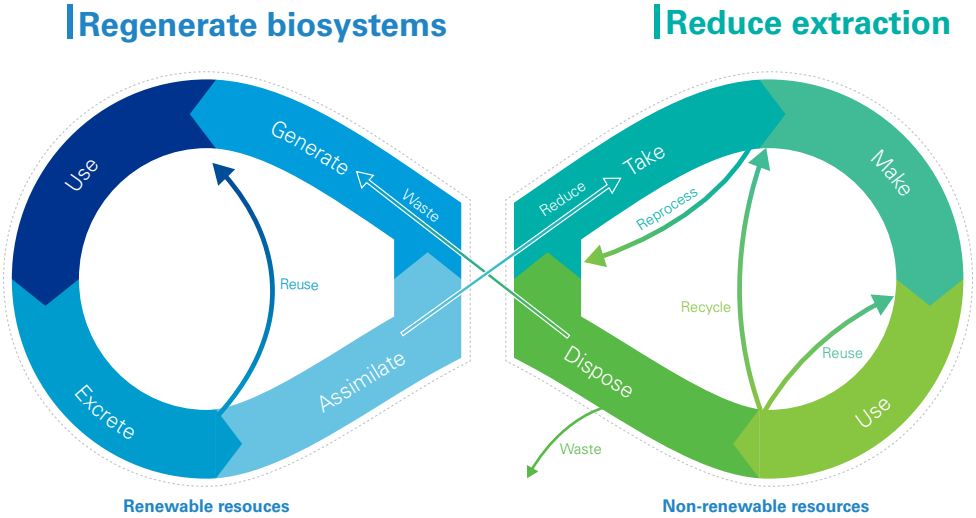
In some cases, these industries will enable the green transition for other sectors, both oceanic and terrestrial. Scaling renewable energy is one of the best available solutions to help corporates decarbonize. This can only happen through a marked increase in off-shore wind and solar generation, due to various capacity constraints with on-shore solutions. The rapidly maturing floating offshore wind sector could exponentially increase renewable generation as it enables projects much further from shore, while off-the-grid 'islanded hydrogen' could scale up the production of green hydrogen for industrial applications[50].

These sectors have already been exposed to investor and governmental pressure to decarbonize. Notwithstanding implementation challenges, many companies have started down the net zero pathway.

But it is the emerging conversation around the importance of biodiversity that may matter more. There is an increasing expectation that the energy transition preserves biological diversity alongside its equally important climate protection mandate.

When it comes to the ocean, that (biodiversity) cost is often unknown or uncertain. Some of the world's largest companies have already indicated that deep-sea mined minerals will be excluded from their supply chains, until it is "clearly demonstrated that such activities can be managed in a way that ensures the effective protection of the marine environment"[51]. Similarly, in 2016, conservation advocates in Germany attempted to block the construction of a port that would be used to ship turbines for offshore wind, on the grounds of the potential threat to mudflat and marshland habitats[52].

The circular use of oceanic resources



Oceans are a self-contained biosphere — but oceanic waste and non-waste inputs to remain a critical input to the terrestrial economy. In order to become sustainable, the disruption to this natural balance should be governed by three key principles:

- Reduce extraction of non-renewable resources through the redesign, reuse, reprocess, recycle of end products.
- Regenerate living resources by providing the required inputs for the biocycle.
- Minimize terrestrial waste entering the biological ocean cycle.

[49] 'Do medicines come from the sea?' (2021) Ocean Exploration and Research.
[50] Islanded hydrogen is a production system whereby 'off-grid' offshore wind powers the electrolysis process directly.
[51] 'BMW, Volvo and Google vow to exclude use of ocean-mined metals' (2021) FT.
[52] 'Germany's 'Energiewende' clashes with conservation' (2016) DW;

As a Learner:

01 **Circular business model:** When it comes to clean tech, a sole reliance on the continued extraction of mined metals (deep sea or otherwise) is not a long-term viable option. Given the remaining uncertainty around biodiversity impacts associated with some of these activities, companies need to go beyond low-carbon models and minimize their environmental impact more broadly by employing circular economy principles.

New models of ownership of the metals will incentivize recycle and reuse upon decommissioning of old products. Clean tech companies could work with resource producers to 'lease' metals, allowing for reuse in new products.

For example, an alternate ownership model could incentivize the redesign of wind turbines to enhance their recovery potential. This would reduce the need for virgin metal extraction, and generate a new long term annuity revenue stream for the owner — whilst supporting both climate and nature-related goals.

02 **R&D:** Invest the necessary resources to develop the (independently verifiable) research, 'green' best practices and technological development that support these 'blue' business activities. Greater transparency over potential social and environmental impacts for these activities will be required to attract ESG-friendly investors and consumers — particularly for those less optically associated with the green transition.

03 **'Green' innovation:** Technology is transforming and expanding the industries operating in the marine arena — from underwater data centres and ocean thermal energy, to autonomous ships[53].

At a minimum, R&D should consider the biodiversity and ecosystem-wide impacts of these business activities, but could also extend to new technologies (and industries) that could minimize climate and nature-related impacts through oceanic resources. For example, there may be some symbiosis in technologies developed for DSM, for application in deep-sea carbon capture and storage.

As a Leader:

04 **Financing & partnerships:** Many of these subsectors are 'high risk, high reward' given the high costs of capital associated with their development. But given the centrality of the blue economy to the green agenda, there is significant potential to partner with government to support their development. For example, the EU Commission launched a joint private-public process to analyze market failures for ocean energy, and ultimately develop a strategic roadmap for investment support, standards and risk-based public authorization processes.

05 **Reporting:** The Taskforce for Climate-related Financial Disclosures (TCFD) made it widely accepted that climate-related impacts on a company can be material — and critically, the reverse. A concept known as 'double materiality' argues that the impact of a company on ESG issues is also material and therefore reportable (a concept known as 'double materiality').

The next step to climate-related financial disclosures will be nature-related financial disclosures, including an assessment of supply and value chain impacts. The Taskforce on Nature-related Financial Disclosures (TNFD) will officially launch in mid-2021, and will provide a 'double materiality' case for biodiversity and natural capital to financial institutions, asset owners and insurers.

[53] '12 robots that could make (or break) the oceans' (2016) WEF.

If you rely on the oceans, but may not know it…

AGRICULTURE | TRANSPORTATION | INDUSTRIAL MANUFACTURING | FINANCIAL SERVICES | INFRASTRUCTURE

Sectors with global (maritime-transported) supply chains, high-carbon industries, as well as terrestrial sources of marine threats (such as agriculture) are exposed to this blue-green agenda. Ocean and land-based economies are inherently interlinked, and a transition to a blue economy requires recognition and valuation of the non-market environmental services that the oceans provide.

Land-based sources account for approximately 80% of marine pollution globally[54].

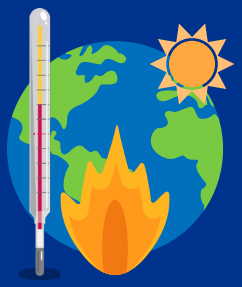
Blue Carbon

Despite their potential, only a few countries currently include these ecosystems in national GHG inventories and NDC targets[55]. While there are some pilot projects taking place, standards for blue carbon have not yet been fully developed — although the recently formed International Blue Carbon Partnership has developed guidance for international and national policy making, including the financing of blue carbon projects.

Blue Finance

The issue of mobilization of finance is central to the transition towards a blue economy. There has been a rise in innovative 'blue' financing solutions[56], that better enable 'terrestrial business' involvement. For example, 'blue' bonds follow in design principles of 'green' social or sustainability bonds with the funds raised used for specific purposes, such as ocean preservation, sustainable fishing or waste management.

To date, they have tended to be more complex than their green counterparts, targeting the SDGs rather than simply the natural environment. For example, in 2018, the Seychelles issued the first sovereign blue bond worth USD$15m to fund the implementation of a fisheries management plan to develop semi-industrial and artisanal fisheries.



The oceans are heating up

The Sustainable Blue Economy Finance Principles promote the implementation of SDG 14 (Life Below Water), and set out ocean-specific standards, allowing banks, insurers and investors to mainstream sustainability of ocean-based sectors.

A 2020 Credit Suisse survey around investor awareness and interest in the blue economy found that:

75% had not assessed their portfolios for their impact on the ocean

31% of asset owners do not address the blue economy in their current investments

90% were interested in investments related to the blue economy.

With the support of private funders, the country then converted USD$21.6m of national debt under the world's first 'debt-to-conservation' swap aimed at ocean conservation and climate resiliency. This created the second largest Marine Protected Area in the West Indian Ocean, alongside the development of a marine management plan and a permanent endowment to sustain climate adaptation and marine conservation activities[57].

> "Oceans will play a critical role in the journey to one planet living. There can be no bystanders. **Just like some will work with the rainforests, cities and farmers, others will need to work with the sea** — channelling its energy down wires and pipes, growing sustainable food, and capturing carbon naturally. There is a lot to do."
>
> — Sam Roch-Perks, CEO, Simply Blue Group

[54] UNESCO (2016).
[55] 'Four ocean-based solutions to advance climate action through NDCs' (2021) WRI.
[56] The UN-convened Sustainable Blue Economy Finance Initiative and Climate Bond Initiative have released a set of certifiable standards and finance principles that provide a framework for investment in the ocean economy.
[57] 'Case Study: Innovative Financing — Debt for Conservation Swap, Seychelles' Conservation and Climate Adaptation Trust and the Blue Bonds Plan, Seychelles (on-going)' (2021) The Commonwealth Blue Charter.

As a Learner:

01 **Reputation management:** Businesses are increasingly expected to 'internalize the externality': to address nature-related impacts of their activities, including on the ocean economy.

In many markets, regulatory compliance (even with environmental standards) is no longer seen to be sufficient. Social opinion is dictated not by what is 'legal', but by what is 'right'.

As awareness of the importance (and continued degradation) of the blue economy grows, there will be a spotlight on the downstream (oceanic) effects of (terrestrial) business activities. The next 'plastic straw' might be agricultural run-offs, which exacerbate algal blooms and destabilize food web dynamics.

Businesses need a better understanding of where they sit in the ecological value chain, or risk being caught out in a #boycott. Transparency (i.e. better impact disclosures) will be key, not just for companies, but also for investors that can apply tools, such as the Sustainable Investment Framework Navigator[58], to manage the impact of their investment portfolios.

02 **Climate risk management:** Continued degradation of the oceans risks reversing progress towards net zero — exacerbating the physical risks associated with climate change, including the likelihood of weather events causing transportation and business disruption.

A better understanding of the role of the ocean economy within the climate change context should enhance business analysis of the potential financial and operational impact under various climate scenarios.

As a Leader:

03 **Market valuation:** There are significant opportunities to partner with government to 'make nature's values visible'[59] — to create a level economic (and regulatory) playing field that incentivizes the blue transition, and the restoration and protection of blue carbon ecosystems.

For example, in the establishment of a 'blue carbon' market, alongside the forest carbon market[60]. Regulated and voluntary environmental markets can smooth out any perceived tensions between economic and environmental considerations by providing monetary incentives for conservation management activities. If the value of the ocean's carbon sequestration services were quantified, 'blue carbon' could be traded and payments distributed to communities involved in conserving and regenerating these habitats. This has the potential to become a critical source of 'genuine' carbon offsets (i.e. a source of real emissions reductions), as the practice comes under heightened scrutiny[61].

04 **'Social' pricing:** Leading companies could also integrate internal valuations of blue natural resources into their investment frameworks. This would reflect the value of nature-based conservation, or the cost of the damage to society and the ecosystem — effectively internalizing the externality[62]. For example, the value of a live whale has been estimated at USD$2m — capturing not only its carbon capture services, but also ecotourism and fisheries enhancement.

Similar to internal carbon pricing (or a 'social cost of carbon') or the quantification of climate risk, the use of internal valuation and pricing mechanisms is based on behavioural economic principles, to guide more effective investment decision-making.

It is time for all businesses to help unlock the power of the oceans to achieve the green agenda.

If we haven't convinced you yet, time to conclude with some simple, powerful facts:

Seagrass only occupies 0.1% of the ocean's surface but stores up to 18% of the carbon sequestered by the ocean — twice the amount of carbon per hectare as terrestrial soils[63].

If macro-algal forests covered 9% of the world's ocean surface, it would have the theoretical potential to **absorb up to 53bn tonnes of CO_2 annually** — more than what we are currently releasing each year.

It would also produce enough biomethane to **cover all of today's needs in fossil fuel energy**[64].

The technology required for seaweed farming already exists at a small scale.

[58] The Sustainable Investment Framework Navigator.
[59] The Economics of Ecosystems and Biodiversity (TEEB) initiative.
[60] A voluntary carbon market underpinned by the Reducing Emissions from Deforestation and Forest Degradation (REDD) program.
[61] 'Rush for carbon credits spurs surge in power company schemes' (2021) FT.
[62] There are a wide range of methods to do this that capture the amenity value, intrinsic value or use value of nature's services. The Dasgupta Review (2021).
[63] 'A blueprint for blue carbon: toward an improved understanding of the role of vegetated coastal habitats in sequestering CO_2' (2011) Frontiers in Ecology and the Environment.
[64] 'Negative carbon via ocean afforestation' (2012) Process Safety and Environmental Protection; 'Global Carbon Budget' (2020) Global Carbon Project.

How KPMG can help

KPMG firms have deep experience in supporting organizations to establish their blue economy strategy. KPMG professionals can help organizations integrate blue economy considerations within their corporate and climate strategies. We assist organizations with identifying and accessing funding for blue economy related investments and projects, aligning and reporting against the evolving TNFD, supporting and developing energy transition to integrate blue energy sources, and supporting ways to protect and promote the social aspects of the blue economy. Our coastal and marine sector specific service offering provides expertise in climate scenario planning and assessment with additional focus on the management of fresh-water assets and infrastructure. This includes additional support with the planning and collection, monitoring, and interpretation of water use using propriety data analytics.

About the KPMG and Eurasia Group Alliance

KPMG International has formed an alliance with Eurasia Group, one of the world's leading global political risk research and consulting firms, to develop solutions that help businesses deal with geopolitical challenges. Through our alliance, KPMG professionals can bring the political insights of Eurasia Group's analysts across 100+ countries and territories together with KPMG firms' nuts and bolts understanding of your business covering the macro to the most granular of analysis.

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