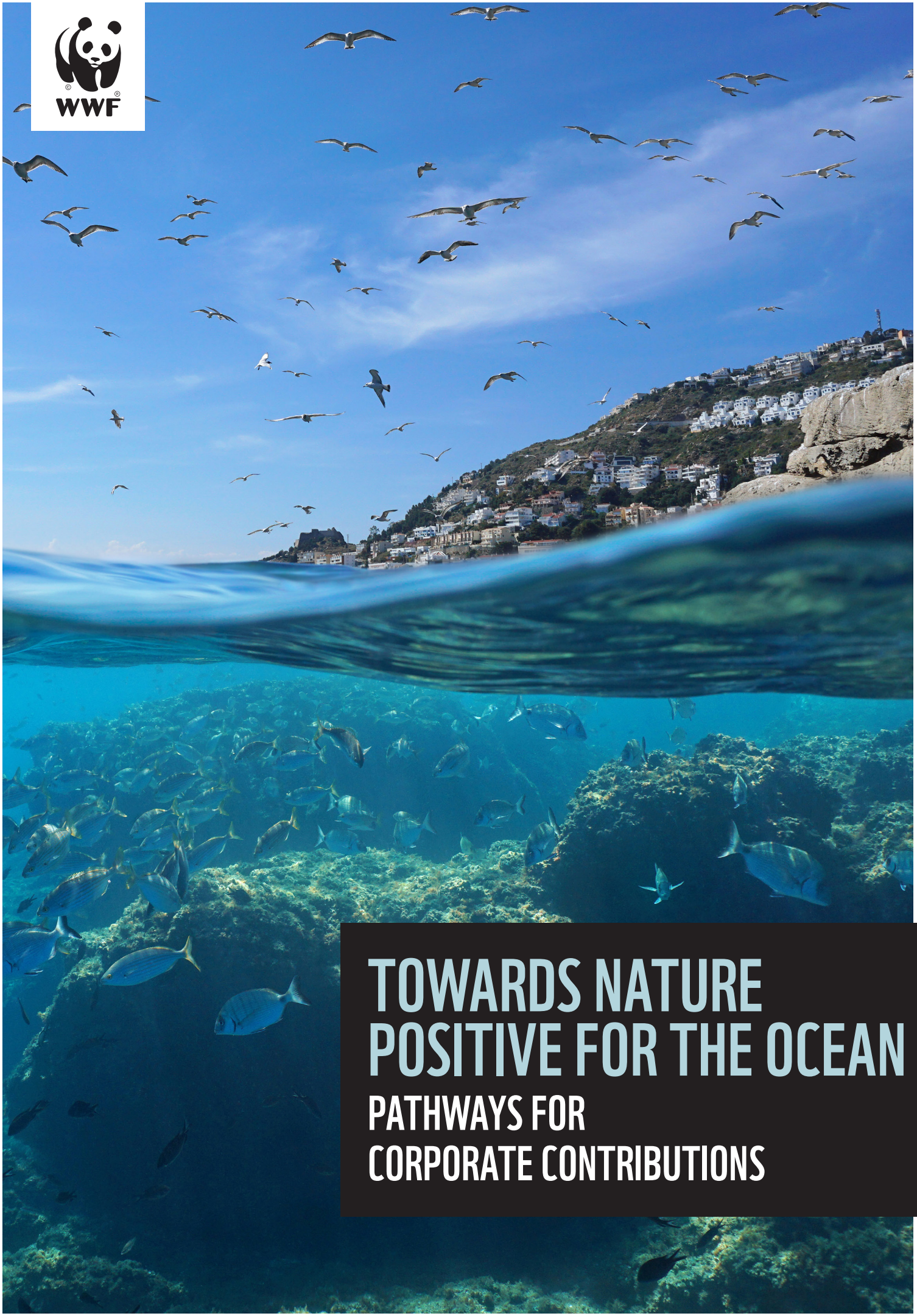

TOWARDS NATURE POSITIVE FOR THE OCEAN

PATHWAYS FOR CORPORATE CONTRIBUTIONS

ACKNOWLEDGEMENTS

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Workshop support: Morgan Housden (WWF-US) and Global Impact Collective.

Private sector consultations: We held bilateral meetings with nine companies operating in the offshore wind, shipping, and coastal and marine tourism sectors to obtain industry feedback on the framework and recommendations.

Production and design: Evan Jeffries and Catherine Perry – swim2birds.co.uk

Published in June 2025 by WWF – World Wildlife Fund

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Please cite this report as: WWF (2025). Towards Nature Positive for the Ocean: Pathways for Corporate Contributions. 10.5281/zenodo.15587372.

This report is funded by Ørsted through a partnership with WWF Denmark and in-kind and funded contributions from WWF-US.

About WWF
World Wildlife Fund (WWF) is one of the world's largest and most respected independent conservation organizations. WWF's mission is to stop the degradation of the earth's natural environment and to build a future in which humans live in harmony with nature. Our WWF-US Oceans team takes a science-based approach to encourage credible contributions to a nature-positive future for the ocean. We develop, recommend, and assess tools, frameworks, and guidance for companies, financial institutions, and policymakers, and collaborate across disciplines and sectors. For more information, see our website: https://www.worldwildlife.org/pages/science-for-a-nature-positive-future-for-the-ocean

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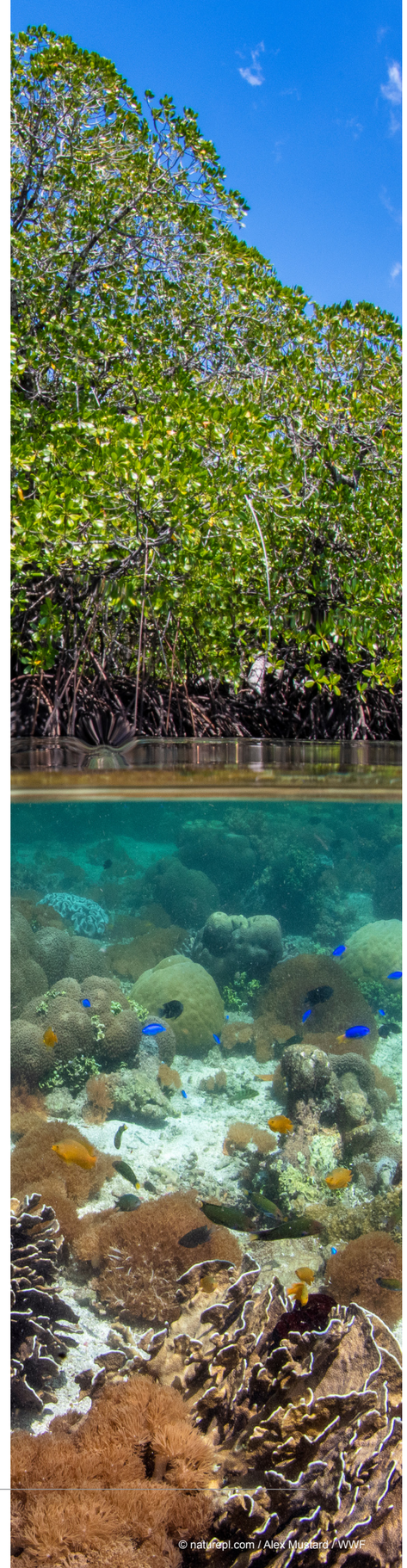

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FOREWORD

Johan Bergenas
Senior Vice President, Oceans, WWF-US

We are now at the midpoint of the UN Decade of Ocean Science for Sustainable Development—a moment that demands both reflection and renewed urgency. As global leaders gather at the United Nations Ocean Conference in Nice, it is clear that the choices we make in the next five years will determine the long-term health of our ocean and the viability of the blue economy that depends on it.

The ocean is an economic powerhouse, providing goods and services valued at over US$24 trillion. And there are inextricable links between the ocean's health and our society's security – for our food, energy, health, and climate resilience – ensuring stability, prosperity, and peace.

But this vast value is under threat. Years of mismanagement and environmental decline have placed ocean ecosystems on a dangerous trajectory. Without decisive action, we stand to lose as much as US$8.4 trillion in economic value in the coming decade. More than two-thirds of publicly listed companies are already exposed—directly or indirectly—to ocean-related risks, from declining fisheries and shifting regulations to reputational fallout from environmental harm.

However, we are also at a moment of immense opportunity. Transitioning toward a nature-positive future—one where we halt and reverse nature loss by 2030—could unlock up to US$10 trillion in new economic value. Ocean-dependent sectors such as offshore wind, coastal and marine tourism, shipping, and seafood must be at the forefront of this transformation.

And yet, the ocean is often overlooked in the broader nature-positive agenda. This report, *Towards Nature Positive for the Ocean*, seeks to change that. Developed by and with leading scientists and thought leaders, with substantial contributions from companies and financial institutions, this report offers practical, evidence-based guidance to help businesses operating in the ocean economy chart credible pathways toward nature-positive outcomes. It makes recommendations within the context of the ocean's unique physical scale, governance complexity, and persistent data gaps—offering tailored actions for companies across key ocean sectors.

The report's message is clear: we must move beyond business-as-usual. Incremental progress will no longer suffice. To bend the curve of ocean decline toward positive outcomes, companies must embed nature into their core strategies—setting bold company-wide biodiversity goals, integrating action on nature, and aligning governance, investment, and innovation with the restoration of ocean ecosystems.

Just as importantly, businesses must look beyond their immediate operations. This means advocating for stronger environmental policies, contributing to research and data collection and sharing, and taking a "seascape approach"—working collaboratively with local communities, governments, and civil society in the places they operate or source from.

This is not just an environmental imperative—it is a business imperative. The health of the ocean underpins global economic stability, social resilience, and climate action. If we fail to act, we all bear the cost. But if we act boldly, we can unlock a future that is nature-positive, climate-resilient, and prosperous for all.

This report forms the backbone of a large body of work that WWF and its partners intend to drive forward in partnership with the private sector operating in the space of marine renewables, shipping, coastal development, and seafood. We are actively engaging with companies to inform approaches to contributing to nature positive through transforming their practices and broader systems, and we welcome the opportunity to partner with additional industry and financial institutions.

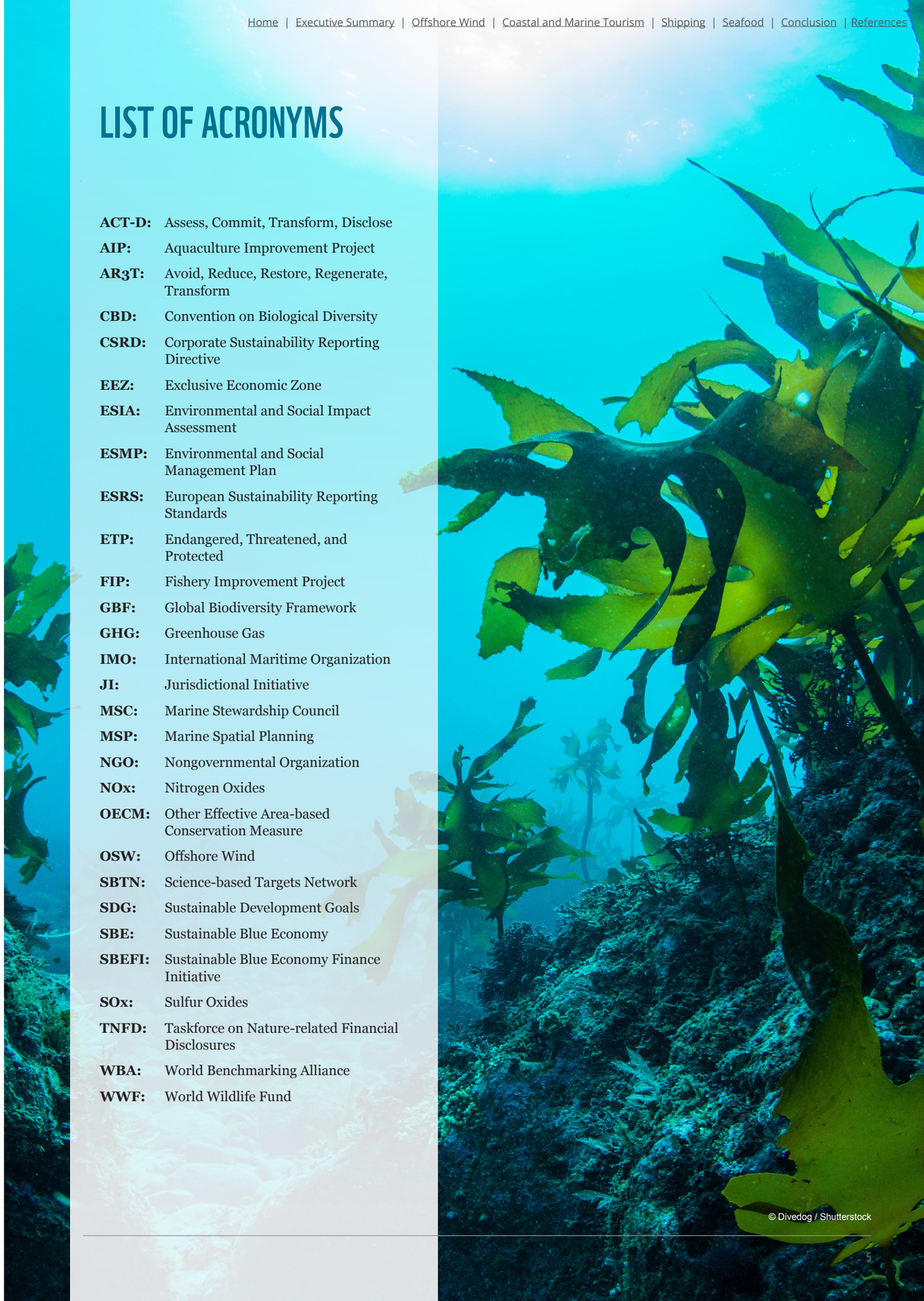
The private sector has a once-in-a-generation opportunity to lead this transformation. The time for incrementalism is over. The time for decisive, collective action is now.

When the oceans thrive, the planet regains its natural strength, people can flourish, societies are prosperous, and the world is more peaceful.

Johan Bergenas

LIST OF ACRONYMS

ACT-D:	Assess, Commit, Transform, Disclose
AIP:	Aquaculture Improvement Project
AR3T:	Avoid, Reduce, Restore, Regenerate, Transform
CBD:	Convention on Biological Diversity
CSRD:	Corporate Sustainability Reporting Directive
EEZ:	Exclusive Economic Zone
ESIA:	Environmental and Social Impact Assessment
ESMP:	Environmental and Social Management Plan
ESRS:	European Sustainability Reporting Standards
ETP:	Endangered, Threatened, and Protected
FIP:	Fishery Improvement Project
GBF:	Global Biodiversity Framework
GHG:	Greenhouse Gas
IMO:	International Maritime Organization
JI:	Jurisdictional Initiative
MSC:	Marine Stewardship Council
MSP:	Marine Spatial Planning
NGO:	Nongovernmental Organization
NOx:	Nitrogen Oxides
OECM:	Other Effective Area-based Conservation Measure
OSW:	Offshore Wind
SBTN:	Science-based Targets Network
SDG:	Sustainable Development Goals
SBE:	Sustainable Blue Economy
SBEFI:	Sustainable Blue Economy Finance Initiative
SOx:	Sulfur Oxides
TNFD:	Taskforce on Nature-related Financial Disclosures
WBA:	World Benchmarking Alliance
WWF:	World Wildlife Fund



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EXECUTIVE SUMMARY

The world faces a **triple challenge**: halting and reversing biodiversity loss, mitigating and adapting to climate change, and addressing economic inequality. A **healthy ocean** is an essential part of the solution; it is home to the majority of life on Earth, is one of the world's greatest allies against climate change,[1] and is an engine of economic productivity. Yet the health of our ocean today is in **steep decline** in large part due to unsustainable industrial activity, and we are edging closer to dangerous tipping points. This poses **immense risks**—to people, planet, and to our collective prosperity and peace. **Recovery of the ocean is possible if we act now - and companies have a key role to play in contributing to a nature-positive future.**

At this mid-point in the UN Ocean Decade, we are at a critical juncture. Successfully addressing the triple challenge is possible, but it will require concerted and collaborative action by all actors—governments, academics, financial institutions, companies, communities, and individuals—at both the local and global level. In our ocean and on its coasts, this will require a transition away from business-as-usual activities that negatively impact ocean health, and towards a resilient, inclusive and sustainable blue economy that restores and regenerates the environment upon which we all depend.

Fortunately, progress in this direction is underway, and a new and ambitious concept is further mobilizing action. Nature positive is a unifying global goal and call to action that serves as a foundation for a better future. Achieving the nature-positive goal is not only possible, but is necessary to ensure that major environmental, social and business risks are avoided and that benefits for people and nature can be fully realized.

To make this happen in the ocean, we must account for the marine environment's unique biophysical properties, its particular legal and policy landscape and the still notable gaps in our knowledge about it, not to mention the sheer size of the ocean and the practical challenges this poses for measurement, monitoring and restoration efforts at scale.

Within this context, this report is designed to support **companies** operating in marine and coastal areas to develop credible plans to contribute to the nature-positive global goal. Specifically, our recommendations focus on

A More specifically, by 2030 biodiversity loss is halted and reversed, with nature visibly and measurably on the path to recovery on a 2020 baseline; by 2050, nature must recover so that thriving, high-integrity ecosystems and nature-based solutions support future generations and the diversity of life (Nature Positive Initiative 2023).

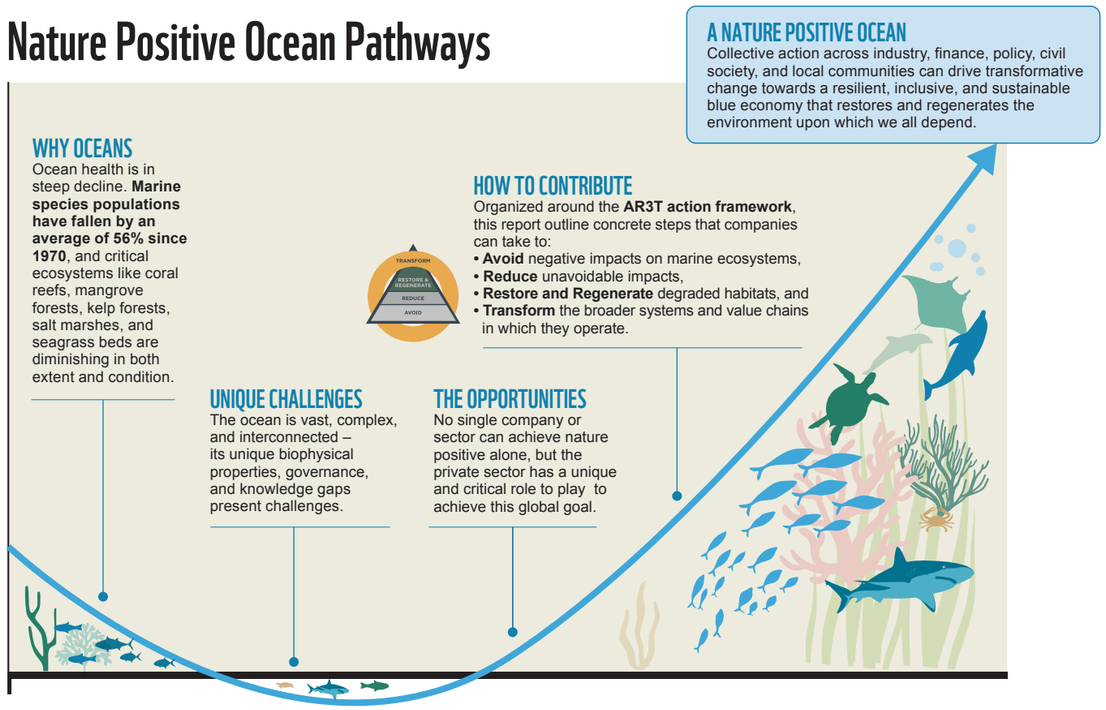

Figure 1: *Charting the journey to a nature-positive future for the ocean*

actions that companies in the **offshore wind, coastal and marine tourism, shipping**, and **seafood** sectors can take, recognizing that their business operations and value chains interface with nature in the ocean and on its coasts.

The principles and pathways for action complement, inform, and build on existing efforts, notably the Science Based Targets Network (SBTN)'s Ocean Hub and cross-realm guidance for setting science-based targets, and the Taskforce on Nature-related Financial Disclosures' (TNFD) LEAP (Locate, Evaluate, Assess, Prepare) approach, disclosure recommendations, and other sector-specific guidance.

This document uses **SBTN's action framework, AR3T**, as an organizing principle. We set out an illustrative set of evidence-based actions that companies can take to avoid future (negative) impacts, reduce unavoidable (negative) impacts, restore and regenerate ecosystems, and transform the broader social and economic systems in which they operate. By mapping these actions along the AR3T framework, this publication aims to help companies begin to develop their own pathways to support the nature-positive global goal. Of particular importance within these illustrative pathways are the **transformative actions**, which push the envelope on what is typically considered, and underscore the importance of multi-actor collaboration: this is especially the case in the ocean, given the cumulative impacts of economic activity across sectors and across large geographic distances.

Of course, companies are not the only actors with a role to play in facilitating the nature-positive transformation. Financial institutions, policymakers, and civil society all play important roles in co-creating the systems and conditions to enable collective achievement of the nature positive global goal—and we will develop additional resources for these audiences in the future.

This document is not intended to be a standalone tool; nor is it a standard, certification scheme, or disclosure framework; nor a mechanism for providing verification, assurance or enabling claims of any kind. Instead, it provides guidance as an entry point for companies to begin contributing credibly to the nature-positive goal through actionable pathways aligned to the AR3T mitigation hierarchy.

Transforming today's blue economy to meet the needs of nature and people will require collective action. Companies have an important role to play—and the future of many ocean industries may be on the line. The nature-positive goal serves as a valuable guidepost for action. While the challenge of halting and reversing nature and biodiversity loss is substantial, there is reason for optimism: significant recovery may be possible for marine systems by 2050 if the main drivers of biodiversity loss are addressed at speed and at scale.[3]

INTRODUCTION

The world faces a **triple challenge**: halting and reversing biodiversity loss, mitigating and adapting to climate change, and addressing economic inequality. Failure to address these significant, intertwined, and complex issues will have dire consequences for people, planet, prosperity and peace. Success is possible but will require concerted and collaborative action by all actors—governments, academics, financial institutions, companies, communities, and individuals—from local to global levels. Several global policy frameworks have been developed, agreed to, and are currently in place, including the Sustainable Development Goals (SDGs), the Paris Agreement, and the Kunming-Montreal Global Biodiversity Framework (GBF), and these serve as roadmaps for collective action. Now, it is time to act at speed and at scale.

2 MILLION

OUR OCEAN IS THE LARGEST HABITAT ON EARTH, SUPPORTING AN ESTIMATED 2 MILLION MARINE SPECIES

US$24 TRILLION

THE OCEAN PROVIDES ESSENTIAL GOODS AND SERVICES WORTH AN ESTIMATED US$24 TRILLION

Our ocean is an essential part of the solution. It is the largest habitat on Earth, covering 71% of the planet's surface, and providing a home to an estimated 1 million marine species.[4] A healthy ocean is one with biodiverse ecosystems, sustainably managed fish stocks, resilient coastlines, clean, pollution-free waters, and the continued capacity to absorb carbon, store heat, and produce the oxygen upon which we depend. When it is healthy, the ocean provides essential goods and services, like food, transport, energy, natural infrastructure, and livelihoods, that are collectively worth an estimated **US$24 trillion**,[5] with annual benefits of around **US$2.5 trillion**,[6] as well as holding enormous cultural and intrinsic values.[7]

CURRENT STATE OF THE OCEAN

Unfortunately, ocean health is in **steep decline**. The cumulative impacts of human industrial activity, from unsustainable fishing and aquaculture, shipping, coastal and marine infrastructure development to offshore drilling, dredging, and mining, among other activities— all exacerbated by a changing climate—have pushed coastal and marine ecosystems to the brink. Marine species populations have declined by an average of 56% since 1970,[B, 8] and critical ecosystems like coral reefs, mangrove forests, kelp forests, salt marshes, and seagrass beds are diminishing in both extent and condition.[9] What's more, scientists warn that early signs indicate that several global tipping points are fast approaching: these include the potential collapse of the subpolar gyre south of Greenland, part of the Atlantic Meridional Overturning Circulation, which would dramatically change weather patterns in Europe and North America.[10]

As ocean resources are depleted, their capacity to provide essential goods and services is diminished, putting people, planet, economic prosperity, and peace at risk. In fact, research indicates that around **US$8.4 trillion** of assets and revenues in sectors including commercial fisheries, aquaculture, coastal real estate and infrastructure, coastal tourism, marine renewable energy, and ports and shipping, are at risk globally through 2036.[11]

B The percentage change in WWF's Living Planet index reflects the average proportional change in monitored animal population sizes at sites around the world, not the number of individual animals lost, nor the number of populations lost.

Table 1: *Value at risk (VaR) in the blue economy: Sectoral breakdowns and potential risk reduction.*

		Value at risk (15-year period, 2021-2036) due to ocean health decline		
SECTOR	**PRESSURES, IMPACTS, AND ASSOCIATED RISKS**	**BUSINESS-AS-USUAL (BAU) scenario**	**SUSTAINABLE DEVELOPMENT (SD) scenario**	**RISK REDUCTION**
Marine renewable energy	• Poor siting and/or design ➔ increased likelihood of project delay or cancellation • Poor management ➔ degradation of natural infrastructure, increased exposure to physical damage	US$8.6 BILLION	US$22.8 BILLION*	US$14 BILLION
Coastal real estate and infrastructure & coastal tourism	• Poor siting, design and/or management ➔ degradation of natural infrastructure ➔ increased exposure to physical damage	US$3.98 TRILLION & US$655 BILLION	US$854 BILLION & US$451 BILLION	US$3.3 TRILLION
Ports and shipping	• More frequent and extreme weather ➔ physical damage • Poor port siting and/or design ➔ increased likelihood of project delay or cancellation • Poor port management ➔ natural infrastructure degradation ➔ physical damage • Growth in decarbonization and pollution regulations ➔ lost market access and fines for noncompliance	US$874 BILLION	US$52 BILLION	US$822 BILLION
Fisheries and aquaculture	• Overfishing ➔ reduced fisheries productivity • Illegal, unregulated or unreported (IUU) fishing ➔ reputational and regulatory risks (lost market access, boycotts, fines) ➔ reduced fisheries productivity • Pollution and disease outbreaks ➔ reduced productivity and stock losses • Unsustainable feed ➔ reputational and regulatory risks; supply volatility and price hikes	US$2.85 TRILLION & US$31 BILLION	US$1.9 TRILLION & US$28 BILLION	US$952 BILLION
TOTAL		US$8.4 TRILLION value at risk under BAU	US$3.3 TRILLION value at risk under SD	US$5 TRILLION could be saved with the adoption of a more sustainable pathway

Source: https://value-at-risk.panda.org/

* The value of marine renewable wind assets is estimated to be three to four times larger under a more sustainable scenario. This means there is more value seemingly at risk. **However, the relative value at risk per dollar invested is still less for the sustainable development scenario.**

Despite incremental progress towards conserving, sustainably managing and restoring marine ecosystems, the rate at which ocean health continues to be degraded far outpaces these efforts.[12]

As we enter the second half of the UN Ocean Decade, it's time to take decisive action. Industrial activity in the ocean and on our coasts is projected to continue increasing significantly in the coming decades—the Organization for Economic Cooperation and Development (OECD) forecasts that the ocean economy could be nearly four times larger by 2050 than it was in 1995.[13] If this growth takes place without significant shifts in how business interfaces with nature, coastal communities and climate change, it will not only exacerbate the current decline, but will also put the businesses themselves—that depend on a healthy ocean—at risk.

REASONS FOR OPTIMISM: A NEW GLOBAL GOAL FOR NATURE

Fortunately, there is an alternative pathway: the transition to a sustainable, resilient and equitable blue economy, one that provides social and economic benefits for current and future generations; protects, restores, and manages diverse and productive marine ecosystems; and secures long-term economic and social stability while keeping within planetary boundaries. As the research above shows, when a more sustainable development pathway is adopted, the value at risk in the global economy is vastly diminished—by over **US$5 trillion** in this scenario. This transformation is increasingly being guided by the emergence of a collective global goal—**nature positive**— to "halt and reverse nature loss by 2030 on a 2020 baseline and achieve full recovery by 2050."[14] In our ocean, this means stopping and reversing the significant biodiversity declines that have occurred over the 20th and early 21st centuries.

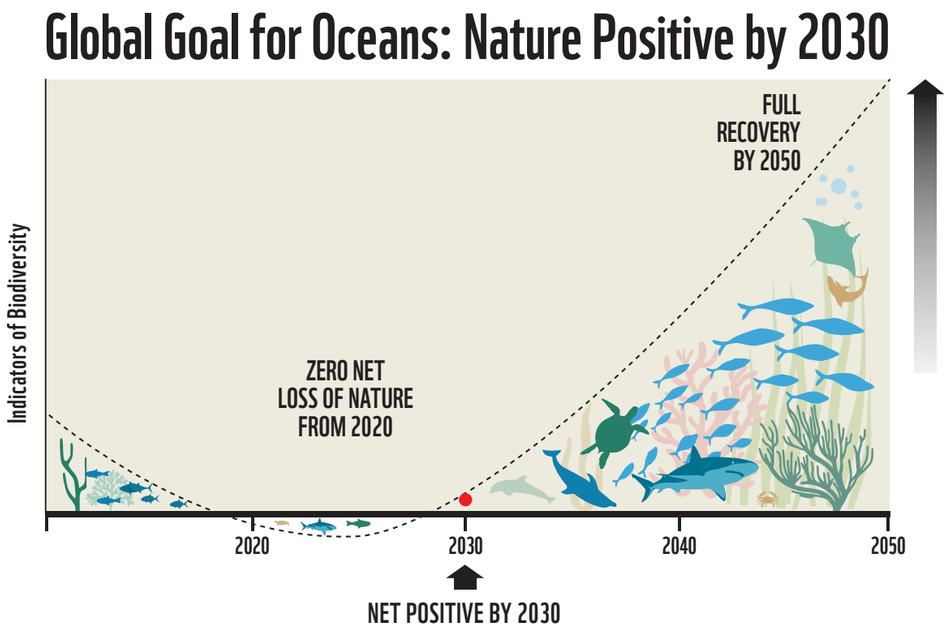

Figure 2: *The nature-positive global goal*[15]

UNPACKING NATURE-POSITIVE AND NET-POSITIVE TERMINOLOGY

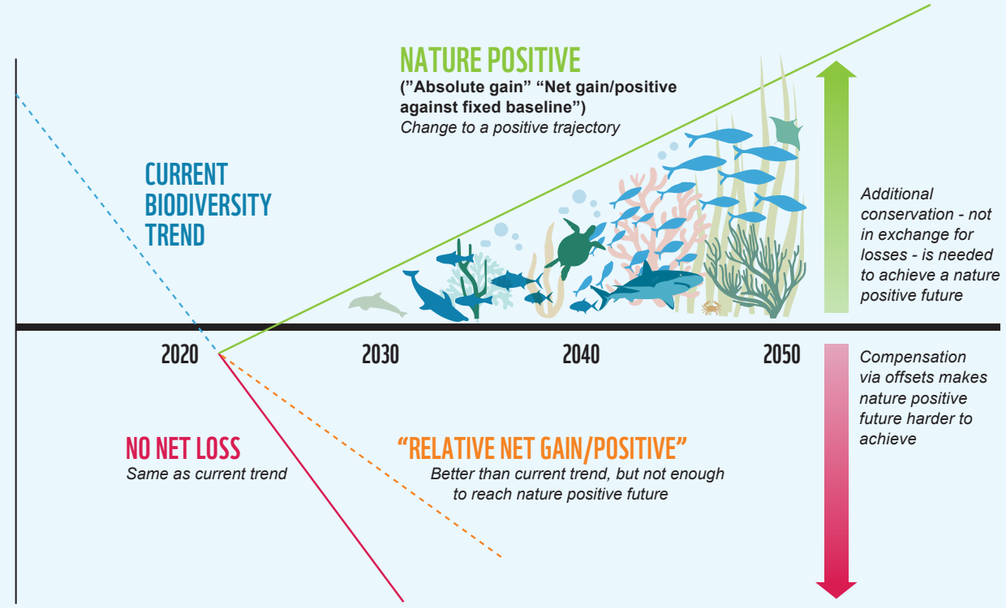

Figure 3: *Illustrating concepts of no net loss, relative net gain, absolute gain, and nature positive. Derived from graphic by Megan Evans, University of New South Wales.*

There are several similar, yet distinct terms, that speak to different ambition levels for biodiversity protection and restoration. These include:

- ***Nature positive*** is a global, societal goal to halt and reverse biodiversity loss by 2030 on a 2020 baseline, and to achieve full recovery by 2050. Being a global, societal goal means that no individual, company, or government can achieve nature positive on their own, but each can make meaningful contributions towards its achievement. A critical component of the nature-positive concept is understanding people as part of nature, and therefore the importance of centering community inclusion, social equity, and environmental justice as core to its achievement.

- **No net loss** is a goal to neutralize or cancel out negative impacts to nature relative to a business-as-usual baseline.[16]

- **Net gain** is a goal to achieve a positive impact on nature relative to a business-as-usual baseline.[17]

There is growing recognition that many current **no net loss** and net gain policies have a limited ability to achieve global goals like the SDGs and GBF targets, especially for the ocean, as a) they rely on compensatory actions like offsetting; b) their achievement is, at best, a "**relative net gain**" in nature; and c) they are most often applied at the project scale.

In contrast, the **nature-positive** global goal seeks "absolute" gains in nature, and calls for not only individual, project-level contributions, but also contributions to the long-term transformation of economic, social and political systems and their relationship to nature. Tracking contribution to nature positive at the corporate level requires accounting for all losses and gains, ensuring only genuinely equivalent gains are used to cancel out losses, and expanding beyond losses from the direct footprint to associated value chains where possible.


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NATURE POSITIVE IS PEOPLE POSITIVE

Essential to the nature-positive concept is the idea that people are part of nature, and therefore human well-being must always be considered in its pursuit. This holistic view of the interconnectedness of nature and people has long been held and advocated for by Indigenous peoples and civil society actors.[18]

Nevertheless, centering and empowering communities, and ensuring equity and justice in conservation and development initiatives continues to prove challenging. Efforts to conserve and/or restore nature can have unintended and negative consequences for people, including limiting access to coastal and marine resources or inequitably redistributing benefits, putting existing livelihoods at risk.[19]

It is therefore critical that any efforts—and notably, in the context of this work, private-sector-led efforts—to avoid and reduce impacts to nature or to restore and regenerate ecosystems should always expressly consider social equity. Companies cannot contribute to a nature-positive future while reducing social and economic benefits to local communities. Meaningfully engaging with local communities, Indigenous peoples, small-scale fishers and other actors via participatory processes, transforming power dynamics, and attending to the distribution of benefits and harms[20] must all be a part of the journey to reach a nature-positive future.[21]

CHALLENGES AND LIMITATIONS

Pursuit of the nature-positive goal is not without critics, many of whom have raised valid concerns.[22] Enhancing the state of nature can mean different things in different contexts depending on baselines, timescales, and which metrics are being measured, monitored, and disclosed. Additionally, the impact of tools like marine biodiversity credits—while relatively new but growing in popularity—is still unclear,[23] with concerns about their long-term ability to conserve or enable the increase of biodiversity, especially in the ocean.

Meaningful progress toward nature positive will require governments, financial institutions and companies to address the conflict between short-term profit pressures and long-term sustainability. In the blue economy in particular, fragmented and private data can make it difficult for organizations to set robust nature-related targets and measure the impacts of ocean interventions. Ongoing risks of greenwashing,[24] greenhushing,[25] and greenwishing[26,27] can undermine this collective pursuit.

ACHIEVING NATURE POSITIVE FOR THE OCEAN

Achieving the nature-positive global goal for the ocean is both possible and essential. However, the marine environment has unique biophysical properties and governance that require particular consideration. For instance:

1 **The legal and policy landscape in the ocean is complex.** For example, while companies operating in EEZs do not own any of the natural resources there, they may be granted leases for temporary rights to certain resources (e.g., related to aquaculture, fish harvest, offshore renewable energy, or oil and gas). In nearshore environments, traditional tenure rights of coastal communities, Indigenous peoples, small-scale fishers, and other traditional groups add more complexity that must be considered.[28] Beyond EEZs, international waters comprise over half of the ocean; companies operate under the jurisdiction of the nation that their vessels are flagged (i.e., registered) to, and are only subject to the international laws and treaties that their flag state chooses to uphold. Unsurprisingly, this has led to overexploitation and conflict.[29] Strong collaborative, international governance to overcome these issues is needed; several international treaties aimed at addressing the shared resources of the high seas have been or are being negotiated, with mixed results so far.

2 **Because of the ocean's interconnectivity, pollution and other impacts from both land and sea can accumulate and travel great distances via tides and currents.** When assessing impacts on nature (both negative and positive) actors operating in marine environments will need to consider impacts not only to habitats and species populations in direct proximity to their operations, but also the extent to which their impacts can materialize in other parts of the world.

The ocean is the ultimate destination for pollutants such as plastics, chemicals, solid waste, and industrial and agricultural runoff, making cumulative impacts from land-based activities a major concern, alongside the impacts of ocean-based industries.[30] Ocean currents and gyres can carry pollution far from the site of impact (e.g., the Deepwater Horizon oil spill), and concentrate waste in certain areas, leading to major localized impacts far from the pollution source (e.g., the Great Pacific Garbage Patch). Moreover, fish stocks don't recognize national and international boundaries, moving freely between various jurisdictions: the effective management of transboundary stocks demands close international cooperation.

3 **There is still much we do not understand about the marine environment.** It is therefore vital to exercise precaution in areas of uncertainty. In addition, sharing data on impacts and pressures on biodiversity and the state of nature can aid in filling collective gaps in understanding.

While our knowledge of the ocean and the store of available data is expanding all the time, there is still much we do not understand. For example, researchers conducting species collection expeditions today are still finding that 70%–90% of the species cataloged are new to science. This demonstrates that humanity still has much to learn about the ocean, which is particularly important when considering the potential impacts of new and expanding industries.[31]

4 **The sheer size of the ocean presents a practical challenge for regular, robust measurement, monitoring, and restoration efforts at scale.** Our ability to monitor impacts is limited by resource and capacity constraints. This underscores the overarching need for collaboration and collective action, especially in the ocean economy, in pursuit of achieving the nature-positive global goal.

Achieving the nature-positive goal for the ocean will require action from every part of society, and the private sector has a particular and significant role to play. Companies' business operations and value chains often directly or indirectly interface with nature and therefore have an outsized impact on nature loss. In addition, companies often have much to lose from their collective and cumulative impacts on nature, given how large their dependence can be.

Private sector actors can and should take clear, urgent actions to transition their business models away from harmful activities and towards restorative and regenerative ones. In addition, companies operate within a complex ecosystem of financial and societal risks and incentives. As a result, they are not able to make change alone. Everyone in society has a role to play and should work together to reach a nature-positive world.

This includes:

- **Policymakers and regulators**—as stewards of public goods—can and should set rules and embed the value of a healthy ocean into public policies and regulations.
- **Financial institutions**—as providers of capital and managers of risk—can and should update cost-benefit and risk models to reflect the real cost of nature loss and climate change, and develop financial products that adequately incentivize restoration and regeneration.
- **Communities, civil society organizations, and individuals** can and should advocate for the prioritization of nature in all realms, exerting social pressure and mobilizing to this end.

THIS REPORT IS PRIMARILY INTENDED TO SUPPORT COMPANIES OPERATING IN THE BLUE ECONOMY IN PARTICULAR THOSE IN THE OFFSHORE WIND, COASTAL AND MARINE TOURISM, SHIPPING, AND SEAFOOD SECTORS—TO UNDERSTAND WHY AND HOW TO TAKE ACTION TO CONTRIBUTE TO THE NATURE-POSITIVE GLOBAL GOAL.

*Supplemental briefing documents for policymakers and financial institutions will be developed to complement this report, following its publication.

WHY AND HOW TO CONTRIBUTE TO NATURE POSITIVE IN THE OCEAN

BENEFITS OF NATURE POSITIVE FOR COMPANIES

Companies are starting to take steps to understand and address their impacts and dependencies on nature in order to ensure the long-term resilience of their business models.[32] Most, though, are only at the beginning of their "nature journeys". Research from the World Benchmarking Alliance (WBA) found that out of more than 800 global companies operating across a variety of sectors, only 5% assess their impact on nature, and less than 1% understand their nature dependencies.[33]

When companies begin to understand the extent of their impacts and dependencies on nature, the case for investing in nature's resilience becomes clearer.

For example, companies in the coastal tourism industry have a clear interest in enhancing the resilience and stability of coastlines where critical infrastructure is located, and companies in the seafood sector can benefit directly from investing in the health and productivity of key fish stocks. What's more, an analysis by the World Economic Forum (WEF) found that corporate actions contributing to nature positive could generate up to US$10.1 trillion in new opportunities for business and create 395 million jobs by 2030, demonstrating that prioritizing nature does not have to come at a cost for business and society.

BENEFITS OF CONTRIBUTING TO NATURE POSITIVE IN THE OCEAN

(adapted from *A Playbook for Nature-Positive Infrastructure Development*)[35]

FOR COMPANIES

OFF-BALANCE-SHEET SERVICES FROM NATURE

- Flood and erosion risk reduction
- Geotechnical resilience
- Reduction in risks related to extreme weather and rising sea levels
- Potential for long-term cost savings with nature-based restoration compared to gray infrastructure
- (Seafood) Habitat creation, restoration, and connectivity, to protect and sustain target populations

VALUE INCREASE

- Land value uplift
- Diversification
- Reduced operational costs
- Stable returns
- Enhanced profitability and supply chain resilience (seafood)

MARKET BENEFITS

- Access to sustainable finance
- First mover advantage—set market standard
- Opportunities to develop secondary revenue streams, for example related to carbon sequestration (e.g. carbon credits, which should be verified through robust methods (see WWF carbon credits and biodiversity credits position for further information)[36]

FOR NATURE AND SOCIETY

BIODIVERSITY IMPROVEMENTS

- Habitat creation
- Habitat restoration
- Habitat connectivity
- Habitat condition improvement
- Species population increases/ Species extinction risk decreases

CLIMATE RESILIENCE

- Coastal resilience
- Temperature regulation
- Water security/drought risk reduction

ENVIRONMENTAL IMPROVEMENTS

- Air quality
- Soil quality
- Water quality

MACROECONOMIC IMPROVEMENTS

- Job creation
- Land value uplift
- Diversification
- Social benefits
- Cultural ecosystem services
- Recreation and amenity value
- Food and nutritional security

Figure 4: *The sooner a company addresses the pressures and impacts of the blue economy on nature and biodiversity, the more quickly risks can be mitigated and reduced, while opportunities for positive impact are increased and can be acted on early. These positive impacts can bring benefits for both the company, and for nature and society.*

HOW TO GET STARTED: THE CURRENT LANDSCAPE OF NATURE GUIDANCE FOR COMPANIES

The many ways in which companies interface with nature are complex, and prioritizing action can be challenging. This is particularly true for companies that operate or have supply chains in marine and coastal areas, where the unique biophysical and governance properties described above can make measuring the impact of business activities particularly difficult.

However, there is now a proliferation of guidance available to support the private sector to understand, identify, prioritize, set targets for, report on and ultimately manage and mitigate impacts, dependencies, risks, and opportunities associated with nature. By way of summary, the basic steps that most of this guidance suggests are as follows:[C]

1. **First, identify and prioritize impacts and dependencies on nature.** Both the TNFD LEAP (Locate, Evaluate, Assess, Prepare) approach and SBTN Steps 1 (Assess) and 2 (Interpret and Prioritize) are credible, step-wise processes for conducting such materiality assessments.

2. **Next, develop an action plan to begin managing impacts and dependencies in order to contribute towards the nature-positive goal.** Some companies are developing nature transition plans, so this step may occur as a part of that process.[37,38] **The principles and sector-specific actions we outline in this report are intended to support companies operating in marine and coastal areas to begin developing their own action plans, by filling gaps in the current guidance from various standards and frameworks that many companies are already engaged in. We recommend that companies work toward setting SBTN targets—Step 3—and then incorporate the actions in this report into SBTN Step 4 action plans where relevant (this is the "Act" step).[D]**

   Keep in mind that not all actions are equally relevant everywhere. Sequencing and right-sizing efforts to both minimize negative and maximize positive impacts on nature is a critical part of developing an action plan. WWF also strongly recommend that companies develop nature-positive action plans in close consultation with local actors including community representatives and Indigenous peoples, as well as subject matter experts including credible civil society organizations, researchers and academics, in order to design context- and project-specific approaches appropriate for the particular regulatory, social, economic and environmental conditions in which they are operating.

3. **Implement the action plan, and regularly monitor and measure impacts, for a defined period of time.** Companies should pursue third-party impact verification and assurance following ISEAL's Code of Good Practice. Companies might also consider collaboration with a credible thought partner, including through the SBTN target-setting and validation process.

4. **Publicly report on progress,** in line with voluntary disclosure frameworks like the TNFD, and/or mandated disclosure frameworks like the European Union's Corporate Sustainability Reporting Directive (CSRD) and Environmental and Social Reporting Standard (ESRS). To date, the majority of companies operating in the blue economy do not yet publicly report on nature-related impacts, and there is a lack of consensus on reported indicators;[39] the adoption and consistent use of reporting standards can reduce this disparity.

5. **Finally, over time, adapt the action plan iteratively in response to challenges, gaps, and opportunities identified through impact monitoring.**

C This set of steps is broadly aligned with the ACT-D Framework (High-level business actions on nature).

D Additional resources to implement science-based targets for nature (Step 4: Act) will be available later in 2025.

INTRODUCING WWF'S ILLUSTRATIVE PATHWAYS TO NATURE POSITIVE IN THE OCEAN

To support companies operating in marine and coastal areas develop credible plans to contribute to the nature-positive global goal, this report uses the SBTN's action framework, AR3T, as an organizing principle. We then provide **an illustrative set of evidence-based actions that companies can take to avoid future (negative) impacts, reduce unavoidable (negative) impacts, restore and regenerate ecosystems, and transform the broader social and economic systems in which companies operate, mapped to the AR3T framework.** Sector-specific actions are mapped for each of the four priority sectors—offshore wind, coastal and marine tourism, shipping, and seafood.

Of particular importance within these illustrative pathways are the transformative actions, which push the envelope on what is typically considered, and underscore the importance of multi-actor collaboration—this is especially relevant in the ocean, given the cumulative impacts of economic activity across sectors and across large geographic distances.

This report draws from and builds on established resources, notably the SBTN AR3T Action Framework, and the United Nations Environment Programme Finance Initiative (UNEP FI)'s Sustainable Blue Economy Finance Initiative (SBEFI)'s guidance documents including *Turning the Tide* and *Diving Deep*.

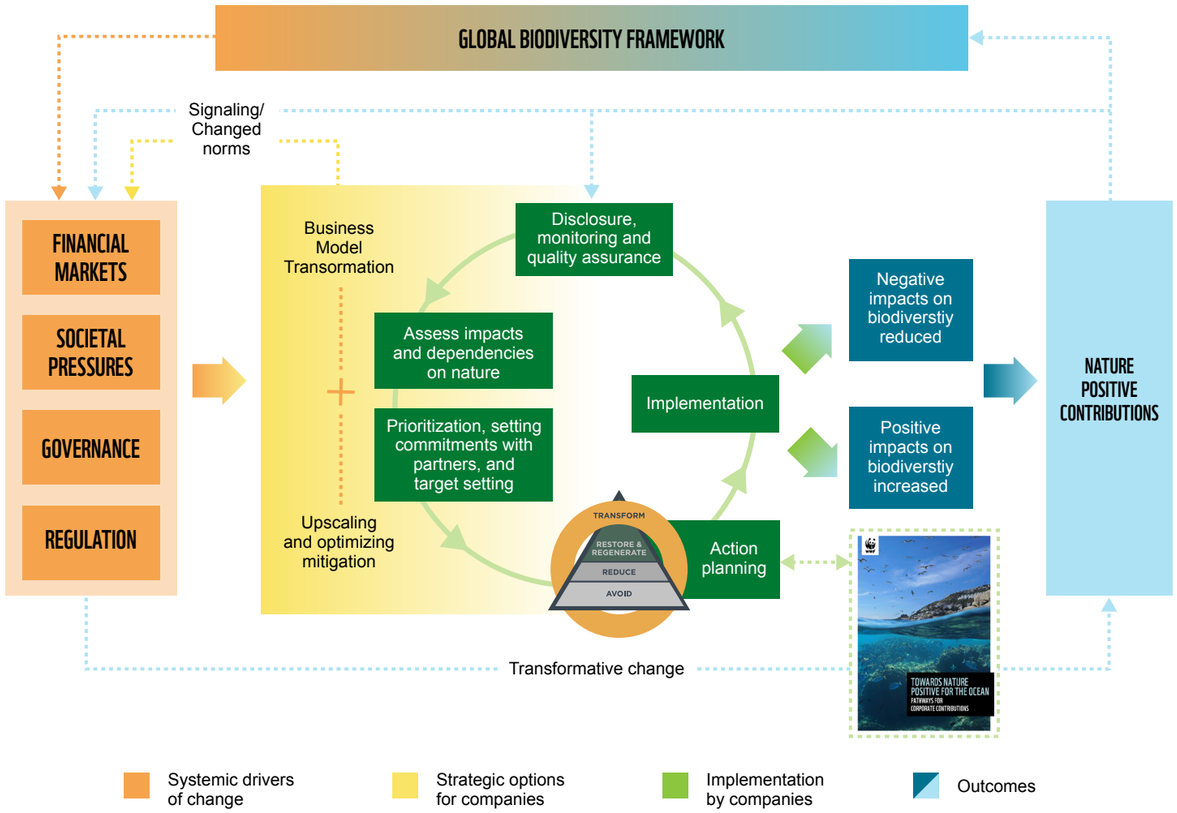


Figure 5: *A conceptual model outlining the process through which private sector contributions to a nature-positive future could be realized*[40]

CASE STUDY

NATURE ON THE BALANCE SHEET

Authors: Jennifer McGowan, Helen Crowley and Jamie Batho

The concept of "Nature on the Balance Sheet" (as developed by the Nature on the Balance Sheet Initiative) refers to the integration of the value of natural capital (including ecosystem services) into conventional financial accounting frameworks and economic decision making. Nature on the Balance Sheet is an innovative global initiative that aims to develop proof points of natural capital being valued and invested into, throughout the economy. NBI lays out a path and process for how to turn action and outcomes for nature positive into an asset on a company's or country's balance sheet rather than a "nice to have" or a "cost". NBI provides the critical (and to this point missing) translation of improved ecological outcomes into improved economic outcomes for countries and reduced liability and improved assets for companies. The pathway includes the following steps:

1. Natural Capital Assessments are used to *"discover value"* by identifying and managing impacts, dependencies, risks and opportunities.

2. Natural Capital Accounting are used to *"quantify value"* by organizing data about natural assets, their services and value to businesses and society.

3. Financial Accounting of Natural Capital *"recognizes value"* in financial accounts, integrating information of both natural and financial assets and liabilities.

These actions will, in turn, drive (and be driven by) change throughout capital markets and the governmental and regulatory environment.

4. Market pricing of nature-related assets and liabilities: Investors, insurers, and banks, reflect the value of natural capital in cost of capital, asset valuation, risk assessment, underwriting, pricing and coverage exclusions.

5. Codification and promotion of natural capital valuation: Governments and central banks use budgetary, fiscal, policy and regulatory instruments to codify and promote natural capital valuation. For example, capital adequacy frameworks reflect exposure to nature related risks, incentivising investment into nature positive assets.

NBI is currently testing steps 1, 2 and 3 with several companies (proof points): one agricultural landscape (Pará, Brazil), one mining landscape (Pará, Brazil), and two forestry landscapes (Minas Gerais, Brazil, and Texas, USA). Alongside, NBI has identified the system-level actors with whom to engage that play a vital role enabling steps 1, 2 and 3, but also in enabling steps 4 and 5, to create broad conditions to stimulate rewarding and incentivizing positive stewardship of nature across all sectors and geographies (this includes accounting bodies, rating agencies, central banks and financial service providers).

The Nature on the Balance Sheet Initiative recognizes the profound role that nature plays in underpinning economic stability and sustainability. It emphasizes that environmental assets and ecosystem services must be considered alongside conventional financial metrics to have a full visibility of a company's assets and liabilities. By doing so, companies can create a more comprehensive view of their value proposition, incorporating biodiversity, water quality, soil health, and ecosystem condition as critical components of their balance sheets. It therefore presents a transformative shift in accounting practices that acknowledges the intrinsic value of natural assets.

This initiative builds on over a decade of foundational work. The four foundational partners in the NBI are **The Landbanking Group, the Capitals Coalition, the Centre for Global Commons** (University of Tokyo) and Systemiq.

The Landbanking Group deploys this approach in projects and with clients who enhance ecological resilience while also providing economic benefits through:

- Building natural capital accounts using latest technology developments for data collection across biodiversity, carbon, soil and water (earth observation, bio-acoustics, image recognition, eDNA etc.).
- Using valuation methodologies to structure contracts between parties for investment into, and valuation of, natural capital.
- Monitoring the performance of these investments continuously.

Their initiatives illustrate how effectively managing natural resources can lead to healthier ecosystems and long-term profitability, enabling businesses to incorporate environmental stewardship into core operational strategies.

Putting nature on the balance sheet requires standardized approaches to measure, report and value natural capital. Groups like Accounting for Nature aim to provide structured methodologies and standards for measuring and reporting on environmental assets such as vegetation, fauna, freshwater, soil etc., into environmental accounts. By tracking changes in natural capital and environmental assets, these frameworks enable individuals, organizations, and governments to quantify their environmental contributions, track progress, inform estimates of nature's value, strengthen decision-making and bring transparency and rigor to markets and claims.[325]

The transposition of nature into financial statements ultimately incentivizes the adoption of adopt practices that benefit both the environment and society. Incorporating nature into balance sheets will become increasingly vital in achieving sustainable development goals, protecting and regenerating nature, mitigating climate change impacts and improving global economic resilience.

This is being published as the first in a series of WWF Nature Positive Ocean Pathways reports. The next report in the series will build on the qualitative action pathways described herein and explore in more detail how effective measurement, monitoring and evaluation can support companies to quantify nature-positive contributions.

THE VALUE PROPOSITION OF THE AR3T ACTION FRAMEWORK

Figure 6: *AR3T Action Framework, Science Based Targets for Nature*[43]

The traditional mitigation hierarchy (avoid, minimize, restore, compensate) has long provided guidance to reduce harmful corporate impacts on nature, but notable limitations in its application to date, especially in the ocean, indicate that it is not fit-for-purpose to enable the achievement of the global nature-positive goal. Specifically:

- Its application works only at the site or project level (rather than at a strategic planning or whole-of-business scale), which limits potential for positive impact.[41] In addition, without collective action towards systems transformation, the nature-positive goal cannot be achieved.
- Its inclusion of compensation has led in many cases to an over-reliance on biodiversity offsets and credits, which have not yielded credible evidence of success in supporting the achievement of no-net-loss or net-gain, especially in marine environments. While compensation can be important, weight must still be put on the parts of the hierarchy which will have more impact, namely avoidance and mitigation measures.

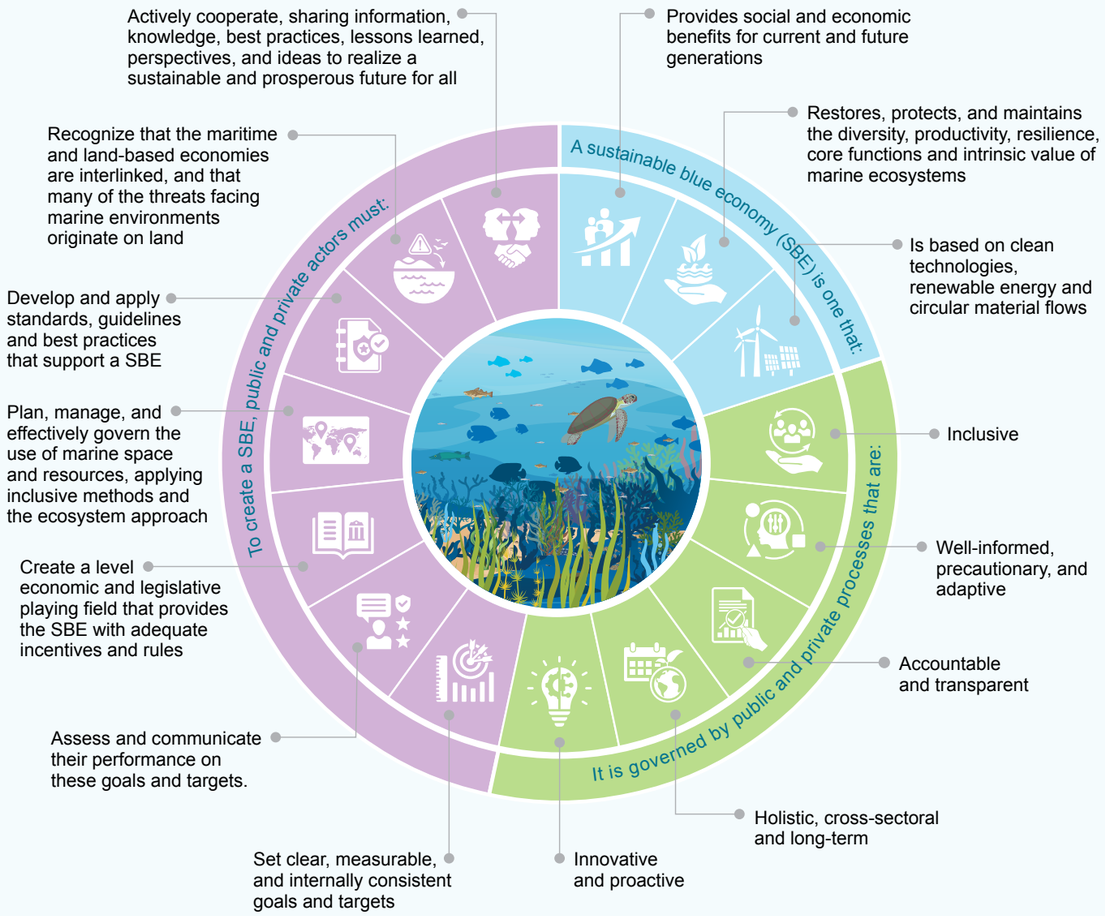
In 2020, the SBTN's Guidance for Business introduced a new action framework, **AR3T**. This covers actions to **Avoid** future impacts, **Reduce** unavoidable impacts, **Restore and Regenerate** ecosystems and nature's contributions to people, and Transform the broader social and economic systems in which companies are embedded. The AR3T framework is built on the mitigation hierarchy set out in the International Financial Corporation's (IFC) Performance Standard 6, as well as the conservation hierarchy, which, importantly, expands the mitigation hierarchy concept to include proactive, positive steps for nature. It also includes Transform as a cross-cutting step, reflecting the systemwide changes required to bend the curve for biodiversity.[42]

Transforming today's blue economy to meet the needs of nature and people will require collective action. Companies have an important role to play—and the future of many ocean industries may be on the line. The nature-positive goal serves as a valuable guidepost for action. While the challenge of halting and reversing nature and biodiversity loss is substantial, there is reason for optimism: significant recovery may be possible for marine systems by 2050 if the main drivers of biodiversity loss are addressed at speed and at scale.[44]

PRINCIPLES FOR A SUSTAINABLE BLUE ECONOMY:

THE FOUNDATION FOR CONTRIBUTING TO NATURE POSITIVE IN THE OCEAN

A company's contribution to nature positive in the ocean will be greatly strengthened if it adopts a foundational set of principles to consistently and credibly guide its efforts. For example, the *Principles for a Sustainable Blue Economy*[45] were developed in 2015 for companies operating in and around the ocean to provide guideposts and guardrails for responsible actions in the ocean that contribute to prosperity now and into the future. These Principles are summarized in the graphic below; we encourage companies to use them while integrating the suggested sector-specific pathways into their action plans for nature positive. Companies can also reference these principles when choosing partners to work with, ensuring alignment of values and goals in collaborative efforts.



Source: WWF. *Principles for a Sustainable Blue Economy*. WWF International, 2015. https://wwfint.awsassets.panda.org/downloads/15_1471_blue_economy_6_pages_final.pdf.

Below is a list of cross-cutting activities that companies can consider and use to align their actions with the Principles. These activities serve as entry points to developing the nature-positive pathways outlined in the next section of this report.

Relevant principles:	Cross-cutting activities:
Provides social and economic benefits; is inclusive	• Conducting **robust actor engagement processes, public consultations, and environmental and social impact assessments (ESIAs)** to ensure that all actor concerns are addressed and managed, especially those of Indigenous peoples and local communities , upholding the UN principles of Free Prior and Informed Consent and thorough environmental and social management plans (ESMPs). • Respecting, considering, and not violating **human rights** (e.g., no child labor), labor rights (e.g., no exploitation of local populations or migrant workers), nor reducing or preventing access to sustainable and inclusive livelihoods; providing suitable and safe working conditions, fair pay, and avoiding discrimination, including against women, Indigenous, or disadvantaged workers. • Supporting **community and people empowerment and engagement,** supporting the capacity of communities to ensure that they benefit equitably from the project. • Protecting the local cultural and historical heritage of a site (including sacred sites), and in line with Indigenous peoples' and local communities' customs and values. Land rights should be protected and there should be no displacement of already marginalized or minoritized groups.
Restores, protects and maintains the diversity, productive, resilience, core functions, and intrinsic value of marine ecosystems; Actively cooperate, sharing information, knowledge, best practices, lessons learned, perspectives, and ideas	• Protecting existing habitats; restoration should only be considered after avoiding and reducing impacts. • Understanding the condition of a site, so that its habitats and ecosystem services are restored to the appropriate state. Each project will have unique considerations, characteristics, and a baseline state, identified through the collection of robust data (biological, ecological, social, etc.), appropriate modeling (e.g., hydrodynamic and sediment transport), and the completion of ESIAs (including actor engagement, mapping, and consultations). Data collection should include identifying the key habitats and species diversity, and habitat function within the footprint of the project site and broader ecosystem, which can determine the current status and function and then the appropriate scale, quality, composition, and area for interventions. This foundational information should inform the restoration intervention. Site- and ecosystem-specific baselining is recommended.[E] • Working with the appropriate actors and experts using scientific and local knowledge when restoring ecosystems. • Modeling and measuring baseline conditions pre-intervention (as described above), and measuring the impact of interventions after a defined period of time. Without understanding the current state and baseline conditions of a site, the target state towards which avoidance, reduction and restoration efforts are required, and which metrics are meaningful indicators of changes in ecosystem health, it will be challenging to discern whether an intervention or a project has been successful in contributing to nature positive results. • Accessing local and/or Indigenous knowledge can provide useful understanding of the historical ecological context (e.g. the extent) for an ecosystem or species and can be used as a baseline for restoration.[46] Considering historical information may also prevent shifting baseline syndrome, wherein reference conditions are more degraded than the original state.[47] In addition, we encourage investment in data collection programs to fill knowledge gaps. Further, learnings and data should be shared through open access platforms to inform industry and advance technical capacity. These are solutions that address the lack of data that is often cited as a roadblock for establishing baselines, precluding credible, science-based action.

E See for example the following resources for guidance on best practices for restoration initiatives: Best-Practice-Guidelines-for-Mangrove-Restoration_spreadsv5.pdf for how to implement robust science-based restoration practices and monitoring, and refer to resources such as Joint landscape position papers and roadmap (2022-2024) | ISEAL Alliance and SBTN's Technical-Guidance-2025-Step3-Ocean-v1.pdf (specifically the seascape engagement initiative roadmap on p.118) for additional guidance.

Relevant principles:	Cross-cutting activities:
SBE is based on clean technologies, renewable energy, and circular material flows	• Prioritizing the use of renewable energy and a circular economy approach to reduce emissions and waste, considering also the tradeoffs between the benefits of the energy transition with its impacts, including habitat loss. • Addressing overconsumption in supply chains and operations to address one of the drivers of biodiversity loss.[48]
Well-informed, precautionary and adaptive; Innovative and proactive	• Deploying innovative, ambitious, motivational solutions to halt and reverse biodiversity loss, which often means working in new ways with limited data. We recommend consulting with the right expertise, following scientific practices, while adaptively managing approaches. One option is to deploy and test solutions at a small scale, then to scale them up or replicate them elsewhere as results demonstrate success (including no harm). This approach allows innovations to be tested in a well-informed and adaptive way.
Accountable and transparent; Assess and communicate their performance; Develop and apply standards, guidelines and best practices	• Communicating performance following available guidance around making credible claims to ensure accuracy and integrity. Credible is defined as using globally recognized frameworks, e.g. the ISEAL Code of Good Practice for Sustainability Systems, that equip companies to credibly deliver against commitments by defining practices for effective sustainability standard-setting; assurance; monitoring, evaluation, and learning; and claims.[F] • Utilizing the illustrative, sector-specific pathways shared below as input for company planning to address impacts, dependencies, and risks identified in the disclosure and target-setting process to chart out science-based pathways for action.
Holistic, cross-sectoral and long-term	• Implementing robust pre-project scoping (pre ESIA), anticipating potential challenges so that they can be integrated or addressed in planning, modeling, or other work in advance. Identifying and addressing needs early on will not only reduce impacts but also reduce the costs of fixing or mitigating problems later in the development pipeline. ESIA is one of the most important steps to capture the environmental, social, and economic implications of a project. This type of reporting helps not only identify the project's impacts and benefits, but also how it will fit into the landscape of the existing industries and activities already occurring in the area. ESIAs should be conducted to the highest standards (see IAIA resources on best practices and principles for ESIAs)[49] even in weak regulatory environments. • Acquiring permits where relevant when deploying projects before any installations may take place. • Designing solutions for the present and the long-term future, using planning and modeling tools to project future climate scenarios and sea level rise, so that solutions continue providing benefits now and into the future.

F These processes and procedures underpin the rigor, reliability, transparency, and impartiality of these tools, and their use helps ensure that the private sector can contribute toward impactful, science-based outcomes while minimizing the risk of false claims due to self-reporting, poor data, conflicts of interest, and inaccurate assessments. These tools are managed by robust institutions that have worked with experienced actors and science-focused teams to build indicators, assurance systems, and data collection functions. Independent assessments and robust transparency provide credibility and ensures reduced bias in assessments, accurate reporting, and reduce the risk of greenwashing. No measurement or claims can be made using the guidance provided herein.

Relevant principles:	Cross-cutting activities:
Create a level economic and legislative playing field	• Advocating for governments to create regulatory pathways that incentivize companies to prioritize rigorous, science- and nature-based approaches rather than gray infrastructure (see also the Transform section).
Plan, manage, and effectively govern the use of marine space; Recognize that the maritime and land based economies are interlinked	• Engaging early with other businesses in SEAs, coastal land use planning, ecosystem-based marine spatial planning and integrated coastal zone management processes, to reduce overall sectoral impacts without incurring a competitive disadvantage. For instance, if bird migration bottlenecks or intact coastal habitats are off-limits for coastal development, then sector-wide planning levels the playing field and does not impose a competitive disadvantage on more responsible companies. Similarly, company collaboration with governments, local knowledge and experts to create regional-scale "no-go zones" for all industrial activities that could disrupt nature, without sacrificing the needs of Indigenous peoples and local communities, can be the most effective way to avoid impacts to biodiversity altogether. A well-planned zoning regime with inputs from all key actors could also mitigate cumulative impacts and safeguard key ecosystems. • Understanding development (e.g., infrastructure) projects in the pipeline within a seascape can also contribute to its effective management. For instance, staggering ocean industry activities to reduce temporary cumulative impacts, delaying activities to avoid migrations or spawning seasons, or reconsidering the size of an operation in the context of other activities or ecological needs can be effective tools to drive meaningful change at scale. • Coordinating collective efforts from all industries to drive positive change for biodiversity by addressing cumulative impacts: each action of land and marine-based industries can directly impact the ocean, and together they can create cumulative and compounding impacts. Fully capturing and quantifying the cumulative impacts of ocean sectors on marine biodiversity, including over time, is a considerable challenge for a Sustainable Blue Economy, given the unique characteristics of the ocean; thus if each individual actor avoids and reduces impacts as much as possible, it will decrease cumulative pressures.

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THE BLUE ECONOMY'S INTERFACE WITH NATURE: AN OVERVIEW

Blue economy activities occur in coastal and marine areas globally, operating across diverse ecosystem types that support unique biodiversity and provide vital services. Companies that operate in and depend on the ocean should develop a deep understanding of these ecosystems' unique values, services, and conditions, and develop approaches to respect their continued health and functionality.

The diagram below shows a selection of coastal ecosystems. The ecosystems showcased are well-documented as critical for biodiversity, serve as habitats for a wide range of endangered, threatened and protected (ETP) species, and provide critical ecosystem services to local and regional communities and economies, as well as to the businesses themselves. Each sector-specific chapter includes a diagram that illustrates the relationships between these ecosystems and the blue economy sector in question, including how companies impact them.

BIODIVERSE COASTAL AND MARINE ECOSYSTEMS AT THE INTERFACE WITH THE BLUE ECONOMY

KELP FORESTS: Kelp forests are found globally in temperate and polar regions. Like terrestrial forests, these marine forests have overstories and understories that support a diversity of species. Kelp provides habitat for fish, invertebrates, and marine mammals, and hosts a high diversity of marine flora and fauna. Specifically, kelp feeds and provides protection to seals, sea lions, whales, fish, sea otters, gulls, terns, egrets, herons, cormorants, and other shorebirds.[57] Globally, kelp forests sequester 4.91 megatons of carbon per year.[58] Like many sensitive marine habitats, kelp forests are declining. Kelp loss has led to socioeconomic consequences, including negative impacts on abalone fisheries in Japan and California and rock lobster fisheries in Australia.[59,60,61] Restoration of kelp forests, whether through transplantation, seeding, or artificial reefs, can support marine biodiversity recovery.[62]

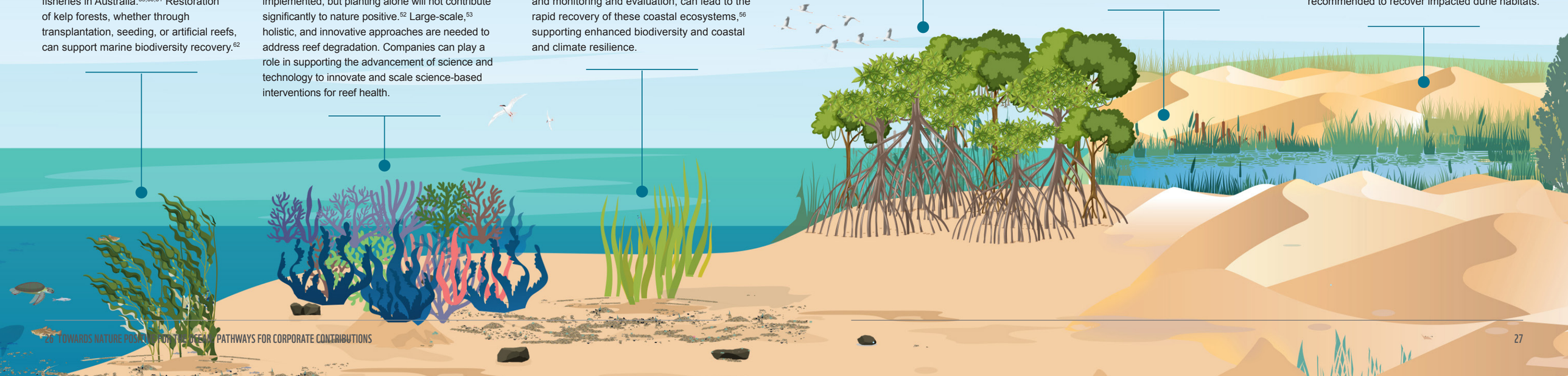
REEFS: Reefs are some of the most biodiverse systems on the planet, and include shellfish (e.g., oyster and mussel) reefs and other biogenic or rocky reefs in the polar and temperate north, as well as coral reefs in the tropics. Healthy coral reefs support 25% of all marine species, protect coastlines, provide socioeconomic benefits, and support food security and livelihoods.[50] Reef habitats globally are degraded due to cumulative impacts from chronic pressures like increasing sea surface temperatures from climate change and acute disturbances like habitat damage from coastal development or destructive fishing practices. The capacity of coral reefs to provide ecosystem services has been halved since the 1950s.[51] Reef habitat loss is occurring at a rate and scale that is not recoverable without significant intervention. While planting corals or oysters directly onto degraded habitat may have micro-scale benefits if projects are scientifically designed and carefully implemented, but planting alone will not contribute significantly to nature positive.[52] Large-scale,[53] holistic, and innovative approaches are needed to address reef degradation. Companies can play a role in supporting the advancement of science and technology to innovate and scale science-based interventions for reef health.

SEAGRASS BEDS: Seagrass beds are critical habitats found in temperate and tropical zones that provide significant ecosystem services. They protect coastlines by stabilizing sediments, preventing coastal erosion and mitigating wave action, while also absorbing carbon dioxide, serving as carbon sinks. These habitats also improve water quality by trapping sediments and reducing turbidity, and support biodiversity by providing nursery areas and foraging habitats for marine species. Seagrasses are declining globally,[54] as are the ecosystem services they provide. However, when degraded seagrass beds are restored, data show that fish and invertebrate biomass, as well as carbon and nitrogen stocks, increase over time.[55] Restoration of seagrass habitats guided by sound science and robust data, with clear and measurable objectives and monitoring and evaluation, can lead to the rapid recovery of these coastal ecosystems,[56] supporting enhanced biodiversity and coastal and climate resilience.

MANGROVES: Mangrove forests are ecologically and economically critical ecosystems, providing extensive services. They are found in the tropics, and provide coastal protection from storms and erosion, sequester carbon, and support fisheries and food production, while providing habitat for breeding, foraging, nesting, and nursery sites for coastal and marine species.[65] Globally, mangrove forest extent is decreasing by 1%–2% annually,[66] which is three to five times faster than the loss of other forest types. Mangrove loss is driven by a combination of climate change impacts and coastal development for housing and aquaculture.[67] Protection and restoration of these biodiverse and productive habitats is of fundamental importance.[68]

SALT MARSHES AND WETLANDS: Salt marshes and wetlands are found in temperate and polar latitudes along coastlines. They are productive ecosystems that support biodiversity, water filtration, nutrient cycling, and carbon sequestration, and provide coastal defense against flooding and storms.[69] Threatened by land reclamation and coastal development, restoration of these habitats is nevertheless increasing globally.[70] Like mangrove restoration, salt marsh and wetland restoration depends upon healthy hydrological connections, so hydrodynamic modeling and robust hydrological data and tools are critical.[71] Given the similarity between the systems existing at the interface of land and sea, similar approaches to the ones described above—including assisted regeneration for mangroves—can be applied to salt marshes and wetland restoration.[72]

DUNES: Dunes are found globally along coasts as transitional zones from marine to terrestrial habitat; they are created by the buildup of sand from wind and coastal dynamics. The formation and stability of dunes is facilitated by the establishment of coastal vegetation that captures and holds sand within plant root systems.[63] Dunes provide beach stability, promote sand accretion, protect the coastline from ground swells and storm surges, and shape the ecology of the coastal ecosystem. Coastal development is the primary driver of dune loss. As dunes are removed or modified to accommodate built structures, their structural integrity and habitat quality may diminish, leading to beach erosion, loss of resilience for coastal ecosystems, reduced habitat extent, and limited resources for a diversity of dune-dependent species.[64] Restoration and rehabilitation efforts are recommended to recover impacted dune habitats.



BLUE ECONOMY PRESSURES AND IMPACTS ON NATURE

In each of the sector chapters that follow, we provide a table that outlines the pressures exerted on nature from the sector's activities, and the resulting impacts to the marine environment.

The pressures and impacts we consider have been adapted from and align with the ENCORE pressures Typology.[73] ENCORE provides information on dependencies and impacts on nature across different ecosystems to support risk management; it is widely used, including in support of SBTN and TNFD. The pressures identified for each sector are further aligned with SBTN, and therefore the illustrative examples provided can inform Step 4[G] of the SBTN process (i.e., response options for companies to mitigate their impacts on nature, based on the targets set in Step 3). In addition, the pressures and impacts have been drawn and adapted from UNEP FI's *Turning the Tide* guidance to ensure alignment across multiple relevant frameworks.

Table 2: *Impact icons and descriptions: This table clarifies the common impacts on the environment with descriptions of each, adapted from UNEP FI's TTT guidance.[74] The impacts and icons are presented in each of the sector chapters, linked to sector-specific pressures. The impact icons are represented in the sector-specific nature-positive pathways, rather than in the pressures, to illustrate the direct link between the activity pathways and the impacts to nature that those pathways could address.*

ENVIRONMENTAL IMPACTS	DESCRIPTION
Loss or reduction in marine biodiversity, including loss of endangered, threatened and protected (ETP) species	Loss or reduction of populations of a given species, or of a species as a whole, due to human impact. This includes ETP species as defined by the IUCN Red List of Threatened Species and protections under applicable jurisdictions.
Loss of ecosystem resilience and provision of ecosystem services	Loss or reduction in the ability of an ecosystem to provide specific benefits. These benefits (termed ecosystem services) include provisioning services such as oxygen production and carbon sequestration, and regulating services for the climate and against disease outbreaks.
Loss or degradation of coastal and marine habitats	Changes to the physical environment on which life depends.
Reduction in animal welfare	The consequences of human activity for the health of individual animals, both wild and farmed. It complements the impact on biodiversity, which looks at impacts on groups of animals and species. These impacts are closely linked and often appear together.
Increased greenhouse gas (GHG) concentrations	The role of GHG emissions in climate change. While human activity affects the climate in many ways, as well as the capacity to offer resilience or adapt to climate change, this impact covers the output of GHG emissions into the atmosphere itself, raising concentrations that result in a changed climate.
Changes to marine, biological, chemical and geological cycles	The consequences of changes to biogeochemistry—natural processes within the ocean such as the water, carbon and nitrogen cycles—that play a role in regulating the planet. While dependent on water chemistry, marine life also plays a role in these cycles. As such, this is closely linked to loss of ecosystem services, though the consequences are somewhat different, focusing specifically on these global regulatory processes.

Source: Environmental impacts table from United Nations Environment Programme Finance Initiative. *Turning the Tide: How to finance a sustainable ocean recovery – A practical guide for financial institutions.* UNEP FI, 2021.

G Additional resources to implement science-based targets for nature (Step 4: Act) will be available later in 2025.

CASE STUDY

STONE REEFS: BEYOND 1:1 COMPENSATION

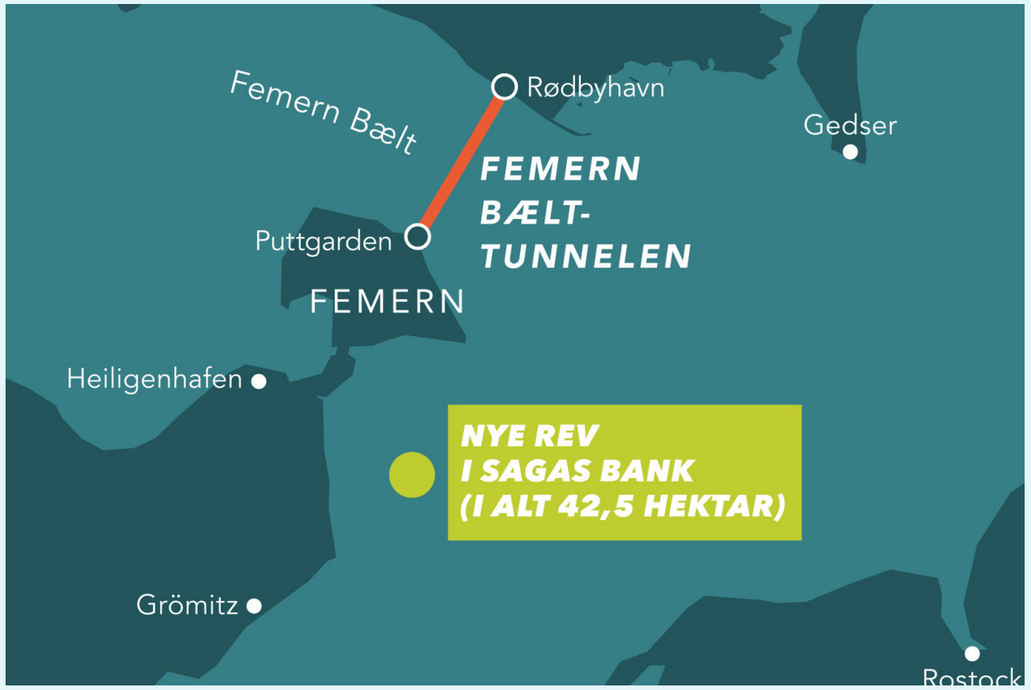
Author: Stine Gro Jensen

The Fehmarn Belt tunnel is Denmark's largest infrastructure project and the world's longest immersed tunnel. In the environmental impact assessment process, it was found that just over 9 hectares of stone reefs would be either permanently or temporarily destroyed due to the construction of the tunnel. The authorities therefore decided that 42.5 hectares of new reefs should be established as compensation. This requirement means that more new reefs will be created than lost due to the construction works.

The compensation effort is focussed on reestablishing former stone reefs that have disappeared as a result of stone fishing in the Fehmarn Belt over the decades. This concerns a 42-hectare seabed area just south of the island of Fehmarn, which is being reestablished with large stones, so that it once again functions as a reef with a rich flora and fauna. Very specific demands for the quality of the stones for the build-up of the reefs have been identified. For example:

- The stones must have their origin from the last ice age and cannot be broken.
- The size of the stones also plays a role, so that they correspond to those that have been lost during decades of stone fishing in the Fehmarn Belt. Thus, the majority of the stones should come from the Baltic Sea area and have a diameter of 60–100 cm.

A monitoring programme will document the development of the new reefs, testing the extent to which the intervention is successful. Although in this case steps are being taken to go beyond a 1:1 compensation ratio, compensation in the coastal and marine habitats is relatively new and untested as to its long-term efficacy and ability to achieve ecological equivalence.[329]



Source: https://femern.com/da/presse/nyheder/stone-market-survey/

SECTOR-SPECIFIC NATURE-POSITIVE PATHWAYS

The following chapters provide companies in four key ocean sectors—offshore wind, coastal and marine tourism, shipping, and seafood—with illustrative sets of sector-specific, evidence-based actions they can take to contribute to the nature-positive global goal. By organizing these actions along the AR3T action framework, this report aims to help companies begin to develop their own, unique action plans.

For each of the four sectors covered, we describe:

1. the sector and its scope
2. the sector-specific interface with nature, including impacts and dependencies
3. an illustrative set of evidence-based actions companies can take to avoid future (negative) impacts, reduce unavoidable (negative) impacts, restore and regenerate ecosystems, and transform the broader social and economic systems in which they operate, mapped to the AR3T framework (note that we use a different hierarchy for seafood, which is explained in the chapter)

Within each sector, we provide illustrative actions for a subset of key business activities that have the most significant impacts and/or dependencies on nature. These are intended to be motivational and ambitious, and should be applied and replicated or scaled to meet the needs of the biodiversity challenges in each place the company operates or sources from. To demonstrate the links between recommended actions and their contribution to global targets, we have mapped GBF targets onto relevant actions (see page 31 opposite).

BOX 1: USING THE AR3T ACTION FRAMEWORK

© Image credit / WWF

DO LESS BAD: AVOID AND REDUCE

AVOID: The first and most important action that any company operating in the blue economy can take to contribute to halting and reversing biodiversity loss is to prevent or AVOID such impacts at all. The AR3T mitigation hierarchy depicts AVOID as the foundational step, upon which all other actions build. When destructive and harmful practices are avoided, ecosystems can recover and regenerate on their own through natural processes, assuming a certain level of resilience, and if the system is healthy enough to regenerate without interventions.

REDUCE: When it becomes impossible to avoid certain areas or actions, it is essential to **REDUCE negative impacts as much as is feasible**. This process, often referred to as mitigation, is a critical step toward achieving nature-positive outcomes.

DO MORE GOOD: RESTORE AND REGENERATE

RESTORE AND REGENERATE: Restorative and regenerative actions for nature are those that **initiate or accelerate the recovery of an ecosystem** with respect to its "health, integrity, and sustainability, and are designed to increase the ecological and biophysical function of an ecosystem with a focus on nature's contribution to people."[75] Restoring and regenerating ecosystems both in terms of their functionality and scale is critical to support biodiversity and to achieve societal benefits. Before considering these options, it is essential that companies and all actors involved first seek to avoid and reduce all potential negative impacts to the extent practicable. In the absence of avoidance and mitigation, restoration and regeneration initiatives will not produce the desired results and benefits.

Because blue economy sector activities could have a significant impact on critical coastal ecosystems—including coral and shellfish reefs, seagrasses, kelp forests, dunes, mangroves, salt marshes, and wetlands[76]—as well as on nature's contributions to people, active and passive restoration and regeneration should be prioritized within these sensitive and biodiverse habitats so that the threats and goals are well understood and the interventions aligned for meaningful, robust, and science-based outcomes.[77]

TRANSFORM: Transformative change is defined as fundamental, system-wide shifts in views, structures, and practices;[H] **in the context of this report, we are focused on transformative changes that help enable a just and sustainable future. We have identified actions that address the drivers of nature loss in the systems in which companies are embedded, from the perspective of influencing institutions, societal structures and norms, aligning goals and values with positive outcomes for nature.**[78] The transformative pathways are cross-cutting, and can and should happen along all other steps of the mitigation hierarchy. For example, companies may focus on transformative change through advocating for robust, science-based seascape and marine spatial planning, and investing in research to advance their industries toward innovations and solutions that support nature and biodiversity.

While we present sector-specific actions in the following chapters, we also make cross-sector recommendations for transformative efforts that are critical to driving collective nature-positive contributions.

H **views** – ways of thinking, knowing and seeing; ***structures*** – ways of organizing, regulating and governing; and **practices** – ways of doing, behaving and relating

CASE STUDY

REFLECTING NATURE POSITIVE IN SUSTAINABLE BLUE ECONOMY PLANS

Authors: Louise Heaps and Mauro Randone

Sustainable Blue Economy plans offer an opportunity to create a clear strategy to manage the sustainable development of the blue economy in a way that is integrated, ecosystem-based and keeps future development ambitions within planetary boundaries. These plans must be supported by a strong vision, goals and objectives underpinned by strong principles, guardrails and guidelines grounded in science. This overarching framework should aim to deliver a multisector transition towards a Sustainable Blue Economy, defined by WWF as one which:

- Provides social and economic benefits for current and future generations;
- Restores, protects, and maintains diverse, productive and resilient marine ecosystems; and is
- Based on clean technologies, renewable energy, and circular material flows.

The ocean represents a high-risk investment environment in terms of data availability, capacity challenges, ownership, regulatory gaps and inconsistencies, and lack of transparency. Additionally, the size and inaccessibility of the ocean bring challenges regarding effective monitoring, control, and surveillance. Governments should therefore urgently develop the policy and regulatory frameworks that reduce the risk profile, such as **ecosystem-based marine spatial plans**, and support and incentivize companies and financial institutions to transition their practices towards nature- and people-positive outcomes.

The nature-positive oceans pathways in this report can support the delivery of a Sustainable Blue Economy by providing a clear actionable and science-based structure to refer to. The pathways offer actionable approaches based on the mitigation hierarchy to guide robust sustainable development decisions. This would support decision-making by identifying development options that should be avoided, those that would need to be transitioned, through both policy and targeted finance interventions, and those that should be proactively sought out, financed and implemented. The nature-positive oceans pathways are also underpinned by the Sustainable Blue Economy Finance Principles, which offer an overarching chapeau that can be adopted and used by all ocean users—whether they are financing, being financed by, or regulating the ocean economy. Adopted by 44 signatories, including the Government of Portugal, this global framework offers a vision for creating long-term environmental, social, and economic resilience.

Source: cancilleria.gob.ec

Kunming–Montreal

GLOBAL BIODIVERSITY FRAMEWORK

The Convention on Biological Diversity (CBD) Kunming-Montreal Global Biodiversity Framework (GBF) includes 23 action-oriented targets for achievement by 2030. Although governments are primarily responsible for enabling GBF targets, the private sector has a key role to play and is increasingly engaged. To demonstrate the connections between our recommended actions and global targets, we have mapped the GBF targets to each of the nature-positive pathways in the tables.

The targets and descriptions are presented below. In the tables, the targets are represented by the relevant number icon.

Please note that not all targets are featured in the table as some are overarching, but they are included within the narrative where relevant. All targets are equally important in contributing to the nature-positive global goal.

- **Target 1** Plan and Manage All Areas to Reduce Biodiversity Loss
- **Target 2** Restore 30% of All Degraded Ecosystems
- **Target 3** Conserve 30% of Land, Waters and Seas
- **Target 4** Halt Species Extinction, Protect Genetic Diversity, and Manage Human-Wildlife Conflicts
- **Target 5** Ensure Sustainable, Safe and Legal Harvesting and Trade of Wild Species
- **Target 6** Reduce the Introduction of Invasive Alien Species by 50% and Minimize Their Impact
- **Target 7** Reduce Pollution to Levels That Are Not Harmful to Biodiversity
- **Target 8** Minimize the Impacts of Climate Change on Biodiversity and Build Resilience
- **Target 9** Manage Wild Species Sustainably to Benefit People
- **Target 10** Enhance Biodiversity and Sustainability in Agriculture, Aquaculture, Fisheries, and Forestry
- **Target 11** Restore, Maintain and Enhance Nature's Contributions to People
- **Target 12** Enhance Green Spaces and Urban Planning for Human Well-Being and Biodiversity
- **Target 13** Increase the Sharing of Benefits from Genetic Resources, Digital Sequence Information and Traditional Knowledge
- **Target 14** Integrate Biodiversity in Decision-Making at Every Level
- **Target 15** Businesses Assess, Disclose and Reduce Biodiversity-Related Risks and Negative Impacts
- **Target 16** Enable Sustainable Consumption Choices to Reduce Waste and Overconsumption
- **Target 17** Strengthen Biosafety and Distribute the Benefits of Biotechnology
- **Target 18** Reduce Harmful Incentives by at Least $500 Billion per Year, and Scale Up Positive Incentives for Biodiversity
- **Target 19** Mobilize $200 Billion per Year for Biodiversity from All Sources, Including $30 Billion Through International Finance
- **Target 20** Strengthen Capacity-Building, Technology Transfer, and Scientific and Technical Cooperation for Biodiversity
- **Target 21** Ensure That Knowledge is Available and Accessible to Guide Biodiversity Action
- **Target 22** Ensure Participation in Decision-Making and Access to Justice and Information Related to Biodiversity for All
- **Target 23** Ensure Gender Equality and a Gender-Responsive Approach for Biodiversity Action

CROSS-SECTOR: TRANSFORMATIVE CHANGE TO REACH NATURE POSITIVE

Transformative change is essential to reaching a nature-positive future. In the context of this report, we focus on shifts that foster a just and sustainable world. Given the continued downward trajectory of biodiversity,[79] new approaches that enable systemic transformations are needed to bend the curve for biodiversity while simultaneously and holistically addressing climate change and supporting sustainable development goals.[80]

Such transformative changes focus on economic, political, and social system change and address the root causes of biodiversity loss. These root causes include systems that prioritize short-term, individual, and material gains; unequal concentrations of wealth and power; and paradigms of extraction and disconnection between people and nature.

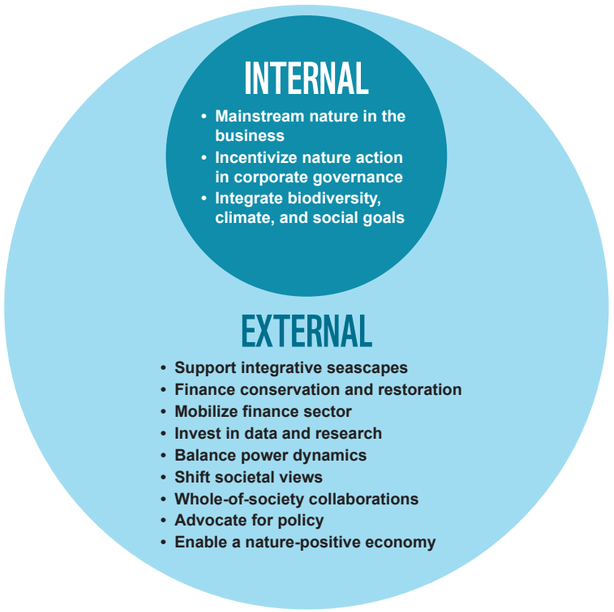


Figure 6: *Transformative change: fundamental, system-wide shifts that address the underlying causes of biodiversity loss. Companies can make changes internal and external to their business; both are needed to reach the nature-positive goal.*

Transformative actions draw on principles including equity and justice (actions benefitting all); pluralism and inclusion (taking multiple approaches and involving all relevant people); adaptive learning and action (using science and knowledge to inform strategies that respond to new information); and reciprocal and respectful human-nature relationships (reconnecting people with other life on Earth, recognizing the interconnectedness of nature).

Transformative change may seem daunting, but there are actions that companies can take both within and outside of their direct operations that contribute, which not only reduce risks but can unlock more than US$10 trillion in business opportunity value.[81]

In the sector chapters below, we provide recommendations for transformative actions that companies can take around specific activities, shifting production, sources, and practices—as well as efforts to benefit society, including data collection and sharing, and advocacy.

In this section, we provide cross-sector recommendations for all companies in the blue economy to transform their **internal** practices, and support the transformation of **external** enabling conditions that can make the nature-positive global goal more achievable.

CASE STUDY

NATURE ON THE BOARD

Author: Emily Howgate

Companies that demonstrate robust corporate governance perform better on sustainability issues,[318] yet many still lack accountable, informed, and representative high-level decision-making. However, a groundbreaking model that incorporates Nature into corporate governance provides hope for a shift in business ethics and decision-making. Known as "Nature on the Board", and pioneered by the brand Faith in Nature, this model establishes a dedicated representative to advocate for ecological interests, helping to institutionalize environmental responsibility and reposition executives' choices in embedded natural relationships rather than human-centric silos.[319]

Through "guardians", the Nature on the Board initiative gives Nature "a voice and a vote" at the highest level of business decision-making. This is a creative approach to bring in new perspectives that invite new outcomes.[320] By formally recognizing Nature as an actor, companies can more proactively integrate sustainability into strategic decisions. Expected business benefits include fostering long-term resilience, reducing environmental risk, improving alignment of brand values and operations, and enhancing corporate reputation and consumer or investor trust. Having Nature on the Board helps position businesses as active contributors to a regenerative economy rather than extractive consumers of natural resources.

Considering wider culture-change, the Nature on the Board precedent relates to transformative action within the AR3T Framework,[321] where companies affect the systems in which they are embedded to address the drivers of nature loss. If more companies adopt this model (which has been open-source shared), a shift in corporate governance and cross-sector accountability for Nature can emerge. Encouragingly, this is beginning: other businesses are bringing Nature's voice to the table[322] and organizations such as the Scottish Association for Marine Science have raised the blue perspective with Ocean on the Board.[323]

This governance model resonates with broader legal and philosophical movements recognizing the intrinsic rights of nature,[324] which are part of advancing environmental protections, biodiversity outcomes, and public ecological awareness. It is a fundamental rethinking in corporate governance, shifting from an anthropocentric paradigm to a more ecologically inclusive model of corporate leadership.

Source: Nature on the Board, 2023

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TRANSFORMATIONS INTERNAL TO THE COMPANY

Mainstream nature in the business

Companies can integrate nature into their operations by setting enterprise-wide goals that prioritize nature across all strategies and actions. This may involve developing nature transition and action plans that touch on company policies, plans, and practices that incorporate the sector chapters. Companies should also actively participate in and advocate for the use of science-based standards, such as commodity-specific certifications (e.g., the Marine Stewardship Council), or target-setting processes that can be applied to any commodity (e.g., SBTN); and frameworks that support transparent disclosures, like those outlined by TNFD. Additionally, businesses must invest in efforts to achieve environmental goals, track their progress, and report on outcomes.

Integrate goals for biodiversity with related goals (climate and social)

When interventions are designed to address multiple goals together—including to support biodiversity, water, food, climate, and health—they are more effective, cheaper, and more durable. Interventions with potential for synergies and co-benefits that support coastal and marine health include the protection and restoration of mangroves and wetlands, integrated seascape approaches, and marine spatial planning. Climate-smart approaches to restoration, for example, can ensure that interventions are long-lasting.

Incentivize nature in corporate governance

To ensure the recognition of nature's central role in managing both physical and transition risks, incentivizing nature-positive outcomes within corporate governance is necessary. This can include, for example, specific recognition of nature-positive management at the C-level within COO or CSO functions, as well as incentives at the executive level for achieving nature-positive outcomes. At the board level, encouraging consideration of how the company is positioning itself with respect to nature-related risk and nature-positive opportunities will help embed these considerations from the top down.

Complementing a top-down approach with a bottom-up corporate culture that encourages reflection and action on the company's interface with nature, including incentives, can create company-wide momentum for action. Similarly, particularly with Millennial and Gen Z hires, linking corporate practice to values like the state of nature can benefit both recruitment and retention of talent.

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TRANSFORMATIONS EXTERNAL TO THE COMPANY

Embrace whole-of-society collaborations for nature

The nature-positive goal is relatively new in comparison to longstanding work on net zero and emissions disclosure for climate; as a result, companies may not yet be fully equipped to engage. Collaborating with all relevant actors (e.g., governments, civil society, scientists, local communities) to develop strategies and action plans in addition to collaborations in pre-competitive platforms within sectors can support the achievement of the nature-positive goal.[83] Such collaborations can enable piloting and finalizing new strategies, as well as offer opportunities to overcome first-mover disadvantages and successful early adoption of nature-positive approaches.

Support inclusive and integrative seascape engagements

Cumulative impacts of multiple ocean industries manifest in seascapes and coastal communities. To reach the nature-positive goal, seascape-wide collaborations are needed within and across sectors with all relevant actors (governments, civil society, the private sector, and communities) through inclusive approaches. Marine spatial planning (including nature-inclusive design for offshore wind) and jurisdictional approaches for seafood[84] are existing models of such collaborations.

Finance environmental conservation and restoration in seascapes

Despite the clear importance of nature for our global economy, there is currently a biodiversity funding gap, estimated to be between US$300 billion and US$1 trillion.[85] Companies can play a role in beginning to address this gap through direct financial investments for conservation and restoration in the seascapes in which they operate and in those on which their supply chains depend, and by promoting sustainable management practices. For example, for companies in the seafood sector, investments in initiatives like Fishery Improvement Projects (FIPs), Aquaculture Improvement Projects (AIPs) and large, seascape-scale efforts like jurisdictional initiatives (JIs) can provide mutual benefits to ecosystems and businesses. For companies operating in the coastal and marine tourism sector, financial investments in mangrove, coral reef, or seagrass restoration efforts can provide substantial value both to ecosystems and to companies through enhanced buffer protection from storms and improved habitat that enhances the visitor experience. For all investments in environmental conservation and restoration, companies should prioritize the provision of local jobs and support to communities, fostering economic growth, community benefits, and environmental stewardship.

Data-driven: Invest in research, capacity, and new approaches to support nature

Companies should invest in research and data collection to enhance their contributions to a nature-positive future, including testing new technologies and approaches. Before scaling or replicating new approaches, companies should pilot in various contexts, both ecological and social, to assess their effectiveness. Additionally, businesses can support capacity-building initiatives and provide assistance to others when possible. Data collection and the public sharing of biodiversity information are also crucial, as they enable shared decision-making, better planning, and the reduction of environmental impacts, and can provide foundational information to enable others in a seascape to take action.[86]

Balance power dynamics

Companies must fulfill their obligations under international human rights law to respect and protect the human right to a healthy ocean, while also building resilience for coastal communities and marine economies. It is essential to acknowledge and address historical injustices associated with the industry, ensuring that past wrongs are recognized and corrected, which may be required to enable local buy-in. Additionally, companies should value the insights provided by diverse approaches and knowledge systems, including Indigenous and local knowledge. Active support and engagement of Indigenous peoples and local communities throughout all processes is critical, ensuring equitable involvement, benefit-sharing, and respect for their rights. Tools like the Ocean Equity Assessment[87] can be utilized to guide these efforts and ensure a more just and inclusive approach to ocean sustainability. Companies should also avoid concentrating power further through monopolization, which is one of the root causes of biodiversity loss.[88]

Mobilize the finance sector

Acknowledging the biodiversity funding gap, there is an even larger financial issue that those seeking to halt and reverse biodiversity loss must confront. An estimated US$7 trillion of annual financial flows, public and private, are contributing directly to negative impacts on nature.[89] For a sense of scale, the private finance that presently has a known, direct negative impact on nature—approximately US$5 trillion—is around 140 times larger than private investments in nature-based solutions.[90] Subsidies for fossil fuels and fisheries contribute significantly to environmental damage in the ocean. These subsidies must be reformed and repurposed if we are to halt and reverse nature loss, but by doing so we can simultaneously address climate change and support the Sustainable Development Goals. Companies can play a role in advocating for these goals and should be guided by the GBF: Reduce harmful incentives by at least US$500 billion per year and scale up positive incentives for biodiversity (Target 18).

Financial institutions (FIs)—as lenders to, investors in, and underwriters of companies across the blue economy—are exposed to the substantial financial risks associated with ocean health decline, as well as potentially costly reputational risks linked with human rights and labor abuses at sea. At the same time, FIs are also uniquely positioned to incentivize and drive improvements in industry performance at scale, and to channel funding towards business strategies that contribute to nature-positive goals.[6]

It is therefore in FIs' own interest that their clients and portfolio companies take proactive steps to understand and manage their impacts and dependencies on nature, to minimize their exposure to potential downside risks (e.g., risk of client default, risk of share value depreciation), and maximize their exposure to possible upside benefits. (e.g., sustainable and even regenerative blue economy business models). Financial institutions have a wide range of tools they can use to incentivize corporate action aligned with the above recommendations, from exclusions and sector policies, to transition and sustainable finance frameworks, to corporate stewardship and engagement.

While there is growing evidence that some FIs are taking steps to align financial flows with the needs of a regenerative and Sustainable Blue Economy, much more needs to be done.[91,92,93,94] Companies taking the lead in supporting the nature-positive global goal can play an important role in demonstrating what is possible, and can develop innovative financial products—like blue and sustainability linked loans—in collaboration with leading banks to show what sustainable finance can achieve.

Contribute to shifting societal views and values for nature

Companies can also go further by recognizing that nature is embedded in society, the economy, and people's lives. They can actively participate in shifting societal views and values to emphasize and prioritize the fundamental interconnections between humans and nature.[95] In doing so, companies can communicate effectively and accurately with consumers, helping them understand the importance of these interconnections and encouraging more sustainable behaviors.

Advocate for policy changes to level the playing field

Companies should avoid blocking progress and focus on enabling action by advocating for strong policies that support nature. They should disclose any nature-related lobbying activities to ensure transparency.[96] Companies can also advocate for the standardization of rules related to nature impacts across businesses, the promotion of equitable and effective area-based conservation, and the restoration of coastal and marine ecosystems like mangroves, wetlands, seagrasses, and coral reefs.

In addition, companies should champion rights-based approaches, including the recognition of the rights of nature, and push for innovative financial models that support biodiversity while ensuring equitable benefit-sharing, such as debt-for-nature swaps. They should advocate for aligned policies that reduce harm from major environmental pressures and support the repurposing of environmentally harmful subsidies (e.g., fossil fuels and fisheries) to incentivize nature-friendly practices, such as renewable energy. Furthermore, companies can advocate for and enable the inclusion of nature in national income measures and global financial flows as an essential tool for guiding public and private investments toward a sustainable future.

Enable a nature-positive economy

If effectively applied, these approaches—alongside actions by policymakers, FIs, and civil society—will enable the transformation to a nature-positive economy, one in which the net result of all economic activities combined leads to an absolute increase in nature towards full recovery.[97] Similar to other concepts (e.g., doughnut economics, bioeconomy, green economy), the nature-positive economy emphasizes a world in which economic activities are aligned with planetary boundaries and meet society's needs, in a safe and just operating space for humanity.[98] Such a shift would include moving away from measuring conventional GDP growth alone as a benchmark for societal progress toward a model that places equal emphasis on biodiversity, social well-being, and prosperity.[99]

I Alternatives include: Genuine Progress Indicator, Indicator of Sustainable Economic Welfare, Gross Ecosystem Product, natural capital accounting, the Sustainable Development Index, Inclusive Wealth, Gross National Happiness, Sustainable Wellbeing Index, the Socio-Environmental Index

OFFSHORE WIND: FIXED AND FLOATING


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Marine renewables play a critical role in enabling the global transition to renewable energy at pace and at scale. Offshore wind (OSW) is the leading industry within the marine renewables sector, and by 2030 the global installed capacity of offshore wind is projected to increase sevenfold from current operational capacity.[100] This industry's growth has a positive impact on the world's ability to mitigate climate change and improve air and water quality, as well as on outcomes for human health and some indicators of biodiversity.[101]

However, the transition to renewables will undeniably put new pressures on the places where OSW is developed. Depending on how future OSW projects are designed and developed, the seabed, fisheries, critical species and habitats, and local communities will be impacted by new development to varying degrees. It is therefore critical to address potential impacts through a comprehensive approach that prioritizes equity, local engagement, and strategic planning, including through marine spatial planning across actor groups.

While several other renewable technologies are being developed, we have selected fixed and floating OSW because they are the marine renewable technologies presently being deployed commercially, and have the potential to be scaled to produce more clean energy.[102] This chapter touches on several different phases of fixed and floating OSW project development and operation. In general, any individual or group working in the marine and offshore renewables space is an appropriate audience for this chapter. More specifically, those involved in project scoping and planning, construction, operation, and decommissioning will benefit from the content provided. Additionally, financial institutions lending to, investing in, or underwriting OSW projects will also benefit from the recommendations herein, as they can inform corporate engagement efforts, policy development, and sustainable finance frameworks and associated products.


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OFFSHORE WIND: THE INTERFACE WITH NATURE

Offshore wind operations occur in coastal and marine areas, which globally encompass a diversity of ecosystems supporting biodiverse assemblages of flora and fauna that provide vital ecosystem services. Given the rich biodiversity often found in coastal and marine systems, the OSW industry is well positioned to develop in consideration of and in alignment with nature. While the installation of structures in coastal waters can negatively impact marine systems, the AR3T framework provides OSW companies with pathways to avoid and reduce impacts, and then restore and regenerate ecosystems, benefiting the company, nature, and society.

The diagrams below illustrate a non-exhaustive selection of coastal ecosystems that are impacted by OSW development, or that may be impacted in the future. They are also ecosystem types where restorative and regenerative interventions have been scientifically designed and deployed to rehabilitate and repair the system, which can be scaled to restore ecosystem services.

KELP FORESTS: Kelp forests are found globally, including in the temperate/polar regions where there is the most momentum around OSW installation, thus kelp forests could be impacted by pollution or direct habitat degradation from turbine or cabling placement.

REEFS: OSW deployment often occurs at depths or near rocky, oyster or coral reefs. These critical and sensitive habitats can be impacted by industry activities causing, for example, sedimentation, invasive species, and/or pollution, as well as direct habitat degradation from turbine or cabling placement.

SEAGRASS BEDS: Seagrass beds are a critical habitat that can be impacted by OSW development, for example from turbine deployment, anchoring, or cabling.

MANGROVES: Mangroves may be impacted by OSW projects through the installation of turbines and cabling near or through them.

SALT MARSHES AND WETLANDS: These habitats can be impacted by an OSW project through installation of turbines and cabling near or through marshes or wetlands or the reclamation of these areas to connect the turbines to the grid.

DUNES: OSW cabling or other operations and grid placement may impact nearshore and coastal habitats.

While reduced ocean health does not materially impact OSW and its associated activities, OSW has the potential to cause negative impacts to the ocean. Despite its role in climate mitigation, the OSW industry exerts pressures on coastal and marine environments that can change how they function and the services and benefits they are able to provide. For example, infrastructure may impact carbon-rich ecosystems' (e.g., mangroves, wetlands) extent and capacity to absorb carbon, reducing overall mitigation benefits; such impacts should be carefully considered in project planning.

The following table outlines the relationship between OSW and the impacts it exerts on the marine environment in greater detail.

Table 3: *The pressures and proximate environmental impacts of the offshore wind industry on nature. These are not exhaustive, but a selection of well understood pressures and impacts adapted from Turning the Tide[103] and supported by additional scientific literature.*

PRESSURES Biophysical demands placed on a natural resource	ENVIRONMENTAL IMPACTS Changes in the state of nature or its capacity to provide ecosystem services and social benefits
1. Seabed disturbance and disruption of coastal habitat	
ENCORE Typology: ● Area of seabed use	**Loss or degradation of coastal and marine habitats:** During construction, operation and decommissioning of wind farms the seabed is disturbed by heavy equipment, which makes the ecosystem less resilient due to habitat degradation and loss. Impacts arise mainly due to suspended sediment, which can affect sensitive habitats and nearby organisms. Coastal and marine ecosystems and habitats that could be impacted include reefs, seagrass beds, mangroves, dunes and coastal vegetation, salt marshes, wetlands, and kelp forests. **Loss or reduction in marine biodiversity, including loss of endangered, threatened and protected (ETP species):** Siting a wind farm in an area of high biodiversity or with a fragile habitat will have a deleterious effect on both biodiversity and habitats. **For example:** Destruction of habitat can impact key nesting, breeding, and foraging areas for sea turtles, sea birds, fish, and crustaceans. **Loss of ecosystem resilience and provision of ecosystem services:** The degradation and loss of coastal and marine habitats due to OSW activities can lead to the loss or reduction in the ability of an ecosystem to provide specific benefits. For example, disruptions of critical ecosystems that support biodiversity eg: tropical/ biogenic reefs, seagrass beds, mangroves, dunes and coastal vegetation, salt marsh, wetlands, or kelp forest, are those that also provide ecosystem services like coastal protection, carbon storage, flood defense, food provisioning, thus leading to loss of resilience and the ability to adapt to impacts of climate change.
2. Pollution	
ENCORE Typology: ● Emissions of nutrient pollutants to water and soil ● Emissions of toxic pollutants to water and soil ● Generation and release of solid waste	**Reduction in animal welfare:** Pollution stemming from maintenance activities and service vessels will contribute to reductions in animal welfare. Excess heat from cabling could potentially impact abiotic properties of water, and electromagnetic field generation from undersea cables could affect animal welfare both at a local and a larger scale including dispersal/distribution patterns—but this is an area that needs further research.[104] This also covers potential pollution from waste treatment associated with wind farms, particularly at decommissioning Pollution from biofouling agents or turbine corrosion protection may also harm wildlife.[105]
● Emissions of non-GHG air pollutants	**Loss or reduction in marine biodiversity including loss of ETP species:** Pollutants leach from infrastructure, and movement of sediment causes nutrient release and turbidity, altering and decreasing water quality. Debris pollution or leading-edge erosion on blades can contribute to plastic (including microplastic) pollution, impacting organisms via consumption or habitat via abrasion. The heat and electromagnetic fields from cabling may alter abiotic habitat properties, impacting native species settlement, as well as larval migration or feeding and navigation of marine organisms (e.g., rays).[106] An increase in suspended sediment from construction, especially silt, can smother or bury mussels or spat, or prevent settlement of larvae because of poor water quality.
3. Invasive species	
ENCORE Typology: ● Introduction of invasive species	**Loss or reduction in marine biodiversity including loss of ETP species:** LInvasive species disrupt the ecological functioning of natural systems, often by out-competing local and native species for natural resources, with negative implications for biodiversity, and potentially causing significant economic damage at local and regional scales.[107] In the OSW industry, invasive species are typically introduced via materials, ships, ballast water, and biofouling. OSW structures serving as steppingstones for the spread of invasive species have been flagged as a risk which may vary by location.[108]
4. Wild population impact/disruption of wildlife	
ENCORE Typology: ● Disturbances (eg noise, light)	**Reduction in animal welfare:** Ongoing sources of noise and light will disrupt and distress marine animals, notably marine mammals. **Loss or reduction in marine biodiversity including loss of ETP species:** There is potential for impact from collisions between turbines and wildlife (birds and bats), especially during migratory events. Turbine blades are not readily identifiable to flying birds and bats, increasing the risk of collisions causing injury or death. Vessels and ships traveling to and from OSW sites could strike marine mammals, and OSW infrastructure could disrupt migration routes. Noise and light from construction and operational phases may also impact wildlife.[109]
5. Exploitation of natural resources	
ENCORE Typology: ● Other abiotic resource extraction	**Loss or degradation of coastal and marine habitats:** OSW construction may require dredging, which temporarily disturbs the seabed. The construction of OSW infrastructure may require mined materials (e.g., steel or materials for concrete production), and mining can lead to degradation and disruption of habitats.
6. Climate change	
ENCORE TYPOLOGY: ● Emissions of greenhouse gases (GHG)	**Increased GHG concentrations:** Emissions are generated by vessels that transport and install OSW infrastructure, as well as during the operational phase to service turbines, and by machinery used to install cabling. It is important to note, however, that emissions from these sources are significantly smaller than the avoided GHG emissions from OSW production.[110]

While this report and the recommended pathways for nature positive are divided up into sub-sectors of OSW, there are some high-level considerations that should be addressed upfront by all OSW companies. Across the entire sector, the following actions should be considered at the outset for risk management for the protection of people, nature, and biodiversity:

1. OSW activity or development should not take place within protected or conserved areas[111] (refer to regional or local legislation to determine such areas in the context of your work). Protected or conserved areas should not be downgraded, downsized, degazetted, or delisted for large-scale OSW development,[112] and OSW should also not be developed in other areas that are important for biodiversity and ecosystem services including sites with high ecological integrity. Nor should there be involuntary displacement of Indigenous or local communities for any OSW activity, even in the absence of strong regulation and enforcement for land rights protection. Where possible, selecting and bidding on areas that are already degraded will avoid biodiversity loss and provide opportunities for restoration.

2. Existing OSW farms that are operating in an area being considered for OECM designation must be assessed on a case-by-case basis. The assessment should consider infrastructure lifespan, cumulative impacts (rare or ETP species and ecosystems, spawning or migration sites, ecologically intact areas, regions with significant oceanographic processes), mitigation measures, monitoring frameworks, effects on coastal communities, and whether these measures can ensure long-term biodiversity conservation outcomes in line with GBF targets.

3. OSW companies should avoid bidding for developments sited in or near migratory pathways for sensitive or ETP coastal and marine species, as well as coastal seabird and bat populations.

4. OSW companies should avoid bidding for developments that have been planned in the absence of robust, inclusive, ecosystem-based marine spatial planning that considered biodiversity, or that failed to include an actor engagement process, particularly with the fishing industry and local communities.[113]

5. WWF also strongly recommend that companies develop nature-positive action plans in close consultation with local actors—including community representatives and Indigenous peoples, as well as subject matter experts including credible civil society organizations, researchers or academics, in order to design context- and project-specific approaches appropriate for the particular regulatory, social, economic and environmental conditions in which they are operating.


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NATURE-POSITIVE PATHWAYS IN OFFSHORE WIND

The tables below summarize specific approaches and pathways available for the OSW sector to contribute to nature-positive pathways.

Each table focuses on an OSW sub-sector or industry activity that has material impacts on nature and biodiversity. For more focused examples and information, the activities encompass fixed and floating OSW sub-sectors and each table includes the following information:

- **Activity type:** Actions in fixed and floating OSW that have been shown to impact nature in the planning, construction, and operational phases, and where the available evidence supports illustrative, science-based nature-positive pathways to address these impacts.
- **Industry classifications:** Categorization of the activity type using global codes for business based on economic activities including the International Standard Industrial Classification (ISIC), a system used to classify economic activities; Nomenclature statistique des activités économiques dans la Communauté européenne (NACE), the European Union's industry classification system; and the North American Industry Classification System (NAICS), which is used by the US government to categorize businesses based on economic activity.
- **Relevant impacts:** Icons identifying the impacts of the activity on nature (linking to the pressures and impacts table above) and those that are addressed by operationalizing nature-positive pathways.
- **Global Biodiversity Framework targets:** The GBF targets and their corresponding target numbers are mapped to each of the nature-positive pathways to show which policy targets are addressed by the illustrative actions. Please note that not all targets are featured in the table given that some are overarching and cross-sectoral, but they are included within the narrative where relevant. All targets are equally important to contribute to the nature-positive global goal.
- **The AR3T illustrative nature-positive pathways:** The table is organized by the AR3T mitigation hierarchy—**avoid, reduce, restore and regenerate, transform**—for each industry activity, with a synthesis of science-based actions the OSW industry can take to credibly contribute to the global nature-positive goal. The sub-sector tables outline specific risk management considerations per sub-sector alongside opportunities companies may consider for diversifying their activities in line with restoration and regeneration actions. While all steps in AR3T can be helpful for risk management,

the tables provided consider avoid and reduce actions as the primary drivers of risk management, and restore and regenerate as more closely aligned with creating opportunities. Transformative actions refer to fostering the enabling environment, and therefore cut across both risk management and opportunities. It is important to note the following:

- These illustrative pathways build on existing guidance and the scientific literature, serving as a practical starting point for companies that want to contribute to nature positive in their work. The tables provide an opportunity for industry to begin to understand the concepts, characteristics, and fundamentals of a project that contributes to nature-positive outcomes.
- **These pathways cannot be used for measuring impact or enabling claims, and are not a certification scheme,** but rather highlight a selection of science-based examples to demonstrate how a company could credibly operationalize the mitigation hierarchy to address pressures and impacts on nature.
- The examples are also not exhaustive. There are an extraordinary number of potential pathways a company could take, depending on the context. We have chosen pathways that are supported by science, are impactful, and potentially scalable to facilitate positive change. These pathways can be used as a tool to engage with partners and scientific experts to further develop project-specific plans that adapt the examples provided to the unique ecological, biological, social and economic characteristics and context of the site and the individual project.

OFFSHORE WIND ACTION PATHWAYS

Credible, science-based pathways and illustrative examples by OSW activity to contribute to nature positive. OSW activity types discussed in this chapter:

- **Micro-siting**
- **Design and manufacture**
- **Marine groundworks and installation**
- **Cable laying**
- **Operations and maintenance**
- **Decommissioning**

In the tables below, we provide linkages to specific GBF targets for each pathway. In addition, the cross-cutting and overarching GBF targets, which apply across all the offshore wind tables when the principles and pathways are adopted, include:

Target 14 Integrate Biodiversity in Decision-Making at Every Level

Target 15 Businesses Assess, Disclose and Reduce Biodiversity-Related Risks and Negative Impacts

Target 18 Reduce Harmful Incentives by at Least $500 Billion per Year, and Scale Up Positive Incentives for Biodiversity

Target 23 Ensure Gender Equality and a Gender-Responsive Approach for Biodiversity Action

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MICRO-SITING

Micro-siting refers to the step that occurs after a site has been assigned or leased to an OSW company. It is well understood that OSW companies often do not have the option to select a site and must work with the site assigned by the relevant authority. Micro-siting refers to the decisions the company makes within the assigned site, such as planning where to place turbines or cabling so that impacts to the nature and biodiversity within the bounds of their site are avoided or reduced.

Industry classifications

ISIC 7110

NACE N71.12 Engineering activities and related technical consultancy

NAICS 541320 Landscape Architectural Services

NAICS 541330 Engineering Services

Related impacts:

- Loss or degradation of coastal and marine habitats
- Loss or reduction in marine biodiversity, including loss of ETP species
- Loss of ecosystem resilience and provision of ecosystem services

RISK MANAGEMENT → OPPORTUNITIES

Risk management in micro-siting deals primarily with early-stage risks in the development and operation of a wind farm site, and as such manages physical risks to the company as well as the risks to the environment that may result from development. In this context, Avoid actions focus in particular on preventing site development in particularly sensitive or rare (micro)habitats and healthy ecosystems. The activities to Reduce impact similarly focus on both strategies and techniques that may arise at subsequent stages of development, particularly marine groundworks and installation. For this reason, site selection is emphasized and should be viewed as complementary to the recommendations made for marine groundworks and installation. (**Target** 15)

AVOID

- **Avoid conversion of natural habitats. Avoid development in protected and conserved areas or other areas of particular importance for biodiversity,** ecosystems, and ecosystem services.[114] This includes vulnerable and ecologically valuable areas with key functions including habitat for species with limited ranges, keystone species, ETP species (for example, and at a minimum, those listed on the IUCN red list, CITES, and any with a local status if available)and areas that provide ecosystem services like carbon sequestration and coastal flood defense that are not easily replaceable. **(Targets** 1 3 4**)**

- ***For example:*** *Where OSW development areas overlap with areas with vulnerable or ecologically significant habitats like oyster reefs, or where coastal cabling runs through dunes, the developer should aim to site the turbines and other infrastructure away from ecologically complex or sensitive habitats to avoid damage and instead on degraded open ocean floor if possible, and reroute cabling to prevent fragmentation of marine and terrestrial habitats or disruption of migratory corridors. Establishing a buffer zone, or a minimum distance between construction activities and sensitive habitats, is recommended. For coral reefs, a minimum distance of 400 ft (approx. 120 m) from activity to the habitat has been recommended; however, the local habitat conditions (e.g. currents) and construction activity impacts should be considered case by case.*[115]

REDUCE

- **Reduce micro-site selection where sediment/habitat disruption due to groundworks and installation would be significant,**[116] and/or where there is a high need for maintenance dredging in order to reduce impacts to water quality and the seabed.[117] **(Targets** 1 3**)**

- Reduce impacts on marine or coastal diversity by **salvaging long-lived or otherwise sensitive benthic marine organisms** or coastal flora from impacted areas and relocating to analogous habitats outside the impact area, using local data and technical expertise for site selection, transplanting techniques, and monitoring efforts.[118] This should be done in partnership with relevant expert actors. **(Targets** 1 3**)**

- ***For example:*** *Successful salvage and transplant of corals occurred as part of a biodiversity impact mitigation strategy for the coastal development of a desalination pipeline along Australia's Great Barrier Reef. While not an OSW project, the same principles of AR3T apply in that infrastructure was needed in coastal areas that displaced healthy habitats. Before installation, site assessments were conducted to record the coral colonies within the pipeline footprint. This allowed for the company to adjust the plan and re-route to avoid healthy coral colonies, as well as identify the corals that would need to be relocated due to impacts from construction. Colonies of varying sizes were relocated and transplanted outside of the footprint to a site nearby with similar habitat characteristics. Coral survival and growth were monitored. After two years, total survival was deemed successful based on the mean for global coral restoration success.*[119]

Opportunities in micro-siting are limited given the early development stage of the activity, although during this phase companies may be able to identify sites that would offer opportunities for co-location with other sectors and diversification of revenue streams. For coastal siting, notably for transformers and other ground installations, interacting with coastal ecosystems to restore and regenerate their functionality can have direct benefits for the company through e.g. flood defense.

Deployment of robustly designed, modeled, and eco-engineered artificial modules near to shore can offer coastal protection by supporting sediment accretion and serve as a storm break to improve climate resilience of coastal infrastructure, while also offering a habitat for native wildlife. Similarly, restoring historic dunes and planting dune vegetation can stabilize the coastline and protect inland areas from flood risk. (**Target** 14)

RESTORE & REGENERATE

- Plan for **sufficient area for restoration** activities and/or relocation of salvaged species onsite, which is preferable for like-for-like restoration. Identify opportunities for co-location with activities that will benefit from restorative action and provide opportunities for joint ventures and diversification. This is particularly promising in the growing aquaculture sector (bivalves or sugar kelp.[120] **(Targets** 2 11**)**

- Identify the ecologically and biologically **relevant species** of the site and region (reference, for example, baseline studies from the environmental impact assessment, historical data, local expertise and Indigenous knowledge) to determine the appropriate restorative action and design. (**Target** 4)

  - ***For example:*** *During OSW development in Arctic regions, target species were selected based on regional protected status, IUCN Red List status, and the utilization of the OSW area habitat by wildlife, including for shelter and foraging. These included North Sea crab, European lobster, Atlantic cod, poor cod, and European flat oyster. Literature on these species and their life cycles should be referenced to ensure designed habitats are meeting the needs of target species and the ecosystem in which development is occurring.*[121]

- Incorporate **reef modules** in the siting plan as standalone structures in the wind field for habitat restoration where promotion of reef-associated flora and fauna is appropriate. **(Targets** 2 11**)**

  - ***For example:*** *In North America, the Block Island Wind Farm has become a site for dense mussel populations, contributing to reef building and habitat creation.*[122] *Biogenic reefs such as mussels and oysters act as ecosystem engineers, aiding in reef building and water filtration.*[123]

- For successful reef module design and deployment, implement robust habitat mapping and baseline data collection at the site; conduct modeling; set clear and measurable ecological and biological objectives; [J] identify target species (see above), and incorporate natural designs, materials, and surface textures that biomimic the natural habitat.[124]

TRANSFORM

- Advocate for **inclusive actor engagement** as part of OSW development. (**Target** 22)

- Support the implementation of robust regional **marine spatial planning** and effective **designation of protected areas** to help safeguard ecosystem services and create clarity on how marine spaces are used. **(Targets** 1 3**)**

- Support **research** to secure **detailed nature-sensitivity mapping** that can be used to make informed decisions on siting and micro-siting, as well as research on **construction distance and buffer zone requirements** for sensitive habitats to avoid and reduce impacts. **(Targets** 20 21**)**

J See also *Fitting ecological principles of artificial reefs into the ocean planning puzzle* - Paxton, 2022 - Ecosphere - Wiley Online Library


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DESIGN AND MANUFACTURE

Industry classifications

ISIC 7410 (design)
ISIC 2811 (turbines and component parts)
NACE N71.12 Engineering activities and related technical consultancy
NACE C28.11 for turbine and C25.99 for blade manufacture
NAICS 541320 Landscape Architectural Services
NAICS 333611 Turbine and Turbine Generator Set Units Manufacturing

Related impacts:

- Loss or degradation of coastal and marine habitats
- Loss or reduction in marine biodiversity, including loss of ETP species
- Reduction in animal welfare

RISK MANAGEMENT → OPPORTUNITIES

Risk management For both design and manufacture, risk management focuses on material sourcing from vulnerable areas, as well as on design modifications that can reduce the impact of materials on wildlife and the environment once in use. However, it is often the case that tier 1 suppliers are unaware of where materials are sourced, so companies should try to ascertain this.

In addition to reducing risk to the environment, interventions that, for example, reduce collision risk with birds and bats, could reduce reputational and regulatory risk stemming from biodiversity loss and wildlife harm, thus limiting additional costs for mitigation interventions needed to address impacts to ETP species.(**Target** 15)

AVOID

- **Avoid designs that use metals and/or minerals sourced using destructive practices that convert ecosystems** in the construction of blades, turbines, towers, and foundations. (**Target** 1)

  While the use of metals or minerals, such as copper, nickel, manganese, chromium, and zinc, is unavoidable in OSW construction, a project cannot contribute to nature positive if the minerals and metals used are extracted in a way that converts, at a minimum, critical habitats or high conservation value areas.[125]

- **Avoid designs that require materials from land-based mines with destructive practices** leading to habitat loss or degradation (e.g. deforestation).[126] (**Target** 1)

REDUCE

- **Reduce opportunities for waste and the demand for critical minerals** by taking a circular economy approach to design and incorporating recycled materials into manufacturing. This will reduce the mining need for key materials (e.g., steel, sand, gravel, stones and other metals or minerals).[127] (**Targets** 7 16)

  Predictive data show that the global demand for critical minerals in the transition to net zero could be reduced by 58% if recycling is implemented properly.[128]

- **Reduce the chance of collisions with fauna** including by designing turbines that consider the color of the blades and frequency and intensity of lighting to reduce species risk and light pollution, as well as considering turbine height and turbine clustering (rather than rows) to prevent impacts to seabirds and bats.[129] (**Target** 4)

- **Reduce the habitat impact of new installations** by adopting nature-inclusive and nature-based design approaches into marine infrastructure (such as for the monopile or scour protection), selected to be ecologically appropriate for the location, habitat, and native species.[130] (**Target** 11)

  Consider the use of artificial modules/layers for scour protection to prevent unwanted sediment transport and erosion, while also providing habitat and enhancing ecological function based on the natural ecosystem of the site. The layers, if well designed according to best practices for the site and habitat needs, can add value by creating additional habitat for marine organisms.[131] Structures have been designed that can be added to the monopile, such as biohuts for cod, or oyster gabion baskets,[132] as have modular units that can be added to the bases which create habitat for reef-building species that can in turn support a diversity of spaces for further wildlife.[133] A bioenhanced concrete, called ECOncrete, has been found to support colonization of native organisms in marine infrastructure projects.[134] Specialized, marine-friendly concrete should be considered for use in the parts of the turbine that require concrete.

- **Reduce chemical pollution** by prioritizing the use of inert materials and avoiding anti-fouling agents or surface treatments which are harmful to nature.[135] (**Target** 7)

  - ***For example:*** *Mussels are ecosystem engineers in that they filter water, removing harmful substances from the water column.[136] However, these harmful substances bioaccumulate in their tissues, which could lead to additional bioaccumulation within the food chain upon consumption of the mussels by other marine organisms.*

- **Reduce impacts of cabling on wildlife** by designing cables to limit heat, electromagnetic, and vibration pollution. Cable shielding, insulation and bundling can reduce these impacts. For similar reasons, reduce the use of AC cables in favor of HVDC cables. For AC cables, special attention should be given to the distance between twists. DC cables should be bundled, which also reduces the number of vessels needed for cable laying and the amount of trenching.[137] (**Target** 11)

Opportunities The design phase presents a particularly useful window of opportunity for including ancillary structures to enable rapid recovery of the ecosystem following construction impacts, as well as engineered additions that support commercial co-location.

Designing with nature can bring additional benefits: promoting settlement of colonizing organisms (particularly those that produce calcite) can increase the strength and durability of concrete, supporting the structural integrity of e.g. foundations and scour protection.

Considering the decommissioning early in the design planning can present opportunities. For example, plan and design the infrastructure so that decommissioning can maximize material circularity which will reduce costs of purchasing materials for future OSW development. Also, design so that removal of structures will have the lowest impact on the marine environment, requiring less mitigation to repair any damage (thus saving costs). (**Target** 14)

REDUCE (CONTINUED)

- **Reduce habitat degradation** by designing and incorporating reef modules as additional structures onto the scour protection layers for habitat creation outlined above, and to provide settlement surfaces to support native biodiversity, recognizing that it will not outlast the lifetime of infrastructure but provides habitat restoration that otherwise would not have occurred. (At decommissioning, modules can be moved to salvage native growth and habitat: see also the micro-siting Reduce section and the decommissioning table). For successful reef module design and deployment, implement robust habitat mapping and baseline data collection of the site; conduct modeling; set clear and measurable objectives;[J] identify the ecologically and biologically relevant species (target species) of the site (e.g., through baseline studies from the EIA, historical data, local expertise, and Indigenous knowledge); and incorporate natural designs, materials and surface textures that biomimic the natural habitat.[138] (**Target** 11)

RESTORE & REGENERATE

- Design and manufacture **species-specific habitats** to restore and regenerate vulnerable populations of the site. (**Target** 2)

  - ***For example:*** *In the UK, artificial nesting structures for birds have been deployed as part of an OSW project. Orsted, the developer, in collaboration with a group of scientific experts, designed and deployed the structures in line with regulations to support local colonies of kittiwakes, small seabirds that forage and colonize in and along coastal waters and whose populations may be impacted by OSW development along the UK coast. Because the kittiwake population is vulnerable and in decline, artificial nesting structures were deployed along the coast to provide additional nesting habitat and encourage population growth. So far, three structures have been installed 1 km off the coast: each has the space to support 500 pairs of nesting kittiwakes.[139]*

TRANSFORM

- Advocate across the sector for the adoption of circular economy approaches in the design and manufacture of industrial materials. (**Target** 16)
- Advocate for suppliers to **fill the knowledge gap on material sourcing** and mapping to the original source point. (**Targets** 20 21)
- Invest in **technology and solution development** to improve waste reduction and use of recycled materials in manufacturing. (**Targets** 7 16)
- Advocate for including and heavily weighting **non-price auction criteria (e.g. environmental and social factors)** in procurement and tendering processes to foster innovative solutions and advance best practices. (**Targets** 1 14)
- **Invest in research** to identify ways to reduce leading-edge erosion on turbine blades to reduce contribution to microplastic pollution. Also, support research on anti-fouling agents and turbine corrosion-protection systems to identify better solutions and prevent harmful surface treatments on towers and turbine blades from polluting the water column and the seabed. (**Target** 20)
- **Advocate for nature inclusive design (NID) criteria** (e.g. materials used, shape, baseline studies and modeling requirements) by the government to prevent unintended consequences from poorly designed elements. (**Target** 11)

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MARINE GROUNDWORKS AND INSTALLATION

Industry classifications

ISIC 4312 and **ISIC 7112** (Groundworks)

ISIC 4220 (Installation)

NACE N71.12 Engineering activities and related technical consultancy

NACE F43.50 Specialized construction activities in civil engineering

NACE F42.22 Construction of utility projects for electricity and telecommunications (Installation)

Industry classifications (CONT.)

NAICS 541310 Architectural services

NAICS 541320 Landscape architectural services

NAICS 541330 Engineering services

Related impacts:

- Loss or degradation of coastal and marine habitats
- Loss or reduction in marine biodiversity, including loss of ETP species
- Reduction in animal welfare
- Loss of ecosystem resilience

RISK MANAGEMENT → OPPORTUNITIES

Risk management Marine groundworks and installation present specific physical risks to nature, notably through habitat destruction, pollution, and wildlife disturbance during the construction phase. Companies should also be aware of potential transition risks, particularly regulatory and reputational risks, associated with the destruction or degradation of healthy and especially charismatic marine habitats.

Management of these risks includes avoiding impacts through timing of construction activities and through technological innovations that reduce pollution. Given that siting of specific works is a key tool in mitigating impact, risk management for groundworks and installation should be considered in tandem with risk management for micro-siting. (**Target** 15)

AVOID

- **Avoid coastal work at night** to prevent disruption to sensitive nocturnal species and coastal communities. (**Target** 4)
- **Avoid coastal and marine work during spawning, migratory, or breeding seasons for commercially important, vulnerable, and/or ETP species** (noting that migration routes and seasonality are shifting due to climate change, so companies will need to continuously monitor trends and support frequent monitoring). Consult predictive models, as well as recent and historical data to determine migratory activity and life stage behaviors for commercially important, sensitive, and ETP wildlife to avoid disruption. (**Target** 4)
  - ***For example:*** *In the northern Atlantic, Atlantic cod, an important commercial species listed as Vulnerable on the IUCN Red List, spawn between January and April. Therefore, if an OSW development is slated for an area where cod spawning is known to occur, avoiding construction during the spawning period would be advised, given that seafloor construction and water column disturbance and noise would disrupt the spawning activity.*[140] *Similarly, the North Atlantic right whale is listed as Critically Endangered on the IUCN Red List. Its migration routes follow the Atlantic coast of the USA, through areas that may be selected for OSW development. For the majority of the year, these whales feed in the north, primarily in the Gulf of Maine, and migrate to the south, off the coast of Georgia and Florida, from December to March for calving. In this case, a project would consult the known migratory paths and their seasonality, and avoid development works when the North Atlantic right whales are in the area.*[141]

REDUCE

- **Reduce light pollution** by restricting working hours and consecutive days of activity. (**Target** 7)
- **Reduce noise pollution** by establishing and monitoring noise threshold values to ensure emissions remain below acceptable levels. (**Target** 7)
- Restrict working hours and consecutive days of activity, as well as prioritizing **drilling which produces less noise** over hammering for pile installation where possible. (**Target** 7)
- If pile-driving, initiate works with a gradual increase in noise levels ("soft start") to encourage noise-sensitive species to leave the area safely.[142] This method is often preferable to deterrent devices, which can cause persistent disruption. Similarly, using bubble curtains or screens, or adjustable fluid cushions and hydro sound dampers for hammering components has been effective in reducing noise.[144] Consider vibro-piling or jetting, techniques that reduce sediment resistance and allow piles to sink into the seabed without impact hammers.[145]
- **Reduce seafloor sediment disruption** through low-impact construction techniques. (**Target** 1)
- **Reduce wildlife impacts** by conducting appropriate monitoring, such as marine mammal surveys before activities commence, and allowing for ad hoc shutdowns when marine mammals are observed in the area. Passive acoustic monitoring of marine mammals can be used during periods of low visibility.[146] (**Targets** 4 21)
- **Reduce entanglements of marine wildlife** (for example, sea turtles) in gear used during construction, like buoys and lines for floating OSW by securing and tightening lines, eliminating the use of rope where possible, and recovering lost gear/equipment/lines as quickly as possible.[147] (**Targets** 1 4)

Opportunities Restoring degraded habitats, such as seagrass beds, can support coastal and climate resilience as well as biodiversity enhancement. When degraded seagrass beds are restored, data show that fish and invertebrate biomass, as well as carbon and nitrogen stocks, increase over time.[148] Restoration of carbon-capturing habitats such as seagrass meadows, when conducted well with meaningful outcomes[K] can lead to rapid recovery of coastal ecosystem services, but also present opportunities for generating carbon credits[L] for companies undertaking restoration efforts. Biodiversity credits may also present an opportunity for companies; however, they must represent a measured and evidence-based positive biodiversity outcome from nature restoration, conservation or stewardship activities that is not purchased for the purpose of offsetting residual negative impacts.[149]

There are also opportunities in the co-use of vessels and equipment that can be utilized for both the construction of the OSW infrastructure, and also for the deployment of restoration interventions and efforts. (**Target** 14)

RESTORE & REGENERATE

- **Prioritize the restoration and regeneration of especially biodiverse habitats** that could be impacted by groundworks and installation, or that existed in the area previously to restore it to a pre-degraded state (see also micro-siting and cable laying tables). Follow best management practices per ecosystem type. (**Targets** 2 11)
  - ***For example:*** *Key considerations for seagrass restoration include proximity to donor beds, water quality, planting techniques, scale, site selection, and planting materials.*[150] *A passive restoration tactic that has proven successful with eelgrass (*Zostera marina*) is implemented through the release of millions of seeds into degraded lagoonal areas. In Virginia, this has led to the recovery of over 3,600 ha of seagrass beds.*[150] *For kelp restoration, planting methods, hatchery needs, planting depths, and species interactions should be considered.*[151] *In Nova Scotia, a kelp restoration project introduced artificial reefs mimicking natural habitats in a degraded harbor to support kelp restoration. Kelp colonization, as well as use by sea stars, crabs, and fish was recorded, with the depth of the structures influencing success—shallower waters supported higher kelp coverage.*[152]

TRANSFORM

- **Advocate for a well-designed, inclusive, and ecosystem-based marine spatial planning process** that will mitigate impacts of work and installations in biologically and ecologically sensitive areas or habitats that host spawning, migration, and breeding of commercially important, vulnerable, and ETP species. (**Targets** 1 3)
- **Advocate for seascape-level groundworks and installation planning to avoid cumulative impacts** of construction noise and lighting from multiple different coastal projects. (**Target** 1 7)
- **Advocate for piling requirements for all marine construction that limit damage** to seabed habitat. (**Targets** 7 11)
- **Share knowledge** of the best available techniques across the sector for marine groundworks and installation, and continue supporting research and development of new and less impactful approaches and technologies. (**Target** 21)

K See for example the Global Mangrove Alliance Restoration Guidelines Joint landscape position papers and roadmap (2022-2024) | ISEAL Alliance and the SBTN Seascape Engagement Initiative Roadmap on p.118 Technical-Guidance-2025-Step3-Ocean-v1.pdf

L See 773q5lvbf0_WWF_position_and_guidance_on_corporate_use_of_voluntary_carbon_credits_EXTERNAL_VERSION_11_October_2019_v1.2.pdf for more details

CABLE LAYING

Industry classifications

ISIC 4220

NAICS 237130 Power and Communication Line and Related Structures Construction

Related impacts:

- Loss or degradation of coastal and marine habitats
- Loss or reduction in marine biodiversity, including loss of ETP species
- Reduction in animal welfare
- Loss of ecosystem resilience and provision of ecosystem services

RISK MANAGEMENT

Risk management Cable-laying presents specific impacts to nature especially through habitat degradation at installation and via pollution to the surrounding environment from suspended sediment, vibration, electromagnetism, and/or heat.

Companies should also be aware of potential transition risks, particularly regulatory and reputational risks, associated with the destruction or degradation of healthy marine habitats and harm to charismatic wildlife. Management of these risks includes avoiding impact through timing of construction activities, reducing impact through greater insulation of materials, and remediating impact in the immediate environment surrounding cables. Such insulation and burying of cables can reduce the risk of damage, and can thus save costs. (**Target** 15)

AVOID

- **Avoid conversion of natural habitats. Avoid cable laying through protected and conserved areas or other areas of particular importance for biodiversity, ecosystems, and ecosystem services.**[153] This includes vulnerable and ecologically valuable areas with key functions including habitat for species with limited ranges, keystone species, ETP species (for example and at a minimum, those listed on the IUCN Red List, CITES, and any with a local status if available), and areas that provide ecosystem services like carbon sequestration and coastal flood defense that are not easily replaceable and slow to recover if impacted (e.g., coral reefs, sea grass, mangroves). (**Targets** 1 3 4)
  - ***For example:*** *Any projects that may impact a coastal mangrove habitat should make every effort to avoid mangrove removal. A restored mangrove habitat, even of the same area of the impacted mangroves, is not equivalent in terms of the ecosystem services (e.g. carbon storage) or the biodiversity it provides.*[154]
- **Avoid coastal work at night to prevent disruption** to sensitive nocturnal species and coastal communities. (**Target** 4)
- **Avoid coastal works during spawning, migratory, or breeding seasons** for commercially important, vulnerable and ETP species (noting that migration routes and seasonality are shifting due to climate change, so companies will need to continuously monitor trends and support frequent monitoring). Consult predictive models, recent and historical data to determine migratory activity and life stage behaviors. (**Target** 4)
  - ***For example:*** *In tropical regions, endangered green sea turtles nest on beaches and within dune habitats, preferentially selecting nesting sites near or on dunes with native vegetation.*[155] *In the tropical western Atlantic, nesting occurs from March to May. Construction or other activities should make every effort to avoid cabling through nesting sites, and construction should not occur during nesting months in known nesting areas/sites.*

REDUCE

- **Reduce impacts on marine or coastal diversity** by salvaging benthic marine organisms or coastal flora from impacted areas and relocating to analogous habitats outside the impact area using local data and technical expertise for site selection, transplanting techniques and monitoring efforts. This should be done in partnership with relevant expert actors. (**Targets** 1 3)
  - ***For example:*** *Successful salvage and transplant of corals occurred as part of a biodiversity impact mitigation strategy for the coastal development of a desalination pipeline along Australia's Great Barrier Reef. While not an OSW project, the same principles of AR3T apply in that infrastructure was needed in coastal areas that displaced healthy habitats. Before installation, site assessments were conducted to record the coral colonies within the pipeline footprint. The assessments allowed for the company to adjust the plan and reroute to avoid healthy coral colonies, as well as identify the corals that would need to be relocated due to impacts from construction. Colonies of varying sizes were relocated and transplanted outside of the footprint to a site nearby with similar habitat characteristics. Coral survival and growth were monitored. After two years, total survival was deemed successful based on the mean for global coral restoration success.*[156] *The same principles can be applied to different ecosystem types, to make microsite changes and reroute cabling around healthy habitats where possible, and salvage the native benthic organisms of that location where impossible to avoid.*
- **Reduce seabed disturbance and impact** by (**Target** 1): Conducting pre-construction route planning to limit trenching needed. Utilizing techniques such as horizontal directional drilling where possible and refilling trenches with the same excavated material to support seabed recovery.
- **Reduce suspension of sediment** by working carefully and slowly with machinery that reduces sediment disruption. (**Target** 11)
- **Reduce impacts of cabling on wildlife** by designing cables to limit heat, electromagnetic, and vibration pollution. Burying cables at depths can minimize electromagnetism impacts on wildlife, especially organisms like sharks and rays that rely on natural magnetic fields to navigate and forage (and that may be found in OSW areas).[157] Cable shielding, insulation and bundling can reduce impacts from temperature, vibration and electromagnetism. For similar reasons, reduce the use of AC cables in favor of HVDC cables.[158] For AC cables, special attention should be given to the distance between twists. DC cables should be bundled, which also reduces the number of vessels needed for cable laying and the amount of trenching. (**Targets** 1 4)
- **Reduce the impact of cabling** by deploying modular artificial structures over cabling, such as basalt bags or reef cube filter bags to create microhabitats, or reef cube mats and fleximats that serve both to protect cabling and promote colonization by native wildlife.[159] For successful module design and deployment, implement robust habitat mapping and baseline data collection of the site, set clear and measurable objectives, identify target species, and incorporate natural designs, materials, and surface textures that biomimic the natural habitat. Complement restorative efforts by actively planting species onto the surrounding seabed and through deploying adjacent artificial structures. Planting existing native wildlife such as corals or oysters (depending on latitude and habitat) onto artificial structures will advance timelines to support robust ecosystem function and enhance biodiversity.[160] (**Targets** 2 11)
- **Reduce lighting impacts** by restricting light use during peak nesting seasons and hatching hours, building on the above sea turtle example, to reduce the disorientation of emerging sea turtle hatchlings. (**Targets** 4 7)
- **Reduce the use of harmful chemicals** in cabling that could pollute the water column. In the event of a blowout during horizontal directional drilling, those harmful chemicals could be released and disrupt the marine and coastal ecosystem. Therefore, also reduce the use of harmful chemicals in horizontal directional drilling. (**Target** 7)

CABLE LAYING (CONTINUED)

Industry classifications

ISIC 4220

NAICS 237130 Power and Communication Line and Related Structures Construction

OPPORTUNITIES

Opportunities Opportunities for nature-positive contributions exist within cable laying by building with nature in mind and investing in structures to cover or sit alongside cables that provide artificial habitat for marine wildlife. From a business perspective, there are opportunities to use these nature-based developments as a means to attract sustainable financing as well as co-location opportunities with other industries such as aquaculture. (**Target** 14)

RESTORE & REGENERATE

- **Deploy restoration activities for ecosystem types impacted by the cabling** (e.g., coastal dunes or mangroves) following best management practices for each habitat. (**Targets** 2 11)
  - ***For example:*** *The fundamentals and considerations for dune restoration include having a comprehensive understanding of historical coastal data such as dune shapes, elevations, reference dunes, site selection and sand placement, sand sourcing, plant selection for stability, nesting, foraging and other habitat needs.*[161] *Mangrove and wetland restoration fundamentals include feasibility studies, site assessments (including investigating hydrological connections and species zonation), modeling, and following the best practices as defined at a site-specific level (see, for example, Best practice guidelines for mangrove restoration).*[162]
  - ***For example:*** *In Veracruz, Mexico, coastal dunes were impacted by coastal infrastructure development, causing windblown sand to accumulate in the city, and negatively impact the local community. Dune restoration efforts were initiated to recreate a dune of 2 km in length. Once the sand was placed, a combination of naturalized and native vegetation was planted immediately to support dune stability, sand capture, and natural plant succession. The recreated dune system has been successful in capturing and stabilizing sand, promoting native plant establishment, and has been self-sustaining for over a decade, showing that large-scale coordinated restoration efforts can create long-lasting results.*[163] *Although the infrastructure was not OSW cabling-specific, the example highlights the possibility of successful restoration of habitat and ecosystem services in dunes.*
- While the best practice is to **avoid mangrove forest impacts, restoration could be a suitable intervention** to recover a degraded site.
  - ***For example:*** *The Global Mangrove Alliance has designed comprehensive best practice guidelines for mangrove restoration that bring together local and scientific knowledge. The guidelines lay out best practices based on the best available science and an emphasis on an inclusive mangrove restoration process. The guidelines walk through the key steps and decision trees for approaching and carrying out successful mangrove restoration, from setting goals, assessing feasibility, project design, engagement and implementation, to monitoring and evaluation with case study examples. It also touches on blue carbon projects and how to appropriately design them.*[164]

TRANSFORM

- **Advocate for and participate in robust coastal planning and ecosystem-based marine spatial planning** that considers cable-laying and ground installations to avoid impacts to coastal communities and sensitive habitats. (**Target** 1)
- **Share knowledge** of the best available techniques for cable laying and continue supporting research and development of new and less impactful approaches and technologies. (**Target** 21)

CASE STUDY

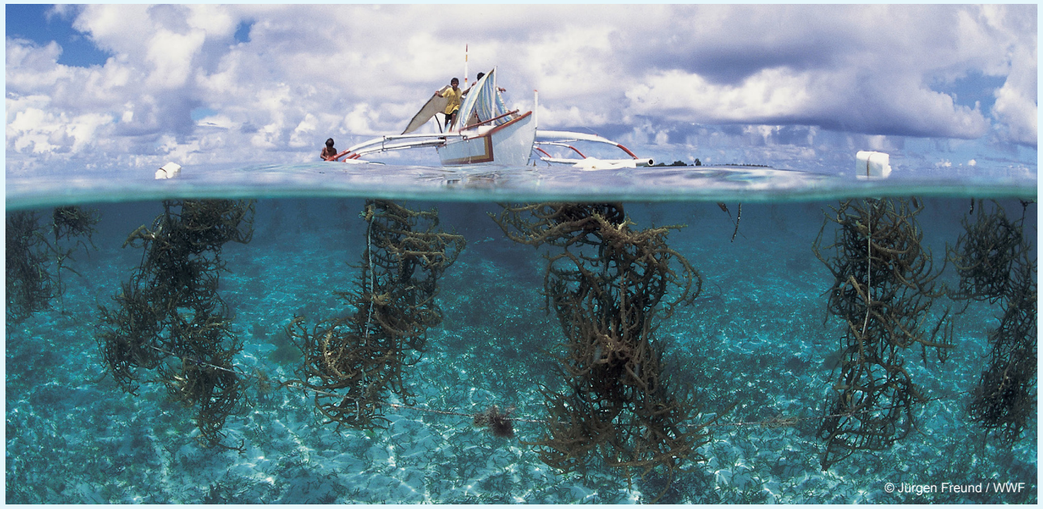
FARMING BETWEEN THE TURBINES: WHAT IS THE POTENTIAL FOR AQUACULTURE ON WIND FARMS?

Author: Merrielle Macleod

Now more than ever, the world is exploring the potential for increased production of low-trophic aquaculture, like seaweeds and bivalves. Possible benefits of this approach include increasing healthy seafood for people, building and diversifying coastal economies, as well as producing innovative new materials that can fill important demands in today's society, like replacements for plastics with seaweed, or reducing emissions from livestock when used as feed additives. A particularly compelling aspect of increasing seaweed and bivalve production is that unlike traditional finfish cage aquaculture, bivalve and seaweed farming has the potential to achieve these benefits while improving water quality, and in some cases even temporarily increasing biodiversity or sequestering carbon.[328]

Seaweed and bivalve farms do not require external feed inputs, arable land or freshwater. However, a challenge remains as to where to site these farms in order to achieve meaningful growth, particularly in the complex mosaic of existing coastal uses. Although there are many aquaculture production system designs, these farms often rely on vertical and horizontal lines that are not always compatible with other uses.

While legal and social license to operate considerations vary by region, many farmers have begun to contemplate aquaculture farm designs within the footprint of wind farms, taking advantage of shared and potentially compatible space needs—and even, in some cases, potential infrastructure sharing. One example is the ULTFARMS project in Denmark, where lines seeded with seaweed (with an eye towards expanding with mussels) were placed between turbines at Orsted's Anholt wind site in 2023 for the first time. While existing projects remain as pilots or experimental in nature to date, the industry is exploring technical, social, legal and environmental challenges and potential with an eye to the future. Concerns and questions remain as well. For instance, filter-feeding bivalves that are potentially exposed to chemicals leaching from turbines could be a risk in food produced at these sites. In addition, there are concerns about the potential for increased damage risk to costly infrastructure from shared use or proximity. The potential for aquaculture co-location with offshore wind will depend on local legal and environmental contexts, and on integrating local actors to design systems that can maximize potential benefits and minimize the risks for the specific situation.



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OPERATIONS AND MAINTENANCE

Industry classifications

ISIC 3510
ISIC 3314
NACE D35.12 Production of electricity from renewable sources
NACE D35.13 Transmission of electricity
NACE C33.14 Repair and maintenance of electrical equipment
NAICS 221115 Wind Electric Power Generation
NAICS 237120 Power and Communication Line and Related Structures Construction (Installation)

Related impacts:

- Loss or degradation of coastal and marine habitats
- Loss or reduction in marine biodiversity, including loss of ETP species
- Reduction in animal welfare
- Increased GHG concentrations

RISK MANAGEMENT → OPPORTUNITIES

Risk management Risk management during operations focuses on managing chronic rather than acute impacts, such as cumulative or long-term impacts of wind farm operations on marine wildlife, as well as improving efficiency and reducing waste.

Notably, operation and maintenance of offshore wind farms is largely undertaken via ships; ensuring vessel-based impacts on nature are avoided or minimized is central to managing transition risks for this sub-sector. (**Target** 15)

AVOID

- **Avoid pollution** by abiding by vessel laws and regulations in areas such as ballast water, wastewater, sewage and emissions management in order to prevent harm to wildlife or disruption of ecosystem processes. Invasive species are especially important to consider here as they are often introduced via ballast water and can disrupt the habitat and functionality of the local ecosystem.[164] (**Target** 7)

REDUCE

- **Reduce pollution and mitigate incidents** by designing robust waste and pollution management plans. (**Target** 7)
  - ***For example:*** *Establish and maintain a spill prevention, control and countermeasures plan.[165] Ensure vessels and machinery are regularly maintained, in compliance with relevant laws and regulations. This includes consistent checks for leaks to prevent spills during ocean operations.*
- **Reduce wildlife disruption and collisions** by reducing speed, planning vessel operations at specific times of day and year, and minimizing the number of vessel trips. Operate with scheduled shutdowns during periods of high wildlife activity, including migratory and breeding seasons.[166] (**Targets** 1 4)
- **Reduce chemical pollution** by prioritizing the use of inert materials and avoiding anti-fouling agents.[167] (**Target** 7)
- **Reduce seabed disruption from anchor drag** by designating fixed mooring points and mooring buoys.[168] (**Target** 1)
- **Reduce impacts from vessel use** by leveraging new technology and alternative methods to maintain turbines, for example by using drones to service the OSW infrastructure instead of vessel trips. (**Target** 20)
- **Reduce harmful impacts from invasive species** on ecosystems by designing and deploying a management plan for their removal and eradication. Opportunistic or non-native coastal plant species may become established near shore. Invasive plants should be removed (refer to best removal practices for each species) and replaced with native vegetation. (**Target** 6)
  - ***For example:*** *In the tropics, a vine (called "love vine") smothers and kills native vegetation, but consistent monitoring of developed sites will allow for early detection and intervention. In the polar north, specifically the North Sea where OSW farms are being installed,, the invasive Pacific oyster (*Crassostrea gigas*) has been replacing the native European flat oyster (*Ostrea edulis*),[169] so monitoring and early detection will allow for intervention to reduce spread and promote native establishment.*
- **Reduce entanglements of marine wildlife** in any lines or gear used during the operation phase, like buoys and lines for floating OSW installations, by securing and tightening lines, eliminating the use of rope where possible, and recovering lost gear/equipment/lines as quickly as possible. (**Targets** 1 4)
- **Reduce entanglements in ghost gear** that may get caught in lines from floating OSW; the increase in lines to anchor down floating OSW structures increases the probability of ghost gear getting caught, making wildlife harm more likely. (**Targets** 1 4)
  - ***For example:*** *Alarms are being developed to notify action response teams if something attaches to anchor lines so they can rapidly respond and free any trapped wildlife and/or remove ghost gear from the water.[170]*

Opportunities Wind farm operators are likely able to capitalize most effectively on co-location and income diversification opportunities due to their sustained involvement with a specific area. Identifying opportunities for additional economic activity, notably in the context of mariculture and the emerging blue economy, can build directly on nature-positive activities that have taken place during planning and construction phases. A recent study mapped the global co-location potential of OSW and aquaculture and found that nearly 3 million km^2 of ocean space in 95 countries is suitable for co-location of OSW and finfish, bivalve or seaweed aquaculture.[171]

In line with risk management during wind farm operations, efficiency gains in e.g. waste management may provide cost saving opportunities.

The opportunity to develop a nursery site, including growing and cultivating, or as a place to temporarily place salvage species for outplanting, could be incorporated into the operations of the site to supply it with living material and support biodiversity enhancement. (**Target** 14)

RESTORE & REGENERATE

- **Restore degraded habitats onsite** to meet the needs of ecosystem repair, and simultaneously integrate nature-based design into restoration for mooring and anchoring systems for both vessels and floating OSW installations. Specifically, use artificial reef modules to create fixed anchor points that provide a reliable and predictable location for service vessels to moor, while also serving as artificial habitat for native wildlife (see reef module information in the micro-siting tab for key considerations). This approach will first restore habitats and can also reduce future harm from anchoring. (**Target** 11)
  - ***For example:*** *Utilizing reef modules for fixed anchoring/mooring points is a new concept with few references in the literature. However, applying the same principles of robust, eco-engineered reef modular design for habitat restoration to nature-based moorings would allow for mooring buoys and anchors to use nature-inclusive design that helps to recover habitats while also reducing the impacts of anchor drag on the seabed.[172]*

TRANSFORM

- **Support research into new technologies** for turbine maintenance, such as drones, to advance knowledge and efficiency and to reduce noise from service vessels. (**Targets** 20 21)
- **Support research and case studies for newer approaches** such as artificial module mooring and anchor bases to evaluate the science and support the field in new, less invasive and disruptive techniques for floating OSW installations and vessel anchoring and mooring. (**Targets** 20 21)
- **Collaborate with scientific monitoring programs** to improve data collection and understanding of long-term and cumulative impacts of OSW deployment to adaptively manage interventions as needed. (**Targets** 20 21)


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DECOMMISSIONING

Industry classifications

ISIC 4311

ISIC 3830

NACE F43.11 Demolition

NACE E38.21 Materials recovery

NAICS 328910 Site Preparation Contractors

NAICS 562920 Materials Recovery Facilities

Related impacts:

- Loss or degradation of coastal and marine habitats
- Loss or reduction in marine biodiversity, including loss of ETP species
- Reduction in animal welfare
- Loss of ecosystem resilience and provision of ecosystem services

RISK MANAGEMENT → OPPORTUNITIES

Risk management For decommissioning, impacts on nature (which are similar to those in marine groundworks and installation) as well as impacts stemming from industrial waste are key sources of transition risk. In addition, there exist regulatory risks related to the proper handling of industrial materials and the demolition of project sites.

Incorporating nature-positive considerations here can be part of ensuring proper and responsible decommissioning. The transition to the circular economy in OSW is another central element of decommissioning, particularly in the context of emphasizing the recyclability of turbine components. (**Target** 15)

Opportunities Decommissioning provides opportunities for nature to reclaim habitat left vacant by removed or abandoned structures; actively supporting recolonization by marine wildlife can accelerate this process.

Allowing for portions of the structures to remain, where it is feasible in the regulatory and environmental context, could generate compounded savings by reducing recovery costs for embedded structures, as well as the need to salvage and transplant species where required by regulations. However, partial decommissioning should not be driven by cost savings: any savings should be allocated for the continued restoration and management of the area by the government, since after decommissioning, the company is no longer legally allowed to utilize or manage the site. (**Target** 14)

AVOID

- **Avoid decommissioning activities that will impact species with limited ranges and keystone species.** Maintain a minimal footprint of decommissioning activity to limit impact to species and surrounding habitats. (**Targets** 1 4)
- **Avoid decommissioning work at night to prevent disruption to sensitive nocturnal species as well as coastal communities.** (**Targets** 1 4)
- **Avoid decommissioning work during spawning, migratory, or breeding seasons** for commercially important, vulnerable, and ETP species (noting that migration routes and seasonality are shifting due to climate change so companies will need to continuously monitor trends and support frequent monitoring). Consult predictive models, recent and historical data to determine migratory activity and life stage behaviors for these species. (**Targets** 1 4)
  - ***For example:*** *In the northern Atlantic, Atlantic cod, an important commercial species listed as vulnerable on the IUCN Red List, spawn on the seafloor between January and April. Therefore, if an OSW decommissioning is slated for an area where cod spawning is known to occur, avoiding demolition in those seafloor locations during the spawning period would be advised.*[173]

REDUCE

- **Reduce opportunities for waste by taking a circular economy approach** to material use and through implementation of a robust waste management plan, recovering materials to facilitate recycling and reuse at other OSW sites. (**Target** 16)
- **Reduce impacts of structural removal on native species** by evaluating native growth on submerged and intact non-leaching components. It is likely that over the life cycle of a project, marine and coastal vegetation and other organisms could grow over the cabling and on the turbine structure. (**Target** 21)
  - ***For example:*** *OSW structures have been found to provide a substrate for biocolonization.*[174] *It is important to evaluate the added value of retaining these structures on site and determine whether they will remain to save native growth. In particular, decommissioning tactics should consider the buildup of biomass and whether it is better to leave the submerged portion of the structure and support only a partial decommissioning, if the regulatory environment allows.*[175] *Similarly, a company should assess whether leaving a partial structure for native growth is better or worse for biodiversity than reusing those parts in a circular economy, to limit further biodiversity loss through material procurement.*

RESTORE & REGENERATE

- **Relocate flora and fauna residing on structures scheduled for decommissioning to adjacent, non-impacted and analogous habitat** to facilitate habitat restoration. (**Target** 1)
  - ***For example:*** *If the cabling or other parts of the structure are to be removed, the flora and fauna should be salvaged from the structure and transplanted elsewhere and/or used to restore the habitat post removal.*[176]
- **Allow certain (non-leaching) components to be left intact and submerged to foster biocolonization, creating an artificial reef.** (**Target** 2)
  - ***For example:*** *While there are not enough mature OSW projects to fully investigate the impacts of leaving portions of the submerged turbine in the water to become an artificial reef, this approach has been investigated for oil rig decommissioning in a "rigs to reef" approach, which could be adapted for submerged turbine bases.*[177]

TRANSFORM

- **Adopt and advocate for circular economy approaches** for the design and manufacture of industrial materials. Recycle decommissioned materials for future use wherever possible. (**Target** 16)
- **Advocate for policy that requires cost savings from partial decommissioning to be put into a government restoration fund** to support ongoing restoration and management of the area. For oil rigs and platforms, it is legally required that the company have finances in place for full decommissioning; therefore there is a precedent for cost savings to be placed into a fund for OSW. (**Target** 19)
- **Contribute to and support research on the new concept of "Turbine to reef"**[178] to better understand how the underwater bases of the decommissioned turbines could become artificial reef structures post project life cycle. (**Targets** 20 21)

OFFSHORE WIND: FIXED AND FLOATING

A nature-positive vision for offshore wind: Visualizing illustrative pathways for the sector.
(Note: Figures are not to scale, and do not depict all actions recommended herein.)

FIXED TURBINE

DESIGN TURBINES TO REDUCE WILDLIFE COLLISIONS
Consider Turbine height, blade color, and lighting

FLOATING TURBINE

RESTORE DEGRADED HABITATS ONSITE
to meet the needs of ecosystem repair, for example with reef modules to create fixed anchors and habitat

REDUCE WILDLIFE DISRUPTION
and collision by reducing speed and minimizing trips

PARTICIPATE IN INCLUSIVE ACTOR ENGAGEMENT
and robust marine spatial planning as part of OSW development

AVOID CONVERSION OF NATURAL HABITATS,
for example avoid mangrove removal

CABLING TO THE LAND-BASED GRID
should avoid vulnerable or ecologically significant habitats

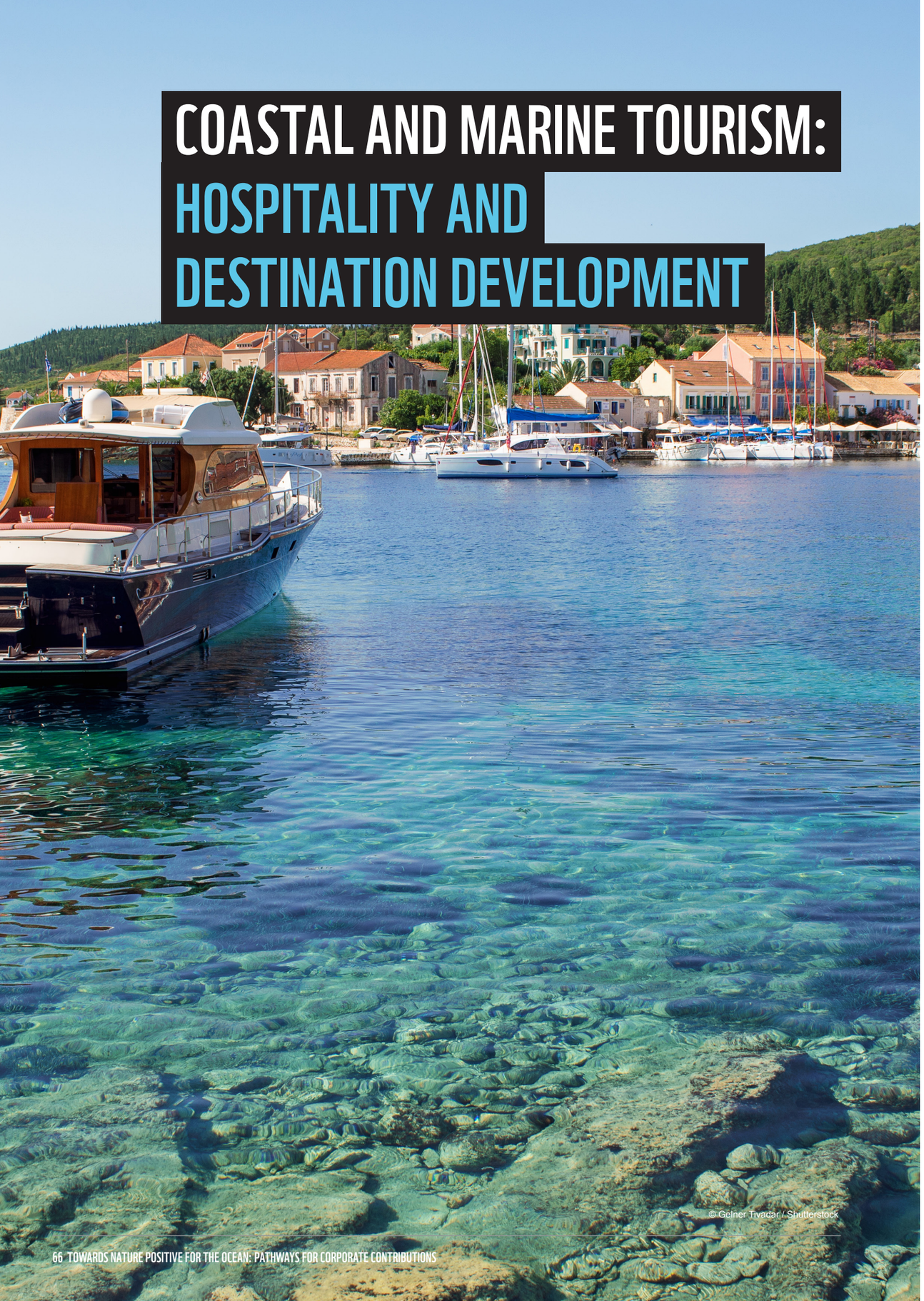
ADOPT NATURE-INCLUSIVE DESIGN
appropriate to each location

REDUCE ENTANGLEMENTS OF WILDLIFE
by securing gear and tightening lines for floating turbines

DEPLOY MODULAR STRUCTURES OVER CABLING
to reduce impact, protect cable, and create habitat

SITE TURBINES AWAY FROM AREAS OF PARTICULAR IMPORTANCE
for biodiversity, ecosystems, and ecosystem services

COASTAL AND MARINE TOURISM: HOSPITALITY AND DESTINATION DEVELOPMENT



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The coastal and marine tourism sector plays a significant role in the economy of coastal communities worldwide, with 50% of global tourism based near the sea. Projections state that by 2030 it will be the largest ocean economy sector by share of GDP. Similarly, the cruise ship industry, a sub-sector of tourism, is growing rapidly in part due to interest from developing economies looking to increase foreign revenue.[179]

This growth presents both opportunities and challenges; coordinated, nature-centric planning and sustainable development offer opportunities to contribute to nature-positive outcomes, while continued growth in an already crowded space increases pressures and impacts on coastal communities and sensitive habitats. Coastal and marine tourism tends to concentrate activities in sought-after, biodiverse coastal regions;[180] thus, cumulative impacts on sensitive areas can be significant.

While coastal and marine tourism encompass many sub-sectors, this chapter focuses on hospitality and destination development along the coast and in the marine environment. While cruise ships are addressed more holistically and from a regulatory perspective in the shipping chapter, we include cruise line destination stewardship and development as applicable within this chapter. Coastal and marine tourism is dependent on coastal and real estate development—including ports, private homes, or other infrastructure along the coast and in nearshore waters—that impacts coastal and marine ecosystems. While it is understood that these sub-sectors are part of and critical to the coastal landscape and seascape, as well as considering cumulative impacts, this chapter focuses on illustrative pathways for hospitality and destination development with learnings that can be applied to other coastal development activities to raise ambitions and contribute to nature positive for the oceans.

This chapter touches on several different phases of hospitality and destination development. In general, any individual or group working in the coastal and marine tourism space is an appropriate audience for this chapter. More specifically, those involved in project scoping and planning (e.g., real estate groups and owners, hotel companies, cruise companies), construction (project developers), hotel or site operations (hospitality groups), and any entity responsible for the management of native coastal and marine wildlife throughout all phases of the projects, could benefit from the content. Additionally, financial institutions (FIs) lending to, investing in, or underwriting marine and coastal tourism projects or companies will also benefit from understanding the recommendations, as they can inform FIs' corporate engagement efforts, policy development, and sustainable finance frameworks (and associated products).

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COASTAL AND MARINE TOURISM: THE INTERFACE WITH NATURE

Coastal areas globally encompass a diversity of ecosystem types that support biodiverse assemblages of flora and fauna. Given the rich biodiversity often found in coastal systems, the coastal and marine tourism industry is well positioned to approach hospitality and destination development in consideration of and in alignment with nature. The sector, however, exerts pressures on the coastal and marine environment that can change how these environments function, and the services and benefits they are able to provide directly to the sectors and to society at large. Specifically, the infrastructure needed for tourism can lead to harmful impacts on nature. The diagrams below show a non-exhaustive selection of coastal ecosystems that are impacted by coastal and marine tourism activities, as well as ecosystems that support biodiversity and provide key services that benefit business, nature, and people. They are also ecosystem types where restorative and regenerative interventions have been scientifically designed and deployed to rehabilitate and repair the system, which can be scaled to restore ecosystem services. By approaching coastal and marine tourism from the perspective of avoiding and reducing impacts and then restoring and regenerating the ecosystems in which the hospitality and destinations are developed, benefits for the company, nature, and society can be achieved. When healthy and thriving, these ecosystems boost not only coastal resilience and protection of assets, **but also tourism that relies on biodiverse nature and wildlife.** As an example, coral reefs provide US$36 billion a year in economic value through tourism, US$19 billion of which is generated through activities on the reef such as diving and wildlife watching, while the remainder is generated from adjacent and dependent areas, such as for tourists seeking ocean views, beaches or locally sourced seafood.[181]

KELP FORESTS: Kelp forests occur globally in temperate and polar regions, and coastal or marine tourism near these sensitive habitats can negatively impact them through pollution, construction, or vessel activity.

REEFS: Because coastal tourism operates near reefs to enhance guest enjoyment, these critical and sensitive habitats are likely to be affected by industry activities.

SEAGRASS BEDS: Seagrass beds are a critical habitat that could be impacted by coastal and marine tourism as they are often found nearshore, where coastal and marine tourism activities are abundant.

MANGROVES: Mangrove loss has been driven by a combination of climate change impacts and anthropogenic activities including coastal development.[183]

SALT MARSHES AND WETLANDS: Threatened by land reclamation and coastal development, restoration of these habitats is increasing globally to protect coastal properties and communities.[184]

DUNES: Coastal development is the primary driver of dune loss. As dunes are removed, modified, or cut through to accommodate built structures, their structural integrity and habitat quality may diminish, leading to beach erosion, loss of resilience for coastal communities, reduced habitat extent, and limited resources for dune-dependent species.[182]

The following table outlines the relationship between coastal and marine tourism and the impacts exerted on the marine environment in greater detail.

Table 4: *The pressures and proximate environmental impacts of the coastal and marine tourism industry on nature. These are not exhaustive, but are a selection of well understood pressures and impacts adapted from Turning the Tide*[185] *and supported by additional scientific literature and information from the Global Sustainable Tourism Council.*

PRESSURES Biophysical demands placed on a natural resource	ENVIRONMENTAL IMPACTS Changes in the state of nature or its capacity to provide ecosystem services and social benefits
1. Seabed disturbance and disruption of coastal habitat	
ENCORE Typology: ● Area of seabed use	**Loss or degradation of coastal and marine habitats:** Tourism causes habitat damage from construction as well as traffic, from pedestrians to large ocean-going vessels. This is a particular issue when siting tourism development in areas of high biodiversity, ETP species habitat, or protected areas. Biodiverse coastal and marine ecosystems and habitats that may be impacted include tropical/biogenic reefs, seagrass beds, mangroves, dunes and coastal vegetation, salt marshes, wetlands, and kelp forests. **Loss of ecosystem resilience and provision of ecosystem services:** Tourism can lead to the loss of vital ecosysztem services such as flood defense or nursery grounds for biodiversity in critical areas such as mangrove forests or dunes. For example, the loss of habitats could lead to a decrease in nesting, breeding, or foraging places for sea turtles, sea birds, fish, and crustaceans in coastal tourism's footprint. Additionally, coastal structures could decrease resilience against storms or hurricanes.
2. Pollution	
ENCORE Typology: ● Emissions of nutrient pollutants to water and soil ● Emissions of toxic pollutants to water and soil ● Generation and release of solid waste ● Emissions of non-GHG air pollutants	**Loss or degradation of coastal and marine habitats:** In addition to GHG emissions, tourism is a source of other pollutants, notably plastic and other forms of waste (from visitors, accommodation and other businesses), sewage (from accommodation and cruise ships), NOx and SOx (from cruise ships). Pollutants can also degrade water quality.
3. Invasive species	
ENCORE Typology: ● Introduction of invasive species	**Loss or reduction in marine biodiversity including loss of ETP species:** Visitors and vessels can accidentally introduce invasive species, especially from cruise ship ballast water. Invasive species can outcompete native species, resulting in biodiversity losses and consequent reductions in ecosystem resilience. Invasive species disrupt the ecological functioning of natural systems, with negative implications for biodiversity, and potentially causing significant economic damage (for remediation and loss of tourism dollars) at local and regional scales.[186] For example, invasive fish can disrupt the natural food chain of reef habitats, or exotic vegetation can overtake native coastal plants.
4. Wild population impact /disruption of wildlife	
ENCORE Typology: ● Disturbances (e.g., noise, light)	**Loss or reduction in marine biodiversity including loss of ETP species:** Both terrestrial and marine species face pressures due to a reduction in available habitat and habitat degradation, vessel collisions (in the case of marine mammals and cruise ships), mistreatment by tourists, and visitor traffic in critical habitats. **Reduction in animal welfare:** Persistent sources of noise and light will disrupt and distress marine and coastal animals. For example, sea turtle nesting activity may be impacted by artificial lighting from the coastal infrastructure.
5. Exploitation of natural resources	
ENCORE Typology: ● Other abiotic resource extraction ● Other biotic resource extraction	**Loss or reduction in marine biodiversity including loss of ETP species:** Tourism introduces new demands for species-based products, both for consumption and souvenirs. The sourcing approach, particularly regarding ETP species, as well as sourcing from overfished fish stocks, can create pressure on biodiversity. **Loss or degradation of coastal and marine habitats:** Construction of tourism infrastructure may result in temporary disturbance to the seabed from dredging or from more permanent change, as well as exploitation of natural resources (e.g., sand).
6. Climate change	
ENCORE TYPOLOGY: ● Emissions of greenhouse gases (GHG)	**Increased GHG concentrations:** Tourism in all its forms is a source of GHG emissions, though cruise ships in particular are a significant source of GHG emissions within the tourism sector.

Coastal and marine tourism is often **heavily dependent upon healthy and biodiverse habitats and abundant wildlife** to enhance the guest experience. For example, natural beauty has been shown to be one of the key criteria influencing tourists' travel destination choices.[187] Another study on scenic ecotourism spots highlighted that the quality of the natural environment and the overall aesthetic experience play a crucial role in attracting tourists,[188] underscoring the importance of improving sector-wide practices that contribute to nature.

While this report and the recommended actions for nature positive are divided into sub-sectors of coastal and marine tourism activity, there are some high-level considerations that should be addressed upfront regardless of the sub-sector in question. Across the entire sector, the following actions should be considered at the outset for risk management for the protection of people, nature, and biodiversity:

1. No coastal or marine activity should take place within protected areas or conserved areas (refer to regional or local legislation to determine such areas in the context of your work) or within the bounds of cultural heritage sites and sacred sites unless designated for multiple use and compatible with the site.

2. Do not participate in or advocate for the involuntary displacement of Indigenous or local communities in any coastal and marine tourism activity, even in the absence of strong regulation and enforcement for land rights protection, nor the downgrading, downsizing, degazetting, or delisting of protected and conserved area designations.

3. Coastal and marine tourism companies should avoid leasing or purchasing land that has been allocated in the absence of robust land-use planning or actor engagement processes (e.g., without a robust environmental and social impact assessment), particularly with affected Indigenous peoples and local communities.

4. Those involved in coastal and marine tourism at any stage of the development should engage across the seascape in which it is located, considering and incorporating broader actors in decision-making. The hospitality industry and destinations should work with actors that have shared visions and values for contributing to nature-positive outcomes. In particular, and where appropriate, companies can work with their competitors in a pre-competitive space to collaborate in setting rigorous brand expectations with shared supplier or development partners to raise the standard for the sector.

5. WWF also strongly recommend that companies develop nature-positive action plans in close consultation with local actors—including community representatives and Indigenous peoples, as well as subject matter experts including credible civil society organizations, researchers and academics, in order to design context- and project-specific approaches appropriate for the particular regulatory, social, economic and environmental conditions in which they are operating.

NATURE-POSITIVE PATHWAYS IN COASTAL AND MARINE TOURISM

The tables below summarize specific approaches/ pathways available for the coastal and marine tourism sector to contribute to nature-positive pathways.

Each table focuses on a specific coastal and marine tourism activity within hospitality and destination development that has material impacts on nature and biodiversity. They include the following information:

- **Activity type:** Actions in hospitality and destination development that have been shown to impact nature in the planning, construction, and operational phases, and where the available evidence supports illustrative, science-based nature-positive pathways to address these impacts.
- **Industry classifications:** Categorization of the activity type using global codes for business based on economic activities including the International Standard Industrial Classification (ISIC), a system used to classify economic activities; Nomenclature statistique des activités économiques dans la Communauté européenne (NACE), the European Union's industry classification system; and the North American Industry Classification System (NAICS), which is used by the US government to categorize businesses based on economic activity.
- **Relevant impacts:** Icons identifying the impacts of the activity on nature (linking to the pressures and impacts table above) and those that are addressed by operationalizing nature-positive pathways.
- **Global Biodiversity Framework targets:** The GBF targets and their corresponding target numbers are mapped to each of the nature-positive pathways to demonstrate which policy targets are addressed by operationalizing the illustrative actions. Please note that not all targets are featured in the table, given that some are overarching and cross-sectoral, but they are included within the narrative where relevant. All targets are equally important to contribute to the nature-positive global goal.
- **The AR3T illustrative nature positive pathways:** The table is organized by the AR3T mitigation hierarchy—**avoid, reduce, restore and regenerate, transform**—for each industry activity, with a synthesis of science-based actions the coastal and marine tourism industry can take to credibly contribute to the global nature-positive goal. The sub-sector tables

outline specific risk management considerations per sub-sector alongside opportunities companies may consider for diversifying their activities in line with restoration and regeneration actions. While all steps in AR3T can be helpful for risk management, for clarity, the tables provided consider avoid and reduce actions as the primary drivers of risk management, and restore and regenerate as more closely aligned with creating opportunities. Transformative actions refer to fostering the enabling environment, and therefore cut across both risk management and opportunities. It is important to note the following:

- These illustrative pathways build on existing guidance and the scientific literature, serving as a practical starting point for companies that want to contribute to nature positive in their work. The tables provide an opportunity for industry to begin to understand the concepts, characteristics, and fundamentals of a project that contributes to nature-positive outcomes.
- **These pathways cannot be used for measuring impact or enabling claims, and are not a certification scheme,** but rather highlight a selection of science-based examples to demonstrate how a company could credibly operationalize the mitigation hierarchy to address pressures and impacts on nature.
- The examples are also not exhaustive. There are an extraordinary number of potential pathways a company could take, based on their context. We have chosen pathways that are supported by science, are impactful, and potentially scalable to facilitate positive change. These pathways can be used as a tool to engage with partners and scientific experts to further develop project-specific plans that adapt the examples provided to the unique ecological, biological, social, and economic characteristics and context of the site and individual project.

CASE STUDY

LOCAL NGO, PUBLIC, AND PRIVATE SECTOR COLLABORATION TO SUPPORT NATURE-POSITIVE OUTCOMES IN MAURITIUS

Author: Josheena Naggea

In July 2024, the island of Mauritius, located 500 miles off the east coast of Madagascar, launched an innovative collaboration between the UNDP GEF Small Grants Programme (SGP) and the local tourism industry to promote marine species conservation and sustainable tourism practices. This initiative is part of the "Conservation of Threatened Marine Megafauna Species in Mauritius" project for the local NGO Mauritius Megafauna Conservation Organisation (MMCO), which focuses on the importance of protecting endangered marine species amid growing tourism interest. For instance, there has been an increasing number of social media posts showing and advertising tourists packages of people swimming in close proximity to marine mammals and turtles in Mauritius, which is a prohibited activity on the tropical island. There are regulations on distances to maintain from these marine animals (e.g., 5 m from sea turtles, 50 m from dolphins, and 100 m from whales).

Source: UNDP-GEF-SGP, Mauritius

However, the populations of marine mammals and turtles are increasingly threatened by popular—and often illegal—tourism practices, such as swimming too close to, feeding, or touching sea turtles, whales, and dolphins.[316] While activities such as dolphin watching contribute to the economy, they also impose significant stresses on marine life when regulations are not respected. To address this, a comprehensive awareness campaign, anchored in local NGO, government and private sector collaboration, was launched, featuring an educational video and poster on responsible wildlife observation. The campaign was developed by a coalition of actors, including the MMCO, the Tourism Authority, the national airline Air Mauritius, and the Ministry of Blue Economy, Marine Resources, Fisheries, and Shipping. The collaboration also extends to local hotels, facilitated by the Association of Hoteliers and Restaurants in Mauritius, where the video will be shown to enhance visitor awareness. The awareness campaign focuses on educating the public and tourism professionals about best practices for observing marine animals and the legal protections in place. The video is shown on arriving Air Mauritius flights and at the International Airport.

This partnership is a model for integrating biodiversity conservation with sustainable tourism. The private sector plays a key role in disseminating conservation messages to key audiences, while the UNDP GEF Small Grants Programme and the Mauritius government have collaborated on multiple environmental stewardship initiatives to implement effective policies and foster local engagement. The initiative illustrates how a nature-positive coalition, founded on a public–private–civil society partnership, can encourage improved biodiversity outcomes, ensuring healthier marine ecosystems and the intricately linked sustainability of the local tourism industry.

COASTAL AND MARINE TOURISM ACTION PATHWAYS

Credible, science-based pathways and illustrative examples by coastal and marine tourism activity to contribute to nature positive. Coastal and marine tourism activity types discussed in this chapter:

- **Site planning and preparation**
- **Site construction**
- **Hotel or destination operation**
- **Vessel operation**

In the tables below, we provide linkages to specific GBF targets for each pathway. In addition, the cross-cutting and overarching GBF targets, which apply across all the coastal and marine tourism tables when the principles and pathways are adopted, include:

Target 14 Integrate Biodiversity in Decision-Making at Every Level

Target 15 Businesses Assess, Disclose and Reduce Biodiversity-Related Risks and Negative Impacts

Target 18 Reduce Harmful Incentives by at Least $500 Billion per Year, and Scale Up Positive Incentives for Biodiversity

Target 23 Ensure Gender Equality and a Gender-Responsive Approach for Biodiversity Action

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SITE PLANNING AND PREPARATION

Industry classifications

ISIC 4100
ISIC 6810
ISIC 7110
NACE M68.12 Development of building projects
NACE N71.11 Architectural activities
NACE N71.12 Engineering activities and related technical consultancy

Industry classifications (CONT.)

NAICS 541310 Architectural services
NAICS 541320 Landscape architectural services
NAICS 541330 Engineering services

Related impacts:

- Loss or degradation of coastal and marine habitats
- Loss or reduction in marine biodiversity, including loss of ETP species
- Loss of ecosystem resilience and provision of ecosystem services

RISK MANAGEMENT

Risk management Risk management in siting deals primarily with early-stage risks in the development of a property or destination, and as such manages physical risks to the company as well as the risks to the environment that may result from development. Taking preventative measures in the early stages of development can reduce the potential for project delays or costly challenges. In this context, Avoid actions focus on preventing site development in particularly sensitive or rare (micro)habitats and healthy areas. The Reduce activities focus on implementing strategies and techniques to prevent impacts to habitats that support biodiversity and provide key ecosystem services. Robust, nature-centric, early-stage planning will also reduce risks of litigation brought by communities or activists due to environmental degradation. Lawsuits are costly and create reputational risks, but can be avoided through thoughtful, nature-forward and inclusive siting and planning. Risk management should focus on activities and techniques that safeguard the well-being of native wildlife and prioritize native plants. (**Target** 15)

AVOID

- **Avoid siting infrastructure for coastal development and tourism in migratory pathways of marine and coastal species or disrupting habitat connectivity** for key species (noting that migration routes and seasonality are shifting due to climate change, so companies will need to continuously monitor trends and support frequent monitoring). (**Targets** 1 4)
- **Avoid conversion of natural habitats. Avoid development in protected and conserved areas or other areas of particular importance for biodiversity, ecosystems, and ecosystem services.** This includes vulnerable and ecologically valuable areas with key functions including habitat for species with limited ranges, keystone species, ETP species (for example and at a minimum, those listed on the IUCN red list, CITES, and any with a local status if available), spawning, breeding, and foraging areas, and areas that provide ecosystem services like carbon sequestration and coastal flood defense that are not easily replaceable (e.g. coral reefs, sea grass, mangroves). (**Targets** 1 3 4)
  - ***For example:*** *Where hotel development or cruise destination development areas include vulnerable or ecologically significant habitats like coral reefs or mangroves, or where coastal structures intersect with native dunes, the developer should aim to site infrastructure to avoid damage to the reefs, mangroves, or dunes, maintain the habitats as features on site, and prioritize placement of structures in degraded habitats, such as areas that were already developed (brownfield sites).*[190]
- **Avoid development in areas without the capacity and infrastructure to handle tourism. (Target** 12**)**
- **Avoid siting any infrastructure on the beach (within the range of high tide).** Coastal buildings that have been constructed too close to the ocean can replace stabilizing vegetation and/or disrupt natural sediment transport and dune structures, causing coastal erosion and loss of beach habitat and risk to coastal infrastructure stability and longevity. Buildings built too close will also risk impacts from sea level rise.[191] (**Target** 11)

REDUCE

- **Reduce impacts to beach and coastal dune habitats and vegetation** by siting infrastructure with the appropriate building setbacks from the line of permanent vegetation.[192] Preserving these areas of transition from beach to vegetation will conserve key habitat for coastal organisms while also maintaining the stability of the beach. (**Target** 1)
- **Reduce micro-site selection where sediment disruption due to construction or operation of the property would be significant** in order to reduce impacts to water quality and the seabed and coastal habitats. (**Target** 1)
  - ***For example:*** *Overwater bungalows are a popular concept for tropical coastal locations. However, installing nearshore structures could disrupt sediment flows and coastal dynamics, leading to erosion and disruption to coastal and marine habitats.*[193] *Alternatives to these types of structures should be considered and modeled to predict sediment disruption. Additionally, in the event of a hurricane, storm surge, or groundswell, structures could be vulnerable, and property debris may damage or harm coastal habitats, organisms, or even coastal community members.*
- **Reduce impacts on marine or coastal biodiversity by salvaging marine organisms or coastal flora from areas that will be impacted** based on the siting plan and relocate to analogous habitats outside the impact area using local data and technical expertise for site selection, transplanting techniques and monitoring efforts. (**Target** 1)
  - ***For example:*** *Successful salvage and transplant of corals took place as part of a biodiversity impact mitigation strategy for the coastal development of a desalination pipeline along Australia's Great Barrier Reef. The same principles of AR3T in this example apply. Before installation of the desalination plant, site assessments were conducted to record the coral colonies within the pipeline footprint. The assessments allowed for the company to adjust the plan and reroute to avoid healthy coral colonies, as well as identify the corals that would need to be relocated due to impacts from construction.*[194]

RESTORE & REGENERATE

- **Plan for sufficient area for restoration activities and/or relocation of salvaged species (both coastal and marine) onsite, which is preferable for like-for-like restoration.** Incorporate restoration sites for degraded habitats in the site planning phase to allow ample space for the regeneration of the habitat. (**Targets** 1 2)
  - ***For example:*** *Part of the site may encompass a degraded coastal wetland habitat. Instead of building over the low-lying site (which ultimately may lead to challenges with flooding and stability), a nature-positive approach would be to rehabilitate the wetland habitat (following best practices) to restore ecosystem functions and services and biodiversity, thus becoming a key nature feature of the site (e.g., for bird watching, nature tours, kayaking). In St. Barth, a degraded coastal salt pond mangrove habitat was rehabilitated, starting with baseline studies*[199] *and, working with local experts, planting native mangrove species.*[200] *Today it is a lush habitat supporting mangrove fringe and bird life, and has become a community amenity with a boardwalk, accessible to all and used daily.*[201] *Despite its current success, the project has encountered hydrological issues, which highlights the importance of robust baseline modeling and hydrological studies to ensure project success.*
- **Rehabilitate ecosystems at scale for nature, climate, and societal benefits.** (**Targets** 1 2)
  - ***For example:*** *In Somerset, United Kingdom, a project that brought together a team of scientists, engineers, and conservationists restored a salt marsh to create ecological and social benefits, demonstrating the benefits that come from successful coastal restoration projects that can be deployed in the degraded coastal habitat context. For centuries, the land in the area had been converted from marsh to farmland. The land reclamation, however, has led to increasing flooding due to climate change impacts and overdevelopment.*

    In 2014, the land was converted back to marshland to mitigate the tidal flooding and adapt to the changing coastal conditions. Marshes are effective in mitigating flooding through absorption; since conversion, the lands have not flooded and the coastline is more resilient, while becoming a hotspot for wildlife, especially coastal birds. While the primary benefits are for coastal flood defense and creation of habitat to support biodiversity, an additional benefit is the sequestration of carbon (over 10 years). To date, 19 tons of carbon per hectare per year have been sequestered.[202]
- **Incorporate reef modules** in the siting plan as standalone structures to restore degraded reef habitats and provide coastal resilience benefits. (**Target** 11)
  - ***For example:*** *Artificial reefs were deployed in St. Maarten, a tropical region; the structures were colonized by crustose coralline algae (which facilitates coral larvae settlement), brooding corals, sponges, algae, and ascidians.*[203] *Reef modules deployed in Mexico in response to beach and habitat loss were found to recover the natural sediment transport dynamics, while also providing new settlement habitat for native species.*[204]
- **For successful reef module design and deployment,** implement robust habitat mapping and baseline data collection of the site; conduct modeling; set clear and measurable objectives;[M] identify the ecologically and biologically relevant species (target species) of the site (e.g. through baseline studies from the environmental impact assessment, historical data, local expertise, and Indigenous knowledge); and incorporate natural designs, materials, and surface textures that biomimic the natural habitat (meeting habitat needs of target species). Complement restorative efforts by actively planting species onto surrounding structures (e.g., reef modules).
  - ***For example:*** *Planting existing wildlife, such as corals or oysters (depending on latitude and habitat) onto artificial structures will accelerate timelines to achieve robust ecosystem functioning and enhance biodiversity.*[205]

M See also *Fitting ecological principles of artificial reefs into the ocean planning puzzle* - Paxton, 2022 - Ecosphere - Wiley Online Library

SITE PLANNING AND PREPARATION (CONTINUED)

Industry classifications

ISIC 4100
ISIC 6810
ISIC 7110
NACE M68.12 Development of building projects
NACE N71.11 Architectural activities
NACE N71.12 Engineering activities and related technical consultancy
NAICS 541310 Architectural services
NAICS 541320 Landscape architectural services
NAICS 541330 Engineering services

OPPORTUNITIES

Opportunities Opportunities in siting are focused on the benefits of restoring and regenerating degraded habitats or preserving healthy habitats on site to allow for natural regeneration. These restored or preserved habitats can become focal points of the property as recreation features and amenities for guests, increasing the value of the property, while also supporting biodiversity and nature.

The design phase presents a particularly useful window of opportunity for including ancillary nature-based structures at the property, either artificial or utilizing existing biomass, that enable rapid recovery of the ecosystem following construction impacts, such as artificial reefs.

Prioritizing habitats that provide coastal protection and climate mitigation can make properties more resilient to storms, hurricanes, or other coastal hazards and save on costs through avoided damage. As an example, healthy mangroves can attenuate and reduce waves, mitigate flooding, and protect coastal developments from storm damage.[197] One study found that coastal flooding in Florida from Hurricane Wilma in 2005 was reduced due to the presence of a 6–30 km-wide mangrove forest.[198] (**Target** 14)

TRANSFORM

- **Advocate for a well-designed, inclusive, and ecosystem-based MSP process** that will mitigate impacts of coastal marine work and installations in biologically sensitive areas or habitats that host spawning, migration, and breeding of commercially important, vulnerable and ETP species. As part of a broader effort for sustainable and equitable development of marine and coastal spaces, companies should advocate for inclusive actor engagement as part of hospitality and destination development. (**Targets** 1 3)
- Similarly, **supporting the implementation of coastal destination and land-use planning** will help minimize and avoid over-tourism and overexploitation of natural resources through comprehensive zoning that balances community and economic needs, while safeguarding ecosystem services and natural spaces. (**Targets** 1 12)
- **Participate in collective action** especially where a land/seascape approach is needed to achieve restorative/regenerative goals. One way is to participate in local destination management organizations, or to engage in partnerships with Indigenous peoples, local communities and NGOs, and participate in activities related to sustainable tourism in the destination.[195] (**Target** 20)
- **Advocate for government protection and acknowledgement of coastal ecosystems that improve coastal resilience.** The US coral reefs task force, for example, has put forward a resolution to categorize coral reefs as national natural infrastructure because of the economic benefits and ecosystem services they provide. (**Targets** 1 3)
- **Advocate and hold governments accountable for making those who damage critical ecosystems subject to fines and compensation for loss and damage** to dependent sectors like tourism. (**Target** 14)
- At this phase, an **ESIA or other type of environmental assessment process** will be underway or concluded, which includes collection of ecological and biological data to inform the reporting and plans. Support data availability, access, and shared knowledge by submitting the EIA-related primary biodiversity data to databases to foster data sharing and collaboration. For example, the Global Biodiversity Information Facility allows for publishing of global data sets that are open access and publicly available.[196] (**Targets** 20 21)

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SITE CONSTRUCTION

Industry classifications

ISIC 4100
ISIC 6810
NACE F41.00 Construction of residential and non-residential buildings
NACE M68.11 Buying and selling of own real estate
NAICS 236220 Commercial and institutional building construction

Related impacts:

- Loss or degradation of coastal and marine habitats
- Loss or reduction in marine biodiversity, including loss of ETP species
- Loss of ecosystem resilience and provision of ecosystem services
- Increased GHG concentrations

RISK MANAGEMENT

Risk management Construction activities present specific physical risks to nature, in particular habitat destruction, pollution and wildlife disturbance. Companies should also be aware of potential transition risks, particularly regulatory and reputational risks, associated with the destruction or degradation of healthy and charismatic coastal and marine habitats, and the disturbance of native wildlife. Development activities in general present specific risks to coastal and marine wildlife and vegetation.

Given that siting of specific works is a key tool in mitigating impact, risk management for construction should be considered in tandem with risk management for site planning and preparation. (**Target** 15)

AVOID

- **Avoid conversion of natural habitats. Avoid construction in protected and conserved areas or other areas of particular importance for biodiversity, ecosystems, and ecosystem services.** This includes vulnerable and ecologically valuable areas with key functions such as habitat for species with limited ranges and keystone species. (**Targets** 1 3 4)
  - ***For example:*** *Any project that may impact a coastal mangrove habitat should make every effort to avoid mangrove removal to begin to contribute to nature positive. A restored mangrove habitat, even of the same area of the impacted mangroves, is not equivalent in terms of the ecosystem services (e.g., carbon storage) or the biodiversity it provides.*[206]
- **Avoid construction at night to prevent disruption to sensitive nocturnal species and coastal communities.** (**Targets** 1 4)
- **Avoid construction during spawning, migratory, or breeding seasons for commercially important, vulnerable and ETP species** known to utilize the site (for example and at a minimum, those listed on the IUCN Red List, CITES, and any with a local status if available). Consult predictive models, recent and historical data to determine migratory activity and life stage behaviors for sensitive and ETP species to avoid wildlife disruption (noting that migration routes and seasonality are shifting due to climate change so companies will need to continuously monitor trends and support frequent monitoring). (**Targets** 1 4)
  - ***For example:*** *In tropical regions, endangered green sea turtles nest on beaches and within dune habitats, preferentially selecting nesting sites near or on dunes with native vegetation.*[207] *In the tropical western Atlantic, nesting occurs from March to May.*
- Every effort should be made to **avoid construction or other activities through nesting sites, and construction should not occur during nesting months in known nesting areas/ sites**. (**Targets** 1 4)

REDUCE

- **Reduce seabed and coastal disturbance and impact** by utilizing techniques such as horizontal directional drilling where possible and refilling trenches with the same excavated material to support coastal and seabed recovery. (**Target** 11)
- **Reduce the impact of infrastructure on the seabed by deploying artificial structures over any piping that may be exposed**, e.g., for sewage lines, or intake/outflow pipes for desalination plants. Deploy modular artificial structures over cabling, such as reef cube filter bags to create microhabitats, or reef cube mats and fleximats that serve both to protect infrastructure and promote colonization by native wildlife.[208] For successful module design and deployment, implement robust habitat mapping and baseline data collection of the site; conduct modeling; set clear and measurable objectives;O identify the ecologically and biologically relevant species (target species) of the site (e.g., through baseline studies from the environmental impact assessment, historical data, local expertise, and Indigenous knowledge); and incorporate natural designs, materials, and surface textures that biomimic the natural habitat (meeting habitat needs of target species). Complement restorative efforts by actively planting species onto structures.[209] (**Targets** 2 11)
- **Reduce opportunities for waste by taking a circular economy approach to construction and recycling and upcycling materials** for development. Conduct in-depth pre-project scoping for sourcing of construction materials and, where possible, purchase supplies locally to limit the import of external materials, which can contribute to GHG emissions and natural resource depletion. Similarly, reduce impacts to habitats by sourcing materials that are native to the site, where possible and responsible. (**Target** 16)

REDUCE (CONTINUED)

- ***For example:*** *Procurement of sand or rocks should be researched to ensure that the quality and characteristics match those of the local habitat and environment. Sand that does not have the same properties and make-up as the native sand can lead to sand loss as well as disruptions to organisms that live in the sandy habitats.*[210]
- **Reduce pollution in all its forms**. (**Target** 7)
- **Reduce chemical pollution** by prioritizing the use of inert materials in construction to prevent downstream impacts to the ecosystem and wildlife. (**Target** 7)
- **Reduce light pollution** by restricting construction working hours and consecutive days of activity, and by restricting light during, for example, peak (sea turtle) nesting seasons and hatching hours to reduce the disorientation of emerging sea turtle hatchlings or other light-sensitive species. (**Targets** 4 7)
- **Reduce noise pollution** by establishing and monitoring noise threshold values and durations to ensure emissions remain at acceptable levels, and by restricting working hours and consecutive days of activity. (**Target** 7)
  If pile installation is required, prioritize drilling, which produces less noise, over hammering where possible to reduce wildlife stress. A number of techniques can be considered—for example, if pile-driving, initiate works with a gradual increase in noise levels ("soft start") to encourage noise-sensitive species to leave the area safely.[211] Similarly, using bubble curtains or screens for underwater work, or adjustable fluid cushions and hydro sound dampers for hammering components has been effective in reducing noise.[212]
- **Reduce stormwater runoff and other construction pollution and mitigate for incidents** by designing robust waste and pollution management plans.
  Establish a stormwater management plan to prevent rainfall runoff from carrying pollutants from construction activities into coastal waters. (**Target** 7)
- **Reduce entanglements of marine wildlife** (sea turtles have, for example, become entangled in buoy lines) in any lines used during construction and operational phases, like buoys and lines for floating docks, by securing and tightening lines, eliminating the use of rope where possible, and recovering lost gear/equipment/line as quickly as possible. (**Targets** 1 4)
- **Reduce seafloor sediment disruption** through low-impact construction techniques. (**Target** 1)
  - ***For example:*** *Vibro-piling in the case of installing docks, a technique that reduces sediment resistance, allowing piles to sink into the seabed without impact hammers.*[213] *Sedimentation can disrupt natural processes, including releasing nutrients stored in the benthos.*[214] *Sediment can also increase turbidity (water cloudiness), which is not suitable for sensitive habitats, like corals, that rely on photosynthesis.*[215]
- **Reduce coastal sedimentation** from construction works by deploying silt curtains in nearshore waters or along coasts where feasible and applicable to contain any sedimentation or plumes. Movement of sand and sediment can smother existing native vegetation or marine organisms, or impair gill function of fish,[216] so reduce impacts by using appropriate barriers or transplanting coastal vegetation and marine fauna before works. (**Target** 1)
- **Reduce emissions** by supporting renewable energy integration into the design of the development, for example, using solar panels on roofs to improve energy efficiency and conservation. (**Target** 8)

O See also *Fitting ecological principles of artificial reefs into the ocean planning puzzle* - Paxton, 2022 - Ecosphere - Wiley Online Library

SITE CONSTRUCTION (CONTINUED)

Industry classifications

ISIC 4100
ISIC 6810

NACE F41.00 Construction of residential and non-residential buildings
NACE M68.11 Buying and selling of own real estate
NAICS 236220 Commercial and institutional building construction

OPPORTUNITIES

Opportunities Restoring degraded or impacted habitats, such as seagrass beds and mangrove forests, can support coastal and climate resilience as well as biodiversity enhancement.

Restoration of carbon-capturing habitats such as seagrass meadows, when conducted well with meaningful outcomes[P] which highlights the importance of goals for people and nature and robust science when planning any marine intervention can lead to rapid recovery of coastal ecosystem services, and also present opportunities for generating carbon credits[Q] for companies undertaking restoration efforts.[217] Biodiversity credits may also present an opportunity for companies; however it must be a certificate that represents a measured and evidence-based positive biodiversity outcome from nature restoration, conservation or stewardship activities that is not purchased for the purpose of offsetting residual negative impacts to biodiversity.[218]

Additionally, deployment of robustly designed, modeled, and eco-engineered artificial modules near to shore during construction can offer coastal protection by supporting sediment accretion and serve as a storm break to improve the climate resilience of coastal infrastructure, while serving as habitat for native wildlife. Similarly, restoring historic dunes and planting dune vegetation can stabilize the coastline and protect inland areas from flood risk. (**Target** 14)

Opportunities lie also within the co-use of machinery and equipment that can be utilized for both the construction of the site, and also for the deployment of restoration interventions and efforts. (**Target** 14)

RESTORE & REGENERATE

- **Prioritize the restoration and regeneration of especially biodiverse habitats that could be impacted by construction** (such as mangroves, corals, salt marshes, seagrass beds, or kelp forests), or that existed in the area previously to restore it to a pre-degraded state. (**Targets** 1 2)
- **Incorporate nature-inclusive and nature-based design approaches into marine or coastal infrastructur**e appropriate for the location, habitat, and native species.[219] (**Target** 2)
  - ***For example:*** *A bioenhanced concrete, called ECOncrete, has been found to support colonization of native organisms in marine infrastructure projects[220] Specialized, marine-friendly concrete use should be considered during construction of infrastructure. Additionally, integrate green roofs into the design with native plants and design buildings to harvest rainwater in particularly drought-prone areas. Consider the use of mature, native trees to create canopies that provide shade and habitat. Additionally, bioswales or vegetated swales, which utilize native vegetation to capture runoff and absorb and filter water, nutrients, sediments, and other pollutants should be integrated into designs. Select plants for the bioswales to prioritize native vegetation and consult engineers to incorporate native plants into the civil design structure.[221]*
- Where it is not possible to substitute a nature-based solution or restorative action for gray infrastructure (e.g., constructing a seawall for a marina), **reduce impacts by enhancing the materials to support habitat creation and biocolonization.** (**Target** 11)
  - ***For example:*** *A company in Florida, USA (KIND designs)[222] is constructing living seawalls that can be retro-fitted onto existing seawalls. The rugosity and material of the living seawalls has been designed to attract colonization of sessile organisms and provide habitat for fish, reducing impacts by providing alternate settlement and habitat niches.*
- **Maximize the use of nature for stormwater and drainage management.** (**Targets** 1 2)
  - ***For example:*** *Mangrove wetlands take up nutrients and filter pollutants;[223] an eco-engineered new or rehabilitated wetland habitat could serve to capture and filter stormwater and runoff.*

TRANSFORM

- **Support local businesses by purchasing supplies** locally which can enhance the destination's economy and well-being. Lead the industry on waste reduction and use of recycled materials in manufacture wherever possible. (**Target** 16)
- **Consider constructing sites with the future in mind**: build for the environmental and climate conditions of today, but also for future scenarios in light of climate change—such as by preparing for eventual sea level rise, storm projections, and changes to the natural environment (such as coral reef dieback) that affect destination desirability.
- **Advocate for regulatory requirements that promote robust forecasting** for all coastal tourism and destination development, as well as measures that improve resilience to climate change. (**Target** 8)
- **Advocate for regulations that prohibit building in flood-prone coastal areas.** (**Target** 1)

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P See for example the Global Mangrove Alliance Restoration Guidelines for how to implement robust and science based restoration practices and monitoring and in general refer to resources such as Joint landscape position papers and roadmap (2022-2024) | ISEAL Alliance and the Seascape Engagement Initiaitive Roadmap on pg. 118 Technical-Guidance-2025-Step3-Ocean-v1.pdf

Q through robust verification methods and see 773q5lvbf0_WWF_position_and_guidance_on_corporate_use_of_voluntary_carbon_credits_EXTERNAL_VERSION_11_October_2019_v1.2.pdf for more details

HOTEL OR DESTINATION OPERATION

Industry classifications

ISIC 5510
ISIC 5610
ISIC 9329

NACE I55.10 Hotels and similar accommodation
NACE I56.11 Restaurant activities
NACE M68.20 Rental and operating of own or leased real estate

Industry Classifications (CONT.)

NACE S93.29 Amusement and recreation activities
NAICS 721110 Hotels and motels
NAICS 722511 Full-service restaurants
NAICS 713930 Marinas
NAICS 713990 All Other Amusement and Recreation Industries

Related Impacts:

- Loss or degradation of coastal and marine habitats
- Loss or reduction in marine biodiversity
- Loss of ecosystem resilience and provision of ecosystem services
- Increased GHG concentrations

RISK MANAGEMENT

Risk management during operations focuses primarily on managing chronic rather than acute impacts, such as cumulative or long-term impacts of operations on marine wildlife, as well as on improving efficiency and reducing pollution.

Notably, the sector's operations and maintenance risks are related to disturbances and pollution. Regulatory and reputational risks are associated with impacting ETP species, or reducing water quality in the ocean, which could reduce the quality of the tourist experience. Additional, remedial cleanup is expensive and time-consuming and should be avoided.

Additionally, it has been found that invasive or nuisance species can increase risk, such as vegetation that promotes fires, or rodents that carry disease. Thus, by taking action to mitigate alien or invasive species, site risks are managed. (**Target** 15)

AVOID

- **Avoid activities during spawning, migratory, or breeding seasons** for commercially important, vulnerable and ETP species, and those activities that could threaten ETP species known to utilize the site (noting that migration routes and seasonality are shifting due to climate change so companies will need to continuously monitor trends and support frequent monitoring). (**Targets** 1 4)
  - ***For example:*** *In the Bahamas, queen conch are a keystone species in that they consume algae and epiphytes from seagrass beds, maintaining the health of the seagrass habitats. In addition to their ecological role, queen conch are also a culturally significant food dish in the Bahamas and an important fishery. Given their ecological, economic, and cultural significance, along with the fact that they are commercially threatened and listed on CITES, day-to-day activities should avoid disruption to queen conch habitats and known aggregation areas.*[224]
- **Avoid sourcing products from overexploited species** (for example and at a minimum, those species listed on the IUCN Red List, CITES, and any with a local status if available). (**Targets** 5 9)
  - ***For example:*** *Restaurant activities should not source from overfished and exploited fish stocks. Similarly the industry should not source souvenirs created from ETP species (at a minimum those on the IUCN Red List and CITES).*
- **Avoid beach renourishment where possible.** Many locations desire sandier, wider beaches; however, adding sand is costly, and a temporary approach that often leads to disruption of habitats, which is why an ecosystem-based approach to coastal planning with setbacks and natural features (see site planning and preparation tab) is preferred (see also Restore and regenerate section below for solutions).[225] (**Target** 11)

REDUCE

- **Reduce habitat loss by preserving as much native vegetation and habitat on site** as possible,[226] which in turn promotes pollinators (e.g., bees, bats, some bird species like hummingbirds),[227] and also reduces the cost of landscaping. (**Targets** 1 2)
- **Reduce light pollution and wildlife disturbance** by restricting operational lighting where possible and limit bright lighting at night. (**Targets** 4 7)
  - ***For example:*** *Restrict light especially during peak sea turtle nesting seasons and hatching hours to reduce the disorientation of emerging sea turtle hatchlings. Follow best practices for coastal and marine lighting for exteriors of hotels and footpaths, security lighting, and in pools, for example utilizing wildlife friendly lighting (which should be long wavelength) and fixtures (low to the ground, shielded, and/or facing away from sensitive habitats).*
- **Reduce harmful impacts of invasive species in coastal landsca**ping by prioritizing native plantings, rather than ornamentals or non-natives. The site should design and deploy a management plan for removal and eradication of any invasive species that establish on site. (**Target** 6)
  - ***For example:*** *In Florida and throughout the Caribbean, the beach naupaka (*Scaevola taccada*) was introduced as an ornamental plant, but it established in coastal areas and became invasive. It has displaced native coastal plants such as dune grasses and inkberry (*Scaevola plumieri*) which are important for providing food sources for birds, stabilizing dune habitats and preventing coastal erosion.*[228]
- **Reduce emissions from transportation** by sourcing materials and food locally. (**Target** 8)
  - ***For example:*** *Properties could support on-site farms or plant nurseries for sourcing of vegetables and plants for landscaping, and create relationships with local fishers to source sustainable, locally sourced seafood. Similarly, prioritizing low-impact transportation options within the destination, such as low-emissions vehicles, public transport, walking, biking, or electric golf carts, could support reduced GHG emissions.*

REDUCE (CONTINUED)

- **Reduce visitor and tourism impact on wildlife** by minimizing visitor numbers in sensitive areas, and providing behavior guidelines for visitors, tour operators, and guides; working with local conservation bodies to identify environmental risks associated with tourism and taking action to reduce those impacts; and following national and international laws and standards for wildlife interactions to ensure minimal disturbance (e.g., no touching, feeding, interfering with native wildlife).[229] Integrate habitat and wildlife rules of engagement into welcome packages or briefings, such as by providing guests with a list of sensitive/ETP wildlife they may encounter while on site, and proper interaction protocols, for example remaining on designated paths and best practices while snorkeling. (**Target** 1)
- **Reduce biological pollution from wastewater and sewage** by selecting robust sewage systems and designing a comprehensive site wastewater management plan that includes measures to address stormwater and runoff. Any wastewater or sewage from the day-to-day running of the property should be managed according to best practices and applicable laws and regulations to prevent nutrient and bacterial pollution in coastal waters. (**Target** 7)
  - ***For example*** *Sewage systems should have tertiary treatment and measures in place to prevent wastewater from entering natural bodies of water. Recycling of appropriate water can be a contributor to reducing the property's water footprint, for example by reusing grey water for irrigation on site.*[230] *Reduce fertilizer use on coastal sites to prevent nutrient pollution to receiving water bodies. Increased nitrogen and phosphorus can have deleterious effects on water bodies and biodiversity, as well as on human health.*[231]
- **Reduce noise pollution from operational activities** by establishing and monitoring noise threshold values and durations to ensure emissions remain at acceptable levels. Reduce water impacts to local communities by deploying water stewardship actions: measure, monitor, and manage water usage, assess water risk, and ensure tourism, coastal development or cruise operations do not conflict with the needs of local communities and ecosystem processes.[232] (**Targets** 7 14)
- **Reduce the impact of waste on wildlife and natur**e by transitioning away from single use, implementing reduce, reuse, recycling programs, and taking a circular economy approach to waste management during operations. (**Target** 16)
- **Reduce entanglements of marine wildlif**e (sea turtles have, for example, become entangled in buoy lines) in any lines used during construction and operational phases, like buoys and lines for floating docks, by securing and tightening lines, eliminating the use of rope where possible, and recovering lost gear/equipment/line as quickly as possible. (**Targets** 1 4)
- **Reduce the impact of invasive species** on natural habitats by including invasive species on the menu where available (and confirm with credible experts that they are indeed invasive to the region). Consumption and demand may in some cases support increased removal of an invasive marine species that is harming the ecosystem. Note that if the removal of invasive species has been done thoroughly, it may enable passive restoration of the habitat. (**Targets** 2 6)
  - ***For example:*** *Lionfish are an invasive fish species in the tropical western Atlantic and disrupt reef health by predating on native fish species.*[233] *A market has emerged for lionfish, with restaurants serving lionfish tacos, ceviche, and other dishes. Similarly, in Europe, Atlantic blue crabs are invasive, and have been disrupting the native shellfish populations.*[234] *In response, blue crabs are being caught by fishers and sold to restaurants throughout Europe, and have now become a part of the cuisine.*[235]

HOTEL OR DESTINATION OPERATION

Industry classifications

ISIC 5510
ISIC 5610
ISIC 9329

NACE I55.10 Hotels and similar accommodation
NACE I56.11 Restaurant activities
NACE M68.20 Rental and operating of own or leased real estate

Industry classifications (CONT.)

NACE S93.29 Amusement and recreation activities
NAICS 721110 Hotels and motels
NAICS 722511 Full-service restaurants
NAICS 713930 Marinas
NAICS 713990 All Other Amusement and Recreation Industries

OPPORTUNITIES

Opportunities in the operational phase of a project are linked to restoring or preserving healthy habitats that can create tourist products based around thriving biodiversity. Nature excursions can provide unique, site-based experiences for guests while also contributing to native flora and fauna rehabilitation and protection. Sense of place is important for tourism, and by maintaining healthy ecosystems a property can provide a premium nature-based experience. Wildlife sightings are an asset for tourists and destinations can develop a business model around them. Not only will restored nature support site experiences, but it will also save costs. According to a study evaluating North Carolina properties after Hurricane Irene, properties with natural shoreline protection measures withstood the impacts of the storm better than engineered structures such as seawalls or bulkheads. Of bulkheads surveyed, 76% were damaged but other shoreline types were resilient.[237]

Further opportunities in wildlife and plant management primarily revolve around capturing cost savings for the company. Preserving and prioritizing native vegetation on site saves on landscaping costs both for purchasing and maintenance. Similarly, salvaging and transplanting mature trees creates shaded areas, maintains habitats, and maintains mature assemblages and site aesthetics. Along the same lines, the opportunity to develop a nursery site, (for growing and cultivating), or a place to temporarily place salvaged species (for outplanting), could be incorporated into the operations of the site to supply it with living material and support biodiversity enhancement.

Additionally, there are opportunities to regenerate a system by removing invasive species while capitalizing on the resource. **(Target 14)**

RESTORE & REGENERATE

- **Extend the lifespan of a beach and maintain ecosystem services such as coastal stability and resilience** (thus reducing the need for beach renourishment) by prioritizing dune restoration and planting of native vegetation (if and where appropriate) to capture and accrete sand, and/or by deploying well designed and modeled reef structures in the marine environment to promote accretion nearshore (e.g., the XBeach numerical model which simulates hydrodynamic processes on sandy coasts and can model sediment transport). **(Targets 1 11)**
  - ***For example:*** *In Veracruz, Mexico, coastal dunes were impacted by coastal infrastructure development, causing windblown sand to accumulate and negatively impact the local community. Dune restoration efforts were initiated to recreate a dune of 2 km in length. Once the sand was placed, a combination of available naturalized and native vegetation was planted immediately to support dune stability, sand capture, and natural plant succession. The recreated dune system has been successful in capturing and stabilizing sand, promoting native plant establishment, and has been self-sustaining for over a decade, showing that large-scale, coordinated restoration efforts can create long-lasting results.[238] In another project in Mexico, reef modules were deployed in response to beach and habitat loss, and were found to recover the natural sediment transport dynamics, while also providing new settlement habitat for native species.[239]*
  - ***For example:*** *In St. Barths, a degraded coastal mangrove salt pond was restored following studies and in collaboration with local experts to plant native mangrove species.[240] Within a few years, the habitat had grown lush, supporting mature mangroves and bird life, and had become a recreational amenity with the inclusion of a boardwalk through the mangroves circulating the entire pond.[241] The example highlights the value of nature as an amenity for guests. However, despite the success of the project, there have been challenges tied to hydrology and water flow, demonstrating the fundamental importance of baseline studies, models, and investigation of hydrology in any restoration project.*
- **Incorporate native features and habitats into operational site and design plans, and/or restore degraded habitats for recreational activities and nature. (Targets 1 2)**
- **Rehabilitate onsite habitats that could contribute to habitat connectivity.** An increasing loss of intact, healthy ecosystems and further ecosystem fragmentation negatively impacts biodiversity, but prioritizing restoration of specific areas can lead to wildlife corridors and opportunities for guests to enjoy nature. **(Targets 1 2)**
  - ***For example:*** *In Costa Rica, the need for cropland and livestock rearing caused widespread deforestation,[242] but one hotel transformed an area where native vegetation had been removed, returning it to native habitat supporting biodiversity. The developer reported that they planted trees, protected and preserved old-growth trees, planted native vegetation species, and developed a sanctuary for native wildlife.[243] While this hotel is not located on the coast, the same principles apply to coastal destinations. This rewilding approach to restoring habitats and supporting native flora and fauna has become a more accepted and adopted approach,[244] particularly in luxury hotel development.*

RESTORE & REGENERATE

- **Create responsible, nature-based guest experiences** led by local, scientific expertise and conservation bodies and using the best available science, that educate participants and also allow for continued funding of restoration, regeneration and research efforts. **(Targets 11 21)**
  - ***For example:*** *Consider offering responsible birdwatching/wildlife viewing excursions, kayak tours, or snorkel adventures.*
  - ***For example:*** *Tigers utilize coastal mangroves, providing an opportunity for wildlife experiences, but this fact also supports the need for habitat protection and rehabilitation.[245]*
- **Integrate species-specific habitat needs into restoration planning** to restore and regenerate nesting, foraging, and breeding areas for vulnerable populations on the site. **(Targets 1 2)**
  - ***For example:*** *Include bird nesting sites and bat roosting boxes into mangrove restoration planning. As coastal development and removal of vegetation continues, birds and bats are suffering habitat loss and population declines worldwide.[246]*

TRANSFORM

- **Consider and advocate for the establishment of or investment in protected areas and/or other effective area-based conservation measures** (OECMs) in nearshore waters of the destination site. There have been examples of hotels working successfully with local fishers and government to establish no-take areas in front of hotel properties and providing capacity-building for fishers.[236] These areas can be materially important to the guest experience. **(Target 1)**
- **Advocate for collective destination stewardship** around the habitat commons. For example, a cluster of hotels can work jointly to protect natural assets to benefit coastal habitats. Similarly advocate for destination-scale stormwater and drainage management. Stormwater planning is a destination-scale impact that requires an integrated approach across sites. **(Target 1)**
- **Support livelihoods of local operators** by prioritizing hiring local and/or exclusively sourcing sustainably caught fish from local fishers, and/or purchasing native plants, fruits, and vegetables from local businesses. Advocate for regulations that require properties to source a percentage of foods from local operators/vendors/stores. **(Targets 5 9)**
- **Consider investing in the community,** e.g., with low- or no-interest loans to support developing community businesses that could improve the economic health of the community. Maximize the results of the robust community and multi-actor engagement from the ESIA to understand community needs and support those efforts. **(Target 19)**
- **Raise awareness and educate travelers** by integrating habitat and wildlife rules of engagement into welcome packages or briefings, such as by providing guests with a list of vulnerable/ETP wildlife they may encounter while on site, and proper interaction protocols, for example remaining on designated paths and best practices while snorkeling. Consider designing educational programs and activities at the destination for guests collaborating with local knowledge, expertise, or NGOS. **(Targets 1 22)**


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VESSEL OPERATION

Industry classifications

ISIC 5011

ISIC 5610

NACE H50.10 Sea and coastal passenger water transport

NACE I56.11 Restaurant activities

NAICS 483112 Deep sea passenger transportation

NAICS 722511 Full-service restaurants

Related impacts:

- Loss or degradation of coastal and marine habitats
- Loss or reduction in marine biodiversity
- Loss of ecosystem resilience and provision of ecosystem services
- Increased GHG concentrations

RISK MANAGEMENT → OPPORTUNITIES

Risk management Risk management in vessel operations is focused on managing both chronic and acute impacts, such as cumulative or long-term impacts of vessels on marine wildlife, as well as site-based habitat degradation. Ensuring vessel-based impacts on nature are avoided or minimized is central to managing transition risks for this sub-sector. (**Target** 15)

AVOID

- **Avoid routing voyages through migratory pathways of ETP species** (noting that migration routes and seasonality are shifting due to climate change, so companies will need to continuously monitor trends and support frequent monitoring) or disrupting habitat connectivity for key species. (**Targets** 1 4)
- **Avoid anchoring cruise ships or vessels in natural habitats. Avoid anchoring in areas that are biodiverse, vulnerable and ecologically valuable, or protected and conserved areas** (refer to regional or local legislation to determine such areas in the context of your work). (**Targets** 1 4)
  - ***For example:*** *Anchoring and anchor drag can dislodge corals, leading to increased coral reef mortality.*[247]
- **Avoid habitat disruption** by maintaining safe distances from natural habitat areas as described above. (**Target** 1)
- **Avoid pollution** by abiding by vessel laws and regulations on topics such as ballast water, wastewater, sewage and emissions management to prevent harm to wildlife or disruption of ecosystem processes. Invasive and non-native species are especially important to consider here as these are often introduced via ballast water, and without proper management can supply the destination sites with invasive species that disrupt the habitat and functionality of the local ecosystem.[248] (**Target** 7)
  - ***For example:*** *Cruise routes may have ships traveling between distinct habitat types with differing species composition. To prevent transport of invasive and non-native species, cruise ships should follow ballast water guidance and best practices.*[249]

REDUCE

- **Reduce wildlife disruption and collisions** by reducing and regulating vessel speed in habitats that support a diversity of species that could be susceptible to collisions or noise (e.g., whales, turtles, dolphins, reef organisms in general), or during migration periods, implementing quiet hours, and minimizing the number of vessel trips where possible.[250] (**Targets** 1 4)
- **Reduce seabed disruption from anchor drag** by designating fixed mooring points and mooring buoys.[251] (**Target** 1)
- **Reduce entanglements of marine wildlife** (sea turtles have, for example, become entangled in buoy lines) in any lines used for vessel activity, like buoys and lines for floating docks, by securing and tightening lines, eliminating the use of rope where possible, and recovering lost gear/equipment/lines as quickly as possible. (**Targets** 1 4)
- **Reduce pollution and mitigate against incidents** by designing robust waste and pollution management plans. (**Target** 7)
  - ***For example:*** *Establishing and keeping up to date a spill prevention, control and countermeasures plan.*
- **Ensure vessels are regularly maintained**, in compliance with relevant laws and regulations. This includes consistent checks for leaks to prevent spills during ocean operations. (**Target** 7)
- **Reduce conflict with other industries that operate in the same space** (e.g., fishing, aquaculture, marine renewables, shipping) by carefully planning cruise routes that coexist with these other industries while also being cognizant of the cumulative impacts of all operations in the marine ecosystem. (**Targets** 1 4)

Opportunities Opportunities for nature-positive contributions for vessel operations are limited, but they exist within mooring and anchoring systems by building with nature in mind, and investing in structures that provide artificial habitat for marine wildlife. (**Target** 14)

RESTORE & REGENERATE

- **Restore degraded habitats onsite** to meet the needs of ecosystem repair, and at the same time **integrate nature-based design** into mooring and anchoring systems for vessels, specifically by using artificial reef modules to create fixed anchor points in frequented areas that provide a reliable and predictable location for vessels to moor, while serving as artificial habitat for native wildlife (see also reef module information in the site planning and preparation table for key considerations and fundamentals). Applying the same principles of robust, eco-engineered reef modular design for habitat restoration to nature-based moorings would allow for mooring buoys and anchors to support habitat recovery, while also reducing the negative impacts of anchor drag on the seabed.[252] (**Target** 11)

TRANSFORM

- **Support research and case studies for newer concepts** such as artificial module mooring and anchor bases, to evaluate the science, and support the field in new, less invasive and disruptive techniques for vessel and cruise anchoring and mooring. (**Targets** 20 21)
- **Support research on updated habitat map**s to ensure vessel activities do not disrupt sensitive species or damage key habitats. (**Targets** 20 21)


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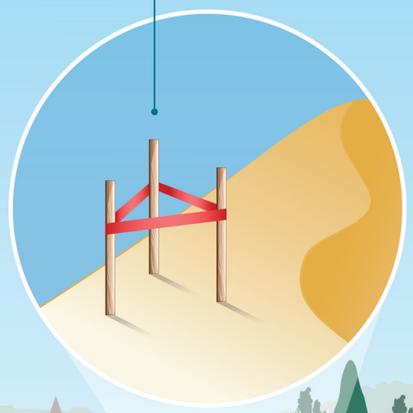
COASTAL AND MARINE TOURISM: HOSPITALITY AND DESTINATION DEVELOPMENT

A nature-positive vision for coastal and marine tourism: Visualizing illustrative pathways for the sector. (Note: Figures are not to scale, and do not depict all actions recommended herein.)

PARTICIPATE IN INCLUSIVE ACTOR ENGAGEMENT
and robust ecosystem-based marine spatial planning processes

AVOID CONVERSION OF NATURAL HABITATS,
e.g. dunes, for development or activities, so that species like sea turtles can nest



AVOID CONVERSION OF NATURAL HABITATS
for development, and maintain them as natural features

REGULATE AND REDUCE VESSEL SPEED
in known sensitive areas to reduce wildlife disruption or collisions and avoid anchoring in natural habitats

USE WILDLIFE-FRIENDLY LIGHTING
on vessels and on the coast to reduce wildlife disturbance and light pollution

REDUCE EMISSIONS
from transportation by sourcing materials and food locally

RESTORE DEGRADED REEF HABITATS
with reef modules to provide coastal resilience and support biodiversity

CREATE RESPONSIBLE, NATURE-BASED GUEST EXPERIENCES
and reduce visitor impacts on wildlife

DEPLOY MODULAR STRUCTURES
over any piping deployed on the seabed to reduce impact and create habitat

SELECT ROBUST SEWAGE SYSTEMS
to reduce pollution from wastewater

SITE INFRASTRUCTURE WITH APPROPRIATE BUILDINGS
set back from the beach to reduce impacts to coastal habitats

INCORPORATE NATURE-BASED DESIGNS
and renewable technology into buildings, such as solar panels, structures to harvest rainwater, or vegetated swales to filter runoff

SHIPPING: CONTAINER SHIPS, BULK CARRIERS, TANKERS, AND CRUISE SHIPS

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The international shipping industry transports 80%–90% of world trade.[253] Without shipping, international trade and the import and export of essential goods including food would not be possible. However, this industry's business-as-usual operations pose a significant threat to our ocean through greenhouse gas (GHG) emissions, harmful chemicals, oil spills, noise pollution, invasive species, and marine mammal strikes.

To date, most of the efforts around improving shipping have focused on decarbonization. The International Maritime Organization (IMO) is now following a revised roadmap to reduce GHG emissions from ships, with the goal of full decarbonization by or before 2050.[254] Nevertheless, while striving for decarbonization is critical, additional effort is needed to fully address the sector's impacts on nature. Momentum around this is growing; for example, the TNFD has developed sector-specific guidance for the maritime transport industry to support its understanding and management of nature-related impacts, dependencies and the associated risks and opportunities; and the World Maritime University is leading a joint statement with partners from academia, shipping companies, NGOs, and industry calling on the IMO to create a high-level mandate for nature to address biodiversity loss and pollution.[255]

Shipping is an expansive industry that reaches all parts of the globe, and this provides opportunities for broad, positive impact. However, given its transient nature, impacts are usually intermittent and temporary, making their quantification and monitoring—and the identification of long-lasting and robust solutions—challenging. The data, though, are clear: cumulative impacts from the shipping industry are increasing stress on the ocean, and both individual and collective actions are needed.

This chapter focuses on container ships, bulk carriers, and tankers as well as cruise ships, insofar as shipping regulations and policy can and should apply to cruises (see the Coastal and Marine Tourism chapter for additional information on cruises and destination development and stewardship). It explores the ways in which the AR3T mitigation hierarchy can be operationalized to address the impacts that the different phases and actors involved in shipping have on nature. It is important to note that both container ships and cruise ships often have dedicated routes, while bulk carriers and tankers are usually operated on a per-contract basis. The ad hoc nature of bulk carriers and tankers makes implementation of new technologies and strategies more challenging, but shipping companies should strive to change the sector and adopt nature-positive pathways despite the regulatory landscape. Illustrative examples of the ways in which the industry can raise ambitions to contribute to nature positive for the oceans are provided, with information that can also be applied to other modes of marine transport.

This chapter touches on several different phases of shipping and the different groups involved in making decisions around shipping practices. In general, groups working in the maritime transportation space or cruise lines are the appropriate audience for this chapter. More specifically, those shipping or cruise companies or agents involved in ship building, ship breaking, or trip planning and chartering, will benefit from the content. Additionally, financial institutions (FIs) lending to, investing in, or underwriting maritime transportation or cruise line companies will also benefit from understanding the recommendations herein, as they can inform FIs' corporate engagement efforts, policy development, and sustainable finance frameworks (and associated products).

THE INTERFACE WITH NATURE

Shipping operations occur from the shallow nearshore water of ports to deep oceanic waters, traversing a diversity of ecosystem types that support biodiverse assemblages of flora and fauna that provide vital ecosystem services. Given this fact, the shipping industry is well positioned to develop in alignment with nature, while capitalizing on any resultant co-benefits of doing so (e.g., access to more investors or preferred shipping routes). While shipping is less carbon-intensive than other modes of transportation (e.g. land and air), it nevertheless puts pressure on coastal and marine ecosystems, leading to harmful impacts (described below); by approaching shipping from the perspective of avoiding and reducing harmful impacts, and then restoring and regenerating the ecosystems that it tangibly impacts, benefits for the company, nature, and society can be achieved.

Coastal and marine ecosystems—on which shipping depends both directly and indirectly—are essential in the services they provide to society. These systems include:

KELP FORESTS: Kelp forests are found globally in the temperate/polar regions where shipping lanes exist, and these critical habitats are thus at risk.

REEFS: As ships approach ports, they enter depths where oyster or coral reefs may grow, and they can impact these critical and sensitive habitats (e.g., through pollution or direct removal and harm from groundings).

SEAGRASS BEDS: Seagrass beds are a critical habitat that could be impacted by shipping activity, either by direct habitat degradation from groundings or anchoring, or by pollution and invasive species transport.

MANGROVES: Mangrove habitats may be impacted by shipping through the alteration of coastlines from ship waves and currents moving sediment, through physical damage from groundings, or through ship pollution.

SALT MARSHES AND WETLANDS: Like mangroves, salt marshes may be impacted by shipping through the alteration of coastlines from ship waves and currents moving sediment, through physical damage from groundings, or through ship pollution.

DUNES: Shipping may impact dunes through coastal erosion from ship waves and underwater currents that disrupt coastal dynamics and sediment transport.

Changes to the ocean thus affect shipping through loss of coastal protection and safe harbors/ports during storms, sea level rise, and storm surge impacts, reducing the safety and service provision on which the sector relies.

The following table outlines the relationship between shipping and the impacts it exerts on the marine environment in greater detail.

Table 5: *The pressures and proximate environmental impacts of the shipping industry on nature. These are not exhaustive but a selection of well understood pressures and impacts adapted from Turning the Tide[256] and supported by additional scientific literature.*

PRESSURES Biophysical demands placed on a natural resource	ENVIRONMENTAL IMPACTS Changes in the state of nature or its capacity to provide ecosystem services and social benefits
1. Seabed disturbance and disruption of coastal habitat	
ENCORE Typology: ● Area of seabed use	**Loss or degradation of coastal and marine habitats:** Coastal ecosystem services and resilience may be disrupted by vessel routes and accidents that damage reefs, mangroves and seagrass beds. Habitats may be impacted by poorly planned anchoring or anchor drag, or shipbreaking activities. Waves and currents from ships, especially in shallow depths, could suspend sediment or erode coastlines. **For example:** Coastal and marine ecosystems and habitats impacted include tropical/biogenic reefs, seagrass beds, mangroves, dunes and coastal vegetation, salt marshes, wetlands, and kelp forests. **Loss of ecosystem resilience and provision of ecosystem services:** The degradation and loss of coastal and marine habitats due to shipping activities can lead to the loss or reduction in the ability of an ecosystem to provide specific benefits. Critical ecosystems that support biodiversity also provide ecosystem services like coastal protection, carbon storage, flood defense, and food provisioning, so their disruption leads to loss of resilience and the ability to adapt to climate change.
2. Pollution	
ENCORE Typology: ● Emissions of nutrient pollutants to water and soil ● Emissions of toxic pollutants to water and soil ● Generation and release of solid waste ● Emissions of non-GHG air pollutants	**Reduction in animal welfare:** Pollution stemming from shipping activities contributes to reductions in animal welfare. This includes chemical pollution, wastewater, sewage, oil and fuel. **Loss or reduction in marine biodiversity including loss of ETP species:** Vessels and shipping operations damage marine life through fuel emissions, NOx and SOx, oil spills, hull residue, toxins, and discharge of waste and ballast water. Pollutants can also lead to degraded water quality.
3. Invasive species	
ENCORE Typology: ● Introduction of invasive species	**Loss or reduction in marine biodiversity including loss of ETP species:** Vessels and shipping operations can accidentally introduce invasive species through discharge of waste and ballast water and biofouling (accumulation of microorganisms on ships' submerged structures, such as their hulls). Invasive species disrupt the ecological functioning of natural systems, often by out-competing local and native species for natural resources, with negative implications for biodiversity and ecosystem resilience, and potentially causing significant economic damage at local and regional scales.[257]
4. Wild population impact /disruption of wildlife	
ENCORE Typology: ● Disturbances (e.g., noise, light)	**Reduction in animal welfare:** Animal welfare may be reduced by collisions with vessels, noise and light pollution. Persistent sources of noise and light will disrupt and distress marine animals, notably marine mammals, impacting behavior. **Loss or reduction in marine biodiversity including loss of ETP species:** There is potential for impact from collisions, especially during marine mammal migratory events. There is also the risk of entanglement of wildlife in lines, and anchoring can damage benthic ecosystems.
5. Exploitation of natural resources	
ENCORE Typology: ● Other abiotic resource extraction	**Loss or degradation of coastal and marine habitats:** Shipbuilding requires exploitation of natural resources and minerals, which may impact sensitive habitats.
6. Climate change	
ENCORE TYPOLOGY: ● Emissions of greenhouse gases (GHG)	**Increased GHG concentrations:** GHG emissions from vessels contribute to global warming, resulting in storm surges, sea level rise, coastline erosion, and ocean acidification.

While this document and the recommended actions for nature positive are divided up into the sub-sectors of shipping, there are some high-level considerations that should be addressed upfront regardless of the sub-sector in question. Across the entire sector, the following actions should be considered at the outset:

1. No shipping activity (e.g., routes or port development) should take place within protected or conserved areas (refer to regional or local legislation to determine such areas in the context of your work) unless designated for multiple use. Protected or conserved areas should not be downgraded, downsized, degazetted, or delisted to enable shipping infrastructure (e.g., ports or shipping lanes), nor should shipping infrastructure be placed in areas important for biodiversity and ecosystem services, including sites with high ecological integrity. There should be no involuntary displacement of Indigenous peoples or local communities to carry out any shipping activity (including port development), even in the absence of strong regulation and enforcement for land rights protection. Shipping companies should avoid routes near migratory pathways for vulnerable ETP species at risk of collision.
2. Shipping companies should not participate in any unfair or unsafe labor practices or human rights abuses—by for example assigning high-risk tasks or demanding unpaid overtime, especially for Indigenous workers or disadvantaged groups. Human rights-based approaches are fundamental to ensuring a holistic nature-positive approach.
3. WWF also strongly recommends that companies develop nature-positive action plans in close consultation with local actors—including community representatives and Indigenous peoples, as well as subject matter experts including credible civil society organizations, researchers and academics—in order to design context- and project-specific approaches appropriate for the particular regulatory, social, economic and environmental conditions in which they are operating.

CASE STUDY

SHIPPING: ARCTIC WATCH

Author: Shay Burnett

Arctic Watch is a new initiative to make shipping safer and more environmentally responsible in the Bering Strait. It will bring in information from Indigenous communities and wildlife experts to chart areas sensitive to impacts from shipping traffic, such as Indigenous subsistence areas and marine mammal habitat. This information will then be provided to shipping companies to assist voyage planning. The Marine Exchange of Alaska will also track the locations of merchant vessels to provide updated information on marine mammal locations and to ensure compliance with sensitive areas to be avoided.

This innovative initiative prioritizes community engagement and traditional knowledge to ensure protection of critical areas and habitats.

As implementation of Arctic Watch continues, WWF will ensure that shipping companies are involved in the development process to maximize the program's utility and ensure industry buy-in. Once successful implementation is seen in the Bering Strait, the scope of Arctic Watch will be expanded to cover more Arctic waters and ensure safe ship operation in the sensitive and remote seascape.

Source: Marine Exchange of Alaksa

NATURE-POSITIVE PATHWAYS IN SHIPPING

The tables below summarize specific pathways available for the shipping sector to contribute to nature positive.

Each table focuses on a shipping activity for various vessel types, that has material impacts on nature and biodiversity. They include the following information:

- **Activity type:** Actions that have been demonstrated to impact nature in the various phases and stages of shipping, and where the available evidence supports illustrative, science-based nature positive pathways to address them.
- **Industry classifications:** Categorization of the activity type using global codes for business based on economic activities including the International Standard Industrial Classification (ISIC), a system used to classify economic activities; Nomenclature statistique des activités économiques dans la Communauté européenne (NACE), the European Union's industry classification system; and the North American Industry Classification System (NAICS), which is used by the US government to categorize businesses based on economic activity.
- **Relevant impacts:** Icons identifying the impacts of the activity on nature (linking to the pressures and impacts table above) and those that are addressed by operationalizing nature-positive pathways.
- **Global Biodiversity Framework targets:** The GBF targets and their corresponding target numbers are mapped to each of the nature-positive pathways in the tables to demonstrate which policy targets are addressed by the actions. Please note that not all targets are featured in the table given that some are overarching and cross-sectoral, but they are included within the narrative where relevant. All targets are equally important to contribute to the nature-positive global societal goal.
- **The AR3T illustrative nature positive pathways:** The table is organized by the AR3T mitigation hierarchy—**avoid, reduce, restore and regenerate, transform**—for each industry activity, with a synthesis of science-based actions the shipping industry can take to credibly contribute to the global nature-positive goal.

The sub-sector tables outline specific risk management considerations per sub-sector alongside opportunities companies may consider for diversifying their activities in line with restoration and regeneration actions. While all steps in AR3T can be helpful for risk management, for clarity, the tables provided consider avoid and reduce actions as the primary drivers of risk management, and restore and regenerate as more closely aligned with creating opportunities. Transformative actions refer to fostering the enabling environment, and therefore cut across both risk management and opportunities. It is important to note the following:

- These illustrative pathways build on existing guidance and the scientific literature, serving as a practical starting point for companies that want to contribute to nature positive in their work. The tables provide an opportunity for industry to begin to understand the concepts, characteristics, and fundamentals of a project that contributes to nature-positive outcomes.
- **These pathways cannot be used for measuring impact or enabling claims, and are not a certification scheme,** but rather highlight a selection of science-based examples to demonstrate how a company could credibly operationalize the mitigation hierarchy to address pressures and impacts on nature.
- The examples are also not exhaustive. There are an extraordinary number of potential pathways a company could take, based on their context. We have chosen pathways that are supported by science, are impactful, and potentially scalable to facilitate positive change. These pathways can be used as a tool to engage with partners and scientific experts to further develop project-specific plans that adapt the examples provided to the unique ecological, biological, social, and economic characteristics and context of the site and individual project.

SHIPPING ACTION PATHWAYS

Credible, science-based pathways and illustrative examples by shipping activity to contribute to nature positive. Shipping activity types discussed in this chapter:

- **Ship building**
- **Ship operations**
- **Shipbreaking**

The cross-cutting and overarching GBF targets, which apply across all the shipping tables when the nature-positive principles and pathways are adopted, include:

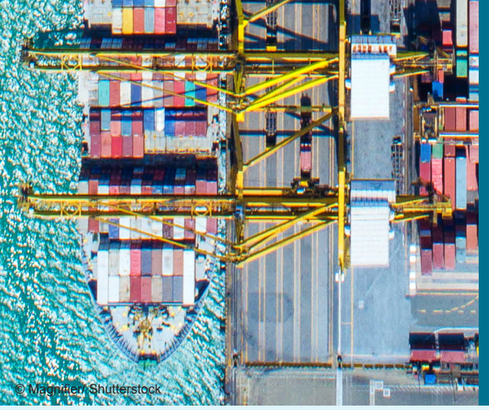
Target 14 Integrate Biodiversity in Decision-Making at Every Level

Target 15 Businesses Assess, Disclose and Reduce Biodiversity-Related Risks and Negative Impacts

Target 18 Reduce Harmful Incentives by at Least $500 Billion per Year, and Scale Up Positive Incentives for Biodiversity

Target 23 Ensure Gender Equality and a Gender-Responsive Approach for Biodiversity Action

© Getty Images / Felix Cesare / WWF-US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SHIP BUILDING

Industry classifications

ISIC 3011

NACE C30.11 Building of civilian ships and floating structures

NAICS 336611 Ship Building and Repairing

Related impacts:

- Loss or degradation of coastal and marine habitats
- Loss or reduction in marine biodiversity, including loss of ETP species
- Reduction in animal welfare
- Increased GHG concentrations

RISK MANAGEMENT → OPPORTUNITIES

Risk management Negative impacts to nature during the shipbuilding process can expose companies to regulatory and reputational risks. Managing these risks effectively requires companies to recognize and mitigate the environmental and social impacts of raw material sourcing, and also to implement design and manufacturing changes to reduce potential harms. (**Target** 15)

AVOID

- **Avoid ship designs that use metals and/or minerals sourced from conflict areas associated with human rights abuses.**
- **Avoid inefficient ship designs which contribute to increased emissions into water and air. (Target** 16**)**

REDUCE

- **Reduce noise** pollution by using the most up-to-date technologies to dampen sound and develop quieter components. Reduce primary sources of noise (e.g., propellors, hull form, on-board machinery) by reducing propeller cavitation, using materials that can dampen noise, and using electric motors. (**Target** 7)
  - ***For example:*** *Maersk updated the propellers of five of their container ships. They found that reducing propeller cavitation decreased low frequency sound levels. Both the decreased propeller cavitation and lighter materials lead to improved fuel efficiency and less energy needed for propulsion.*[258]
- **Reduce waste** by taking a circular economy approach to design to improve recyclability and incorporate recycled materials into manufacture. (**Target** 16)
- **Reduce biological pollution from wastewater and sewage** by selecting robust sewage systems in shipbuilding design. Wastewater should be managed according to best practices and applicable laws and regulations to prevent nutrient and bacterial pollution in marine and coastal waters. Zero-waste solutions should be pursued. (**Target** 7)
  - ***For example:*** *Sewage systems should have tertiary treatment and measures in place to prevent untreated wastewater from entering the ocean.*
- **Reduce emissions by:**[259] (**Target** 8)

  Supporting renewable energy integration into the design of the ship, for example solar panels, Flettner rotors, or wind-assisted devices to improve energy efficiency and energy conservation.

  Installing systems based on biofuels, hydrogen, or electric propulsion. Electric motors can be integrated with solar power and have been installed in larger vessels.

  Investing in research to understand impacts of new fuel options so that they can be adequately mitigated.
- **Reduce emissions by testing new green technology**, This could include installation of zero- and near-zero technologies or innovative energy efficiency/energy management practices to support a reduced emissions profile. Such tech innovation could play an important role in mitigating the impacts of climate change in the ocean. (**Targets** 8 20)

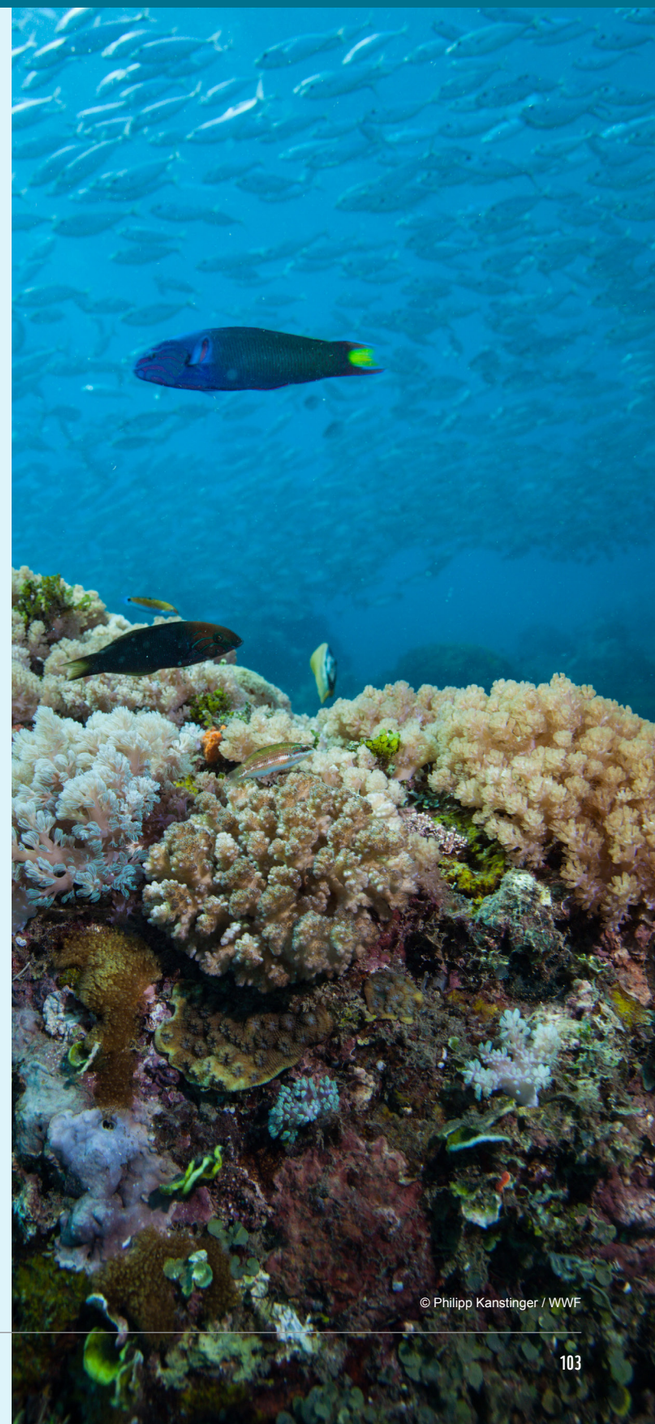
Opportunities The need for contributions to net zero and nature positive from shipping will require substantial innovation in material use, construction practices, operational lifespan and fuel use for maritime vessels. For shipbuilders, being at the forefront (or indeed first movers) of this transition presents a clear opportunity in building future markets. (**Target** 14)

RESTORE & REGENERATE

- **Integrate spaces for planting vegetation** (e.g., green roofs or spaces on cruise ships)[260] which can, at a small scale, contribute to capturing carbon emissions. Consider also, for example, integrating vegetation into drainage areas, to capture and filter rain runoff from the boat. This could help reduce oil or other pollutants from the ship from entering the ocean. (**Target** 11)

TRANSFORM

- **Advocate for and support research on innovative technologies** that can be integrated into new and retrofitted ships that reduce pollution. (**Targets** 20 21)
- **Advocate for the development of sustainable steel production**, to be utilized in shipbuilding. (**Targets** 6 8)
- **Advocate for a regulatory mechanism that incentivizes technological improvements** for reduced noise, increased fuel efficiency, and integration of renewable energy. (**Targets** 7 8)
- **Advocate for requirements in vessel construction to limit noise:** mandatory design changes for vessel construction principles have not been implemented to date. (**Target** 7)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SHIPPING OPERATIONS

Industry classifications

ISIC 5012
ISIC 5229
NACE H52.26 Other Support Activities for Transportation
NACE H50.20 Sea and coastal freight water transport
NAICS 483111 Deep Sea Freight Transportation
NAICS 488390 Other support activities for water transportation
NAICS 488510 Freight Transportation Arrangement

Related impacts:

- Loss or degradation of coastal and marine habitats
- Loss or reduction in marine biodiversity, including loss of ETP species
- Loss of ecosystem resilience and provision of ecosystem services
- Reduction in animal welfare
- Increased GHG concentrations

RISK MANAGEMENT

Risk management While dependencies on nature are limited for maritime transportation and trade, it has substantial direct and indirect impacts on nature and biodiversity in the ocean. These impacts can present significant reputational and regulatory risk for shipping lines and those chartering vessels. Implementing best practices for vessel operations, as well as working with shipbuilders for lower-impact next-generation vessels, are clear avenues for proactive nature-related risk management. (**Target** 15)

AVOID

- **Avoid shipping routes through spawning, migratory, or breeding areas for commercially important, vulnerable and/or ETP species.** Consult predictive models, PSSAs designated by the IMO, recent and historical data to determine migratory activity and life stage behaviors to avoid disruption (noting that migration routes and seasonality are shifting due to climate change, so companies will need to continuously monitor trends and support frequent monitoring). (**Targets** 1 4)
  - ***For example:*** *The North Atlantic right whale is listed as Critically Endangered by the IUCN. Their migration routes follow the Atlantic coast of the USA, through areas that overlap with shipping lanes. For the majority of the year, these whales feed in the north, primarily in the Gulf of Maine, and migrate to the south, off the coast of Georgia and Florida, from December to March for calving. In this case, the company would consult the known migratory paths and their seasonality, and avoid routes that would impact the right whale migration pathways.*[261]
- **Avoid vessel movements through marine protected Areas (MPAs)** or conserved areas (refer to regional or local legislation to determine such areas in the context of your work). Discharges of wastewater should also be avoided in or near MPAs. (**Targets** 1 7)
- **Avoid pollution** by abiding by vessel laws and regulations on areas such as ballast water, wastewater, sewage and emissions management, in order to prevent harm to wildlife and disruption to ecosystem processes. Invasive species are especially important to consider here as they are often introduced via ballast water and biofouling, and without proper management can supply coastal areas and foreign ports with invasive species disrupting the local ecosystem.[262] (**Target** 7)
  - ***For example:*** *Cruise and shipping routes may have ships traveling between distinct habitat types with differing species composition.*[263] *To prevent transport of invasive and non-native species, vessels should follow ballast water guidance and best practices in addition to best practices regarding biofouling, such as MEPC.378(80).*[264]
- **Avoid anchoring in natural habitats.** Avoid anchoring in areas that are in habitats that are biodiverse, vulnerable or ecologically valuable, or in protected and conserved areas (refer to regional or local legislation to determine such areas in the context of your work). (**Target** 1)
  - ***For example:*** *Anchoring and anchor drag can dislodge corals, leading to increased coral reef mortality. Avoid habitat disruption by maintaining safe distances from these areas.*[265]
- **Avoid reliance on heavy fuel oil** by switching to cleaner-burning distillates or utilizing low- or zero-carbon fuel or technology alternatives. (**Target** 8)
- **Avoid operation in Arctic waters when possible** to reduce impact on sensitive waters and species. (**Target** 1)
- **Avoid chemical treatments** of ballast water or biofouling, as biocides or other chemicals that have been used to combat invasive species can have unintended consequences once released into the marine system.[266] (**Target** 7)

REDUCE

- **Reduce emissions of black carbon,** particularly in Arctic waters, through use of cleaner fuels and/or mitigation technologies such as diesel particulate filters. Black carbon and particulate matter mitigation reduces contributions to climate change and health impacts to coastal communities. (**Targets** 7 8)
- **Reduce wildlife collision**s by adaptively managing routes and rerouting ships if species behavior alters or migratory routes change to intersect with historically safe routes. (**Target** 4)
  - ***For example:*** *In Sri Lanka, the shipping lanes to the major port go through a blue whale feeding ground. The World Shipping Council and other organizations have requested the government to adjust the route to mitigate collisions and ship strikes. More generally, the World Shipping Council has published a global voyage planning aid to protect whales, which could be referenced in voyage planning to reduce impacts.*[267]
- **Reduce wildlife disruption and collisions** by reducing and regulating vessel speed in known sensitive areas or during migration periods, and by implementing quiet hours. Reducing speed also decreases noise and the chances of ship strikes, as well as GHG emissions. Operate with scheduled shutdowns and/or slowdowns during hours of high wildlife activity, including migratory and breeding seasons. (**Targets** 4 8)
  - ***For example*** *In the Gulf of Panama, researchers have suggested a traffic separation scheme and reduced vessel speed during the humpback whale wintering season to reduce the risk of whale–vessel collisions.*[268]

    A study in the Mediterranean found that reducing speeds of vessels in shipping routes by c. 2 knots resulted in a ~50% reduction in underwater noise.[269]
- Stagger arrival times of ships into port to reduce congestion and thus reduce wildlife disruption or chances of collision. (**Target** 1)
- **Reduce wildlife disturbance from noise pollution** by routing around and maintaining distance from sensitive areas, such as MPAs or other areas designated by coastal governments. (**Targets** 4 7)
- **Reduce disturbance to wildlife from light pollution** by having "dark" hours or only use lighting necessary for navigation where possible, as cumulative light pollution from many ships in a shipping area can disrupt light-sensitive species.[270] (**Targets** 4 7)
- **Reduce wastewater discharge** (sewage, gray water, etc.) by disposing of it at port at proper pump out stations instead of releasing into marine habitat. Discharge affects nearshore environments and habitats in shipping lanes where the accumulation of gray and black water can lead to increased nutrient load, fecal bacteria, and eutrophication.[271] When this is not possible, use of a sewage treatment plan should be prioritized to avoid discharge of untreated effluent. (**Target** 7)
- **Reduce pollution** from ships and ship cleaning and mitigate against incidents by designing robust waste and pollution management plans. (**Target** 7)
  - ***For example:*** *Establishing and keeping up to date a spill prevention, control and countermeasures plan. Ensure vessels and machinery are regularly maintained, in compliance with relevant laws and regulations. This includes consistent checks for leaks to prevent spills during ocean operations, as well as updating the ship so that operational discharges are reduced. Oil spills can cause harmful impacts to coastal and marine species. For example, sea birds and otters are vulnerable to spills, as the oil can degrade bird's feathers or the insulation of otter fur. Oil spills can also cause central nervous system issues and reduced breeding success in several species.*[272]

SHIPPING OPERATIONS (CONTINUED)

Industry classifications

ISIC 5012
ISIC 5229
NACE H52.26 Other Support Activities for Transportation
NACE H50.20 Sea and coastal freight water transport
NAICS 483111 Deep Sea Freight Transportation
NAICS 488390 Other support activities for water transportation
NAICS 488510 Freight Transportation Arrangement

Related impacts:

- Loss or degradation of coastal and marine habitats
- Loss or reduction in marine biodiversity, including loss of ETP species
- Loss of ecosystem resilience and provision of ecosystem services
- Reduction in animal welfare
- Increased GHG concentrations

RISK MANAGEMENT → OPPORTUNITIES

Risk management While dependencies on nature are limited for maritime transportation and trade, it has substantial direct and indirect impacts on nature and biodiversity in the ocean. These impacts can present significant reputational and regulatory risk for shipping lines and those chartering vessels. Implementing best practices for vessel operations, as well as working with shipbuilders for lower-impact next-generation vessels, are clear avenues for proactive nature-related risk management. (**Target** 15)

Opportunities for vessel operators to restore and regenerate nature relate directly to the environments within which vessels operate, and therefore focus in particular on habitat restoration. Where these habitats are known carbon sinks, opportunities to manage climate impacts may be capitalized on through carbon credit schemes.[R] [278] (**Target** 14)

REDUCE (CONTINUED)

- **Reduce the harmful impact of anti-fouling paints** on wildlife and ecosystems by seeking alternative options. (**Target** 7)
  - ***For example:*** *The biocide TBT in boat paint causes endocrine disturbance in gastropods and bivalves, and inhibits photosynthesis which can impact corals, macroalgae, seagrass and microbial communities.*[273]
- **Reduce reliance on technologies which displace environmental impacts from air to water or vice versa.** Exhaust gas cleaning systems introduce heavy metals and other pollution into aquatic environments, harming the viability of zooplankton and other species at the base of the food web. Accordingly, installation of these systems should be avoided on newbuilds, and they should be gradually removed from existing fleets. (**Target** 7)
- **Reduce ecosystem disruption** by minimizing the spread of non-native, invasive species transported via the hull, ballast water, bilge water, and biofouling. Ballast water can be managed by deployment of treatment systems, for example, primary treatments like filtration to remove large organisms, and then mechanical treatment such as hydrodynamic cavitation, UV radiation, or electro-ionization of magnetic separation to remove smaller, microorganisms. There are different combinations of treatments that will target different organisms, so there is a need to investigate technologies to find the most effective combination in the context of the shipping location and routes, while also minimizing residual impacts to the environment. For that reason, chemical treatments should be avoided to prevent harm to ecosystems when treated water is released.[274] Ensure compliance with the Ballast Water Management Convention.[275] (**Target** 6)
- **Reduce entanglements of marine wildlif**e (sea turtles have, for example, become entangled in buoy lines) in any lines used for vessel activity, like buoys, by securing and tightening lines, eliminating the use of rope where possible, and recovering lost gear/equipment/lines as quickly as possible. (**Target** 4)
- **Reduce harm to nature by deploying just-in-time shipping** to improve fuel efficiency and reduce wildlife collisions; this will also reduce the need for anchoring outside of port, which can lead to habitat destruction. Just-in-time shipping for all vessels in a fleet will reduce overall cumulative impacts of noise and emissions. (**Targets** 7 8)
- **Reduce sedimentation and erosion nearshor**e by reducing speed and minimizing transit through shallow areas where sediment can be easily resuspended. The wave energy and currents created by ships can disturb reefs, fish and birds nesting inshore, and cause coastal erosion. The resuspension and vertical mixing of sediments can increase nutrient transport, leading to eutrophication.[276] (**Target** 1)
- **Reduce conflict with other industries that operate in the same space** (e.g., fishing, aquaculture, marine renewables) by carefully planning routes that coexist with other industries while also being cognizant of the cumulative impacts of all operations in the marine ecosystem. (**Target** 14)
- **Reduce harmful consequences of invasive specie**s on ecosystems by designing and deploying a management service for their removal and eradication as part of regular maintenance. Monitoring and early detection will allow for intervention to reduce their spread and promote native establishment. (**Target** 6)
  - ***For example:*** *The invasive Pacific oyster was introduced to the Wadden Sea and occupied the same habitat niche as native mussels. The non-native oyster spat have settled and created reefs that are new biogenic structures in the intertidal zones, changing the characteristics and structure of the marine community.*[277]

RESTORE & REGENERATE

- **Restore degraded coastlines impacted by the waves and currents created by shipping activity** which have led to erosion, loss of vegetation, and coastal instability. (**Target** 2)
  - ***For example:*** *Mangroves attenuate waves, capture sediments, and create habitat, and seagrass beds also capture sediments and stabilize the seafloor.*[279]
- **Consider lining waterways with vegetation** to dampen waves and stabilize sediments. (**Target** 11)
- **Deploy restoration activities following best management practices** for the ecosystem type concerned. (**Target** 2)
  - ***For example:*** *The fundamentals and considerations for seagrass restoration include proximity to donor beds, water quality, planting techniques, scale, site selection, and planting materials.*[280] *The Global Mangrove Alliance has designed comprehensive best practice guidelines for restoration that bring together local and scientific knowledge for an inclusive mangrove restoration process. The guide walks through the key steps and decision trees for successful mangrove restoration from setting goals, assessing feasibility, project design, engagement and implementation, to monitoring and evaluation with case study examples. It also touches on blue carbon projects and how to appropriately design them.*[281]
- **Design and incorporate reef modules** to attenuate waves created by ships, accrete sand to prevent coastal erosion, and act as a buffer to the currents created by ship movement. The modules could protect existing reefs, fish, and bird nesting habitats, as well as provide settlement surfaces to support native diversity. (**Target** 11)

  For successful reef module design and deployment, implement robust habitat mapping and baseline data collection of the site; conduct modeling; set clear and measurable objectives;[19] identify the ecologically and biologically relevant species (target species) of the site (e.g. through baseline studies from the environmental impact assessment, historical data, local expertise and Indigenous knowledge); and incorporate natural designs, materials, and surface textures that biomimic the natural habitat.[282]
  - ***For example:*** *Deployment of robustly designed, modeled, and eco-engineered artificial modules near to shore can offer coastal protection by supporting sediment accretion, buffering waves, and improving climate resilience, while serving as habitat for native wildlife*.
- **Complement restorative efforts by actively planting species onto surrounding structures** (e.g., onto reef modules). (**Target** 2)
  - ***For example:*** *Planting existing wildlife such as corals or oysters (depending on latitude and habitat) onto artificial structures will advance timelines to achieve robust ecosystem functioning and enhance biodiversity.*[283] *Select target species for the site, which then dictates the appropriate restorative action and design, based on the region in which development is occurring.*
- **Support restoration of habitats that store carbon**, like those mentioned above and that are near port locations and can contribute to coastal resilience by absorbing emissions. (**Target** 8)
- **Collect and contribute ecological biological dat**a, such as e-DNA, to relevant scientific institutions. (**Targets** 20 21)
- **Support use of indices, such as the Green/Environmental Shipping Index**,[284] to support prioritization of green ships for berthing and other ship services. (**Targets** 20 21)

R Through robust verification methods and through robust verification methods and see 773q5lvbf0_WWF_position_and_guidance_on_corporate_use_of_voluntary_carbon_credits_EXTERNAL_VERSION_11_October_2019_v1.2.pdf for more details.

SHIPPING OPERATIONS (CONTINUED)

Industry classifications

ISIC 5012
ISIC 5229
NACE H52.26 Other Support Activities for Transportation
NACE H50.20 Sea and coastal freight water transport
NAICS 483111 Deep Sea Freight Transportation
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NAICS 488510 Freight Transportation Arrangement

OPPORTUNITIES

Opportunities for vessel operators to restore and regenerate nature relate directly to the environments within which vessels operate, and therefore focus in particular on habitat restoration. Where these habitats are known carbon sinks, opportunities to manage climate impacts may be capitalized on through carbon credit schemes.[R 278] (**Target** 14)

RESTORE & REGENERATE

- **Support and preferentially operate from ports that are utilizing nature-inclusive and nature-based design** approaches in marine or coastal infrastructure appropriate for the location, habitat, and native species.[285] (**Target** 11)
  - ***For example:*** *A bioenhanced concrete called ECOncrete has been found to support colonization of native organisms in marine infrastructure projects.[286] Specialized marine-friendly concrete use should be considered during construction. Where it is not possible to substitute a nature-based solution or restorative action for gray infrastructure, e.g. constructing a seawall for a port, reduce impacts by enhancing the materials to support habitat creation and biocolonization.*
  - ***For example:*** *A company in Florida, USA (KIND designs) is constructing living seawalls that can be fitted onto existing seawalls. The rugosity and material of the living seawalls has been designed to attract colonization of sessile organisms and provide habitat for fish, reducing impacts by providing alternative settlement and habitat niches.*
- **Restore degraded habitats onsite** to meet the needs of ecosystem repair, and integrate nature-based design into mooring and anchoring systems for vessels, specifically by using artificial reef modules to create fixed anchor points in frequented areas that provide a reliable and predictable location for vessels to moor, while also serving as artificial habitat for native wildlife (see also reef module information in the site planning and preparation table for key considerations and fundamentals). (**Target** 11)
  - ***For example*** *Utilizing reef modules for fixed anchoring/mooring points is a new concept with few references in the literature. However, applying the same principles of robust, eco-engineered reef modular design for habitat restoration to nature-based moorings would allow for mooring buoys and anchors to have a nature-inclusive design, leading to recovering habitats while also reducing the negative impacts of anchor drag on the seabed.[287]*

TRANSFORM

- **Work cross-sector to reduce cumulative impacts** by participating in and/or advocating for ecosystem-based marine spatial planning and robust integrated coastal zone management. (**Target** 1)
- **Advocate for and support expanded labor rights**, including the right to organize and greater pay in exceedance of requirements within the Maritime Labor Convention, 2006. (**Target** 22)
- **Advocate for sound port placement** that does not disrupt healthy and sensitive habitats, and for ports powered by renewables. (**Targets** 1 8)
- **Advocate for noise buffer zone**s around sensitive areas, such as MPAs or other areas designated by coastal governments. (**Targets** 1 7)
- **Reduce wildlife disruption and habitat fragmentation** by advocating for shipping lanes not to bisect interconnected habitats. For example, the interconnected habitat mosaic between mangroves, seagrass beds, and corals is important for the life stages of many species, and fragmenting it by placing a shipping lane through those connected habitats would disrupt behavior of species that depend upon them for survival. (**Target** 1)
- **Consider "off site" restoration of habitats** associated with material impacts— e.g., at ports of call or in habitats of affected species such as sea turtles. If specific species are impacted, advocate for the creation of marine reserves to preserve the ETP species. (**Targets** 2 4)
- **Invest in research and development** for better antifouling approaches which minimize or eliminate impacts to the maritime environment. (**Targets** 20 21)

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SHIPBREAKING

Industry classifications

ISIC 3830

NACE E38.21 Materials recovery

NAICS 488390 Other Support Activities for Water Transportation and 336611 Ship Building and Repairing

Related impacts:

- Loss or degradation of coastal and marine habitats
- Loss or reduction in marine biodiversity, including loss of ETP species
- Reduction in animal welfare
- Loss of ecosystem resilience and provision of ecosystem services

RISK MANAGEMENT → OPPORTUNITIES

Risk management For shipbreaking, clear risks associated with pollution impacts need to be proactively managed in the context of both reputational and regulatory concerns. Remediation-associated costs may be avoided through implementation of best practices that avoid or reduce harm to nature. (**Target** 15)

AVOID

- **Avoid conversion of natural habitats. Avoid shipbreaking in protected and conserved areas or other areas of particular importance for biodiversity, ecosystems, and ecosystem services.** This includes vulnerable and ecologically valuable areas with key functions including habitat for species with limited ranges, keystone species, ETP species (such as those listed on the IUCN Red List, CITES, and considering local status if available), coastal migration routes, spawning, breeding, and foraging areas, and areas that provide ecosystem services like carbon sequestration and coastal flood defense that are not easily replaceable. (**Targets** 1 3 4)
  - ***For example:*** *Shipbreaking often happens in coastal settings, which has led to the removal of mangroves to accommodate the activity. Shipbreaking close to the coast has also led to discharged pollutants from the scrapped ships entering beach sand and sea water.*[287]
- **Avoid shipbreaking in areas or jurisdictions with insufficient waste management infrastructure** in place to safely dispose of harmful materials including paint, residue, and asbestos.[289] It is important to identify shipbreaking areas that can handle and manage the byproducts to prevent contamination of the surrounding environment, that do not displace natural habitats, and that can manage pollutants. (**Targets** 1 7)
- **Avoid shipbreaking not in accordance with the Hong Kong Convention or the EU Ship Recycling Regulation.**[290] **(Target** 7)

REDUCE

- **Reduce chemical pollution** by implementing robust hazardous waste management and disposal plans. Steel is often coated in paint which contain chemicals, and ships contain other waste such as PCBs, asbestos, oil, and grease. The improper management and discharge of these pollutants can degrade marine habitats, so proper disposal of oily sludge, rags, and sawdust should be implemented. (**Target** 7)
- **Reduce impacts to coastal systems** by strategically planning locations for shipbreaking, material reuse and recycle, management and disposal of pollutants and hazardous materials before any activities begin. This proactive approach reduces the probability of harmful consequences and remedial actions. (**Targets** 1 16)
- **Reduce opportunities for waste by taking a circular economy approach** to material use, and through implementation of a robust solid waste management plan, recovering materials to facilitate recycling and reuse. (**Targets** 7 16)

RESTORE & REGENERATE

- **Support coastal ecosystem restoration in areas previously impacted by shipbreaking activities.** (**Target** 2)
  - ***For example:*** *Shipbreaking has been found to lead to reduced abundance and diversity of marine species, with fishers reporting reduced catches, and loss of coastal vegetation in the areas where it occurs.*[291] *Restorative actions to address these impacts—such as mangrove rehabilitation, seagrass, and reef restoration—are ways in which the industry could support long-term regeneration (see the shipping operations table for more information on restoration and regeneration).*

Opportunities The most prominent opportunity for shipbreakers is in participating in the circular economy transition. This provides opportunities for retaining material value at end of life and building secondary markets for the use of metals and other materials recovered from shipbreaking activities.

Shipbreakers may benefit from increasing the physical resilience of coastlines to storm surges (which, in turn, can drive pollution impacts from hulls) by investing in the regeneration of protective coastal ecosystems. (**Target** 14)

TRANSFORM

- **Advocate for policies that hold shipbreakers accountable** for spills or pollution events and the remedial mitigation interventions. (**Targets** 1 7)
- **Advocate for designated shipbreaking facilities that minimize harm** to coastal environments. (**Target** 1)

SHIPPING: CONTAINER SHIPS, BULK CARRIERS, TANKERS, AND CRUISE SHIPS

A nature-positive vision for shipping: Visualizing illustrative pathways for the sector. (Note: Figures are not to scale, and do not depict all actions recommended herein.)

REGULATE AND REDUCE VESSEL SPEED
in known sensitive areas to reduce wildlife disruption or collisions

AVOID VESSEL MOVEMENTS THROUGH MARINE PROTECTED AREAS
(MPAs) or conserved areas

AVOID SHIPPING ROUTES
through spawning, migratory, or breeding areas of marine species

PARTICIPATE IN AND ADVOCATE FOR ECOSYSTEM-BASED MARINE SPATIAL PLANNING
and inclusive actor engagement

SELECT ROBUST SEWAGE AND WASTEWATER SYSTEMS
in shipbuilding design to reduce biological pollution

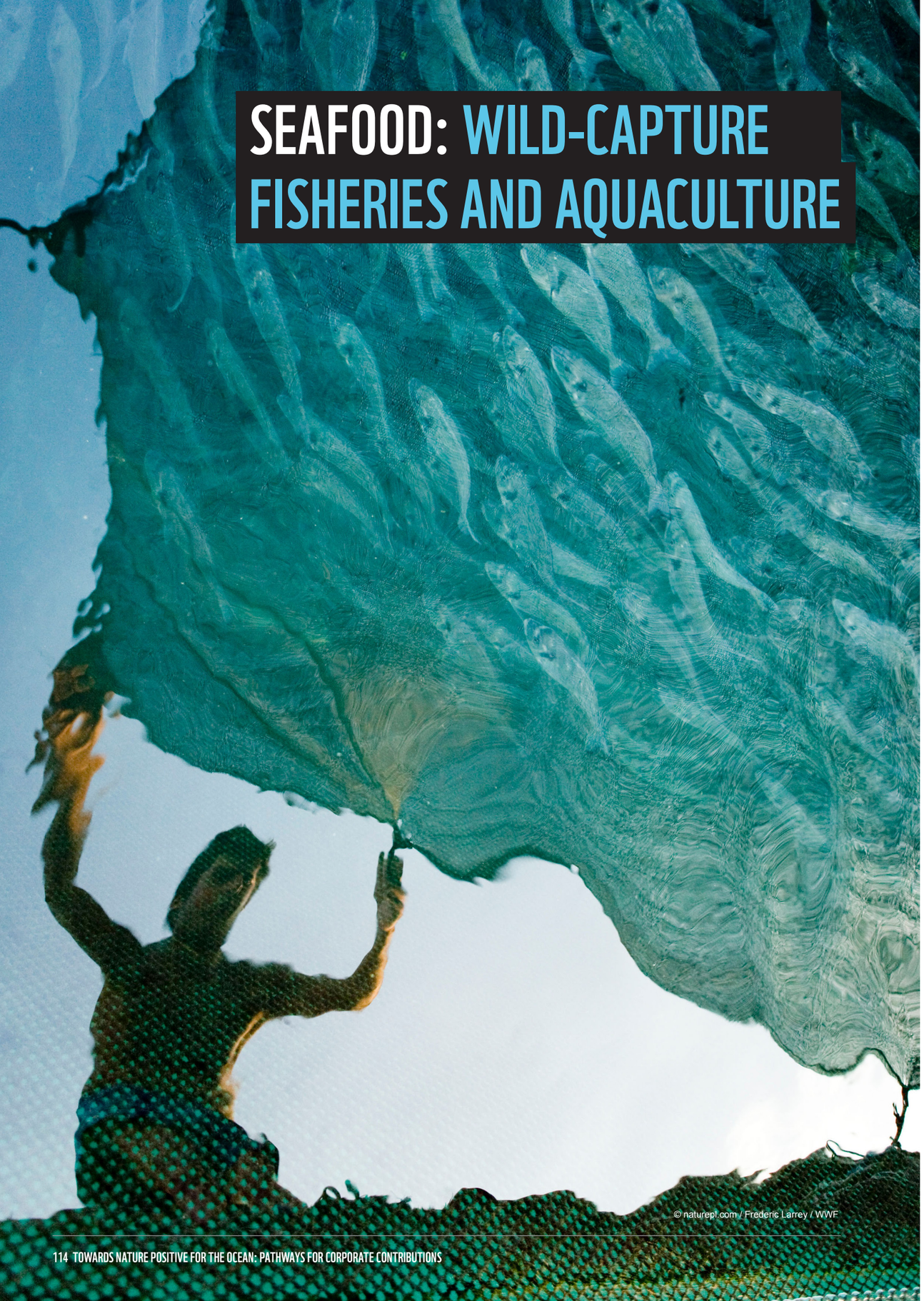
RESTORE COASTLINES IMPACTED BY WAVES AND CURRENTS FROM SHIP ACTIVITY

AVOID CONVERSION OF NATURAL HABITATS
(e.g., mangroves) for shipbreaking

ABIDE BY VESSEL LAWS AND REGULATIONS
for ballast water, wastewater, sewage and emissions management to avoid pollution

INTEGRATE RENEWABLE ENERGY
into the ship design to reduce emissions

RESTORE DEGRADED HABITATS ONSITE
to meet the needs of ecosystem repair, for example with reef modules to create fixed anchors, habitat and provide coastal protection



SEAFOOD: WILD-CAPTURE FISHERIES AND AQUACULTURE

The seafood sector, spanning both wild-capture fisheries and aquaculture, is globally dispersed, disaggregated, complex, and diverse. Seafood is one of the most highly traded commodities in the world, involving 230 countries and delivering a value of over US$195 billion. It employs some 62 million people worldwide, and 500 million people rely on it for their livelihoods.[292]

It is also critical for global food security. Already, more than 3.1 billion people—over 40 percent of the world population—cannot afford a healthy diet, and this is a situation that will likely worsen with the global population projected to reach 8.5 billion by 2030. Given the role of seafood in global diets, maintaining a sustainable and healthy supply is a critical global challenge. Despite its importance, the seafood sector faces many social and environmental challenges. It is one of the most nature-dependent sectors in the world; and with production projected to increase by 10 percent by 2032, aligning the sector with a nature-positive future is fundamental to its continued ability to meet these global needs.[293]

Wild-capture fisheries depend on a healthy ocean to be viable over the long term: there is no parallel with any other sector in the extent to which its functionality and profitability are inherently intertwined with the sustainable management and health of wild species and their associated ecosystems. Despite this, the proportion of production coming from stocks fished outside biologically sustainable limits has increased from 10 percent in 1974 to an estimated 37.7 percent in 2021.ccxciv As a result, since the late 1980s, global capture fisheries production has stayed mostly static, despite technological advancements in catching methods. In other words, more effort is needed to catch the same amount of fish. Compounding the problem is illegal, unreported, and unregulated (IUU) fishing, which undermines conservation and sustainability efforts and creates an uneven playing field that disproportionately impacts developing nations. Moreover, up to 80 percent of the global catch is not even assessed, while chronic underreporting adds further uncertainty to the magnitude of the problem. [294]

Over this same period, aquaculture production has been increasing rapidly and has become one of the fastest-growing food sectors in the world. In 2022, global aquaculture production reached an unprecedented 130.9 million tonnes, surpassing wild-capture supply for the first time.[294] Such expansion risks bringing further pressures through habitat conversion, biodiversity loss, freshwater use, energy use, pollution, social issues, and pressure on wild-caught fish targeted as aquaculture feed ingredients, such as sardine and anchovies.

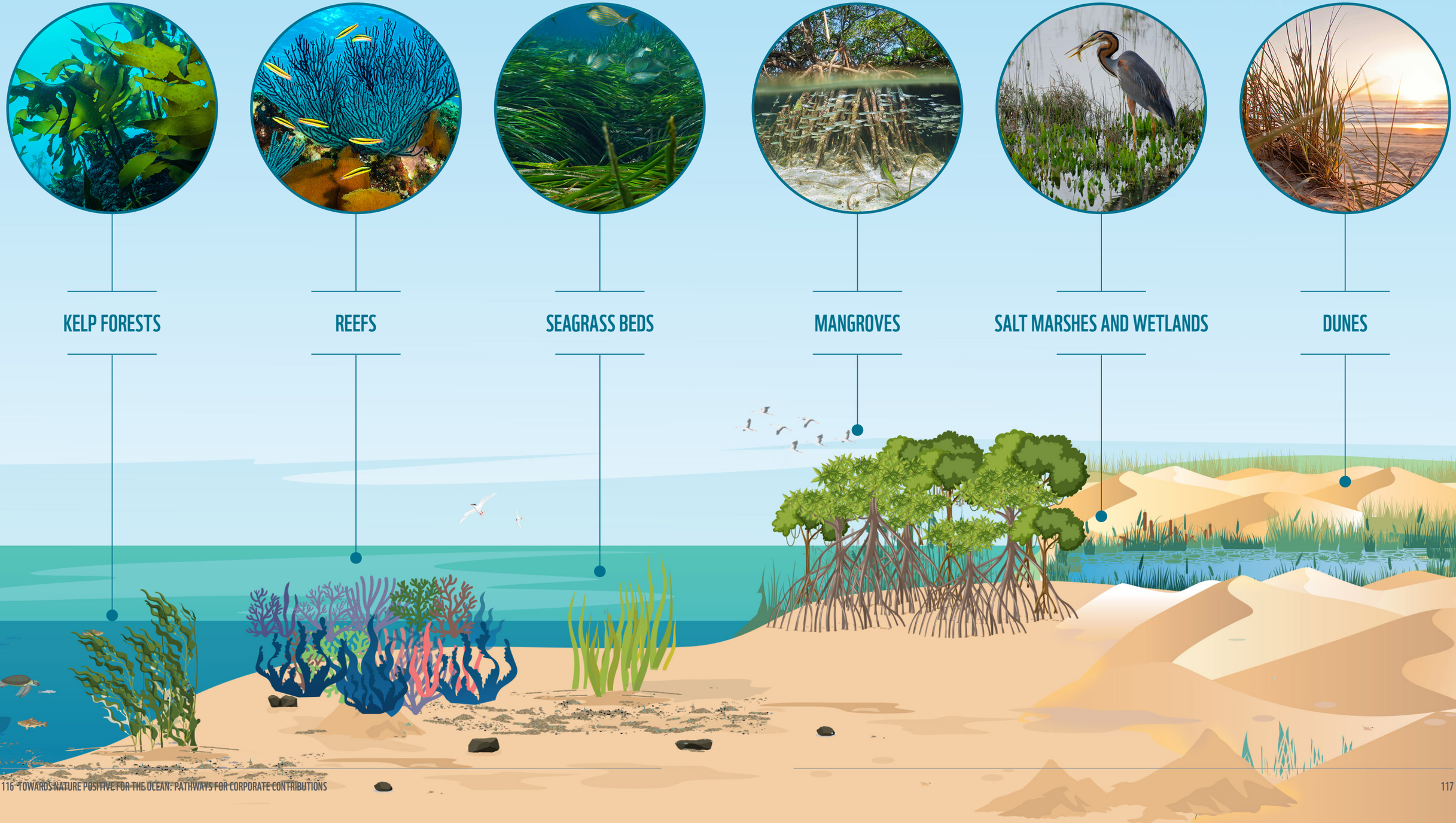
Current approaches to promoting more sustainable wild-capture fisheries and more responsible aquaculture have had successes, ranging from reducing impacts on ETP species to increasing stock size, reducing habitat conversion and stopping overfishing of certain stocks. However, the reality of climate change, the conversion of sensitive habitats, the growing awareness of human rights violations in the sector, the expansion of industrial distant-water fishing fleets during the past decade, and the sheer number of unassessed fisheries, demands renewed action and innovative approaches. Many parts of sector are still a long way from being sustainable, responsible, or contributing to nature positive. Large-scale and rapid action is needed to halt and reverse the decline of nature in the ocean, thus reducing risks to critical livelihoods, food security and well-being in coastal communities around the world.

The seafood sector has a pivotal role to play, and solutions do exist. In fact, the available tools, including credible certification schemes and improvement approaches, are more advanced than those in other sectors in the blue economy. This chapter therefore builds on the tools that have already been developed and the activities that are already happening to ensure continued, and increased, investment into sustainability initiatives. It articulates how these can contribute to the nature-positive global goal, benefiting biodiversity, and also the seafood sector itself. Additionally, this report presents a new hierarchy framework as the foundation for articulating nature-positive pathways in seafood.

THE INTERFACE WITH NATURE

Wild-capture fishing and aquaculture farms occur in coastal and marine areas, which globally encompass a diversity of ecosystem types that support biodiverse assemblages of flora and fauna and that provide vital ecosystem services. Both fisheries and aquaculture operations can impact sensitive and vulnerable habitats, some of which may take decades to recover, while unselective fishing practices can result in significant bycatch which can include ETP species. Poorly designed or sited aquaculture infrastructure can also have impacts on marine and avian species.

The impacts on nature from seafood industry activities are well documented. Credible industry standards such as the Aquaculture Stewardship Council (ASC) and the Marine Stewardship Council (MSC) have been in operation for decades and have wide global reach. In order to contribute to a nature-positive future, companies can and should use these and other existing tools to assess and identify pressures and impacts, risks and opportunities, so that they can design pathways that contribute to nature positive.



The following tables are non-exhaustive summaries of pressures and impacts that occur as a result of seafood production for both wild-caught fisheries and aquaculture.

Table 6: *Example pressures and proximate environmental impacts of aquaculture on nature. These are not exhaustive, but are a selection of well understood pressures and impacts adapted from Turning the Tide[297] and supported by additional scientific literature.[298]*

AQUACULTURE PRESSURES Biophysical demands placed on a natural resource	AQUACULTURE ENVIRONMENTAL IMPACTS Changes in the state of nature or its capacity to provide ecosystem services and social benefits
1. Seabed disturbance and disruption of coastal habitat	
ENCORE Typology: ● Area of seabed/habitat use	**Loss or degradation of coastal and marine habitats:** The siting of aquaculture operations near, in, or connected to marine and coastal habitats can lead to land-use change, deforestation and habitat conversion/degradation. This pressure can be multiplied when farms are co-located in the same area with intensive production. In some cases, aquaculture operations can be sited in or near to protected areas, including High Conservation Value Areas, or Ramsar and UNESCO World Heritage sites where the potential for loss of essential marine habitats is high. Mangroves have been notably affected by land conversion for aquaculture ponds in Southeast Asia, with over 50% of the world's mangroves lost since 1940, driven in part by the expansion of aquaculture.[299] **Loss or reduction in marine biodiversity including loss of ETP species:** When aquaculture leads to direct land conversion, coastal and marine ecosystems, such as wetlands and mangrove forests, may be threatened, degraded or destroyed, leading to an associated loss of biodiversity. These habitats often support nursery grounds, foraging, and breeding, leading to the loss of species that rely on them. **Loss of ecosystem resilience and provision of ecosystem services:** Habitat conversion in coastal ecosystems disrupts their ability to provide vital services to people, biodiversity and climate. For example, mangroves act as coastal green infrastructure, providing protection from storm surges and flooding. Mangroves are also significant carbon sinks and provide vital habitats and nurseries for commercial fish species. Coastal wetlands provide watershed regulation, maintain water quality, are habitats for fish species, and also sequester and store carbon. **Increased GHG concentrations:** Conversion and deforestation of intact habitat for terrestrial crop production for aquaculture feed or directly for aquaculture ponds (in wetlands and mangroves) can lead to increased carbon emissions and reduced sequestration potential.
2. Pollution	
ENCORE Typology: ● Emissions of nutrient pollutants to water and soil ● Emissions of toxic pollutants to water and soil ● Generation and release of solid waste ● Emissions of non-GHG air pollutants	**Changes to marine biological, chemical and geological cycles:** Aquaculture effluent can contribute to eutrophication in local water bodies. Eutrophication leads to overproduction of plankton that consume available oxygen, suffocating other marine species and/or disrupting the balance of the ecosystem, including benthic flora and fauna. **Loss or reduction in marine biodiversity including loss of ETP species:** Aquaculture operations can use harmful chemicals, pesticides and anti-microbials to control disease or parasite outbreaks, and clean net pens. These can then leach out into the surrounding environment, which could affect local ecosystems and biodiversity.
3. Invasive species	
ENCORE Typology: ● Introduction of invasive species	**Loss or reduction in marine biodiversity including loss of ETP species:** Aquaculture, particularly in open net pen production systems, can lead to escape events where farmed fish are released accidentally into the wild. The mixing of farmed species with wild species can cause genetic impacts to local wild populations, spread disease and pathogens, and increase competition for scarce food resources. Where invasive, non-native species are farmed this can be a particular cause for concern. While some commonly farmed species with known risks around escapement have yet to become established locally, the risk of establishment may increase with changing oceanic conditions.
4. Wild population impact/disruption of wildlife	
ENCORE Typology: ● Disturbances (e.g., noise, light)	**Loss or reduction in marine biodiversity including loss of ETP species:** The outbreak and spread of disease and parasites is a common occurrence in aquaculture and can lead to widespread harvest losses both at individual farms and regionally. When outbreaks occur in open-net pen farming, disease or pathogens can spread to local wild populations, putting them at risk—especially if they are already under increasing pressures from other impacts, such as food scarcity and climate change. **Reduction in animal welfare:** To deter predators, farms may take measures that directly or indirectly affect wildlife populations, such as using acoustic deterrent devices. Research suggests that some of these devices can cause pain to cetaceans and cause marine mammals (e.g., seals, dolphins, whales) to avoid areas that may be important for feeding, breeding and migration. In addition, wildlife including birds can be affected through entanglement in nets or ropes.
5. Exploitation of natural resources	
ENCORE Typology: ● Other abiotic resource extraction ● Other biotic resource extraction	**Loss of ecosystem resilience and provision of ecosystem services:** For some farmed species, wild fish are key ingredients in aquaculture feed. In nature, these targeted species—such as anchovies, krill, sand eels, sardines, or herring—serve as the primary food source for larger fish and other marine species, including whales and dolphins, which can therefore be negatively affected due to declining resources. If these fisheries are managed poorly then increased pressure can contribute to their overexploitation, with corresponding impacts on their predators. Soy and other terrestrial ingredients are also used in commercial aquafeed formulations, which in certain regions leads to deforestation, land-use change, and loss of biodiversity and ecosystem functionality.
6. Climate change	
ENCORE TYPOLOGY: ● Emissions of greenhouse gases (GHG)	**Loss of ecosystem resilience and provision of ecosystem services:** In coastal areas, ecosystems provide climate adaptation services to surrounding infrastructure, businesses and communities, for example by reducing flood risks from storm surges. Where aquaculture affects the integrity of ecosystems, these services are reduced.[300] **Increased GHG concentrations:** Conversion and deforestation of intact habitat for terrestrial crop production for aquaculture feed or directly for aquaculture ponds (in wetlands and mangroves) also leads to increased carbon emissions and reduced sequestration potential.

Table 7: *Example pressures and proximate environmental impacts of wild-capture fisheries on nature. These are not exhaustive but a selection of well understood pressures and impacts adapted from Turning the Tide*[301] *and supported by additional scientific literature*

WILD-CAPTURE FISHING PRESSURES Biophysical demands placed on a natural resource	WILD-CAPTURE FISHING ENVIRONMENTAL IMPACTS Changes in the state of nature or its capacity to provide ecosystem services and social benefits
1. Seabed disturbance and disruption of coastal habitat	
ENCORE Typology: ● Area of seabed/habitat use	**Loss or degradation of coastal and marine habitats:** Destructive and/or poorly managed fishing practices can lead to the loss or deterioration of important marine habitats, ranging from (for example) coral reefs in the shallow seas to sensitive seabeds in deeper waters. These vital habitats, established over millennia, are highly vulnerable to disturbances and they can take years to recover from just a single event.
2. Pollution	
ENCORE Typology: ● Emissions of nutrient pollutants to water and soil ● Emissions of toxic pollutants to water and soil ● Generation and release of solid waste ● Emissions of non-GHG air pollutants	**Loss or reduction in marine biodiversity including loss of ETP species:** Fishing vessels can also damage marine wildlife through NOx and SOx emissions from fuel use, hull residue, and discharge of waste and ballast water. Other pollution impacts are noted in section 5 of this table: Climate change.
3. Exploitation of natural resource	
ENCORE Typology: ● Other biotic resource extraction	**Loss or reduction in marine biodiversity including loss of ETP species:** Overfishing is a result of too much fishing effort deployed on a fish stock such that it cannot sustain itself over time. This can include catching too many fish overall or catching excessive females and juveniles, leading to too few adults in the population. Overfishing causes a decline in biomass below scientifically determined sustainable levels, and can also cause significant negative ecosystem shifts resulting from removing top predators from the food chain or altering the fertility of fish stocks by over-catching breeding females. Additionally, illegal, unreported and unregulated (IUU) fishing is a systemic problem in global fisheries, with IUU activities more likely to lead to fisheries being overexploited through indiscriminate fishing techniques that not only overfish target species, but which also catch non-target species, including ETP species such as cetaceans, sharks, rays, turtles and many others, further exacerbating marine biodiversity loss. This leads to a decrease in ecosystem resilience and essential ecosystem services, which depend on healthy biodiversity and the maintenance of fish stocks at sustainable levels.
4. Wild population impact/disruption of wildlife	
ENCORE Typology: ● Other biotic resource extraction	**Loss or reduction in marine biodiversity including loss of ETP species:** Destructive and non-selective fishing practices can lead to increased mortality of non-target species (through "bycatch"), including sharks, whales and dolphins, marine turtles, seabirds and other vulnerable species. Fishing vessels that abandon, discard or lose fishing gear in the ocean can contribute to the loss of biodiversity by impacting marine mammals, sharks, turtles, and many other species through entanglement and so-called "ghost fishing", where fishing gear continues to catch fish after it has been lost. Unless the gear is retrieved, this can continue for years due to the durability of modern materials.
5. Climate change	
ENCORE TYPOLOGY: ● Emissions of greenhouse gases (GHG)	**Loss or reduction in marine biodiversity including loss of ETP species:** Fish stock abundance and distribution are both affected by climate change;cccii this can affect the viability or accessibility of different fisheries and further reduce population resilience to exploitation.[303] **Increased GHG concentrations:** Some fishing techniques disrupt carbon sequestered in the benthic environment, while fishing vessels themselves emit CO2, contributing to GHG concentrations. Overfishing also impacts the broader role that marine animals play in the ocean carbon cycle.

As a result of these pressures and impacts, there are some high-level considerations that should be addressed upfront by all seafood companies. Across the entire sector, the following actions should be considered at the outset:

1. Comply with relevant minimum international guidelines, conventions, and codes, especially:
   - The United Nations Food and Agricultural Organization's (FAO) Code of Conduct for Responsible Fishing[304]
   - FAO Guidelines for Sustainable Aquaculture[305]
   - FAO's Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines)[306]
   - United Nations Fish Stocks Agreements (UNFSA) and the overarching United Nations Convention on the Law of the Sea (UNCLOS).[307]
2. Companies should use best practices and develop corporate policies in conjunction with a credible human/labor rights organization that includes ILO labor requirements, a robust due diligence process, efficient monitoring systems, and public reporting. Social policies need to be compliant with WWF's Environmental and Social Safeguards Framework.
3. WWF also strongly recommend that companies develop fishery and aquaculture improvement action plans in close consultation with local actors—including community representatives and Indigenous peoples, as well as subject matter experts including civil society organizations, researchers and academics—in order to design context- and project-specific approaches appropriate for the particular regulatory, social, economic and environmental conditions in which they are operating.

CASE STUDY

CONSERVATION AND FISHERIES SECTOR IN A COLLECTIVE EFFORT TO CREATE A MARINE PROTECTED AREA

Author: Pablo Guerrero

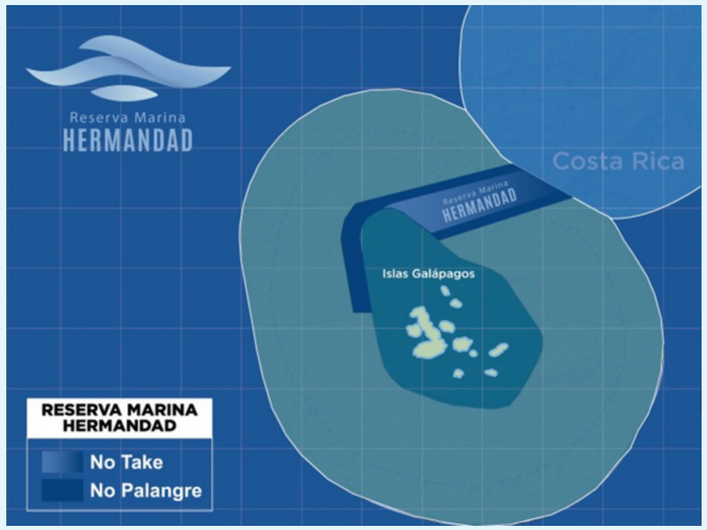
Initially, the establishment of the Galapagos Marine Reserve (GMR) in 1998 led to resistance among Ecuador's industrial fisheries, which lost traditional fishing grounds. At that time, the tuna industry did not participate in the process of creating the 143,000 km² marine reserve. Years later, scientific evidence demonstrated that the creation of the GMR increased fishing productivity in both the Galapagos exclusive economic zone surrounding the GMR, as well as inside the marine reserve.[317]

Due to spillover effects from the GMR, which increase the abundance of fish populations outside the reserve, the industry began to recognize the reserve as providing breeding and foraging areas that benefit fishing.

Therefore, when a negotiation began in 2021 between the conservation sector and the fishing sector, the latter actively participated in a historic process in Ecuador around a marine protected area. This process enabled a consensus around the creation of the Hermandad Marine Reserve through Presidential Decree No. 319, signed on January 14, 2022. With this action, an additional 60,000 km² were added to the protected area system of Galapagos, preserving seamounts used by sea turtles, manta rays, whales and sharks in their migrations. In addition, the new reserve is expected to boost productive development and lead to an increase in fishing resources.

The openness to dialogue and the consequent support of the fishing sector, which now understands the benefits of conservation, made it possible to protect these critical marine ecosystems—maintaining both migratory routes and feeding areas of threatened marine species, and responsible fishing areas.

Source: UNDP-GEF-SGP, Mauritius



Source: cancilleria.gob.ec

NATURE-POSITIVE PATHWAYS IN THE SEAFOOD SECTOR

As outlined in the introduction, this chapter presents a new hierarchy for articulating nature-positive pathways in seafood—the **Seafood Improvement Hierarchy**—establishing the priority actions needed for nature-positive outcomes. The steps have been adapted from the AR3T action framework. Where the mitigation hierarchy follows avoid, reduce, restore & regenerate, transform; the seafood hierarchy steps are avoid, improve, scale, transform. The hierarchies are aligned, but the latter meets the unique characteristics of the seafood industry.

The Seafood Improvement Hierarchy uses the following structure:

Avoid [Step 1]: Seafood companies should ensure that their sourcing avoids or eliminates practices that cause negative impacts to biodiversity and people, to reduce risks to business as well as to nature and people. From the outset, all companies should implement measures that avoid biodiversity and habitat loss, and mistreatment of workers. When harmful practices are avoided, this also contributes to the natural recovery, and passive restoration and regeneration of a system.

Improve [Step 2]: Seafood companies should require effective management and best practices in their direct operations and through their source fisheries and aquaculture farms. This step aims to reduce harm to biodiversity, habitats, and workers as well as impacts on natural resources.

Scale [Step 3]: Seafood companies should support holistic improvement of the system beyond their specific fisheries and aquaculture farms. In the broadest sense, scaling should include targeted actions to expand progress made under the Improve step of the Seafood Improvement Hierarchy.

Transform [Concurrent]: Seafood companies should support transformational non-sourcing activities that advocate for and support long-term sustainable and responsible outcomes for ecosystems and communities. Activities in the Transform category occur in addition to and concurrently with the three previous steps to Avoid, Improve and Scale.

For the seafood industry to address its core impacts and contribute to a nature-positive future, companies should follow the Seafood Improvement Hierarchy sequentially (steps 1-3) and concurrently (Transform). For example, a company cannot ignore the Avoid step and skip to the later steps in the hierarchy. Contributing to nature positive means thinking about regenerative and transformative actions, without sacrificing or discounting the paramount importance of the early stages of the improvement hierarchy.

In the table on page 126, example actions that contribute to nature positive are organized along the Seafood Improvement Hierarchy.

It is important to note the following:

- These illustrative pathways build on existing guidance and the scientific literature, serving as a practical starting point for companies that want to contribute to nature positive in their work. The tables provide an opportunity for industry to begin to understand the concepts, characteristics, and fundamentals of a project that contributes to nature-positive outcomes.
- These pathways cannot be used for measuring impact or enabling claims, and are not a certification scheme, but rather highlight a representative selection of science-based examples to demonstrate how a company could credibly operationalize the Seafood Improvement Hierarchy to address pressures and impacts on nature.
- The examples are also not exhaustive. There are many potential pathways a company could take, based on its context. We have chosen pathways that are supported by science, are impactful, and potentially scalable to facilitate positive change. These pathways can be used as a tool to engage with partners and scientific experts to further develop project-specific plans that adapt the examples provided to the unique ecological, biological, social, and economic characteristics and context of the site, seascape or project. The section on successes and next steps suggests processes for how this can be done.

In addition to the pathways, we have mapped the corresponding Global Biodiversity Framework targets to each of the nature-positive pathways in the tables to demonstrate which policy targets they address. Please note that not all targets are featured in the table given that some are overarching and cross-sectoral, but they are included within the narrative where relevant. All targets are equally important to contribute to the nature-positive global goal.

SEAFOOD ACTION PATHWAYS

Credible, science-based activities the seafood sector can take to contribute to nature positive. This chapter is organized by the Seafood Improvement Hierarchy which includes:

- **Actions to Avoid**
- **Actions to Improve**
- **Actions to Scale**
- **Actions to Transform the system**

The cross-cutting and overarching GBF targets, which apply across the seafood tables when the nature-positive principles and pathways are adopted, include:

Target 14 Integrate Biodiversity in Decision-Making at Every Level

Target 15 Businesses Assess, Disclose and Reduce Biodiversity-Related Risks and Negative Impacts

Target 18 Reduce Harmful Incentives by at Least $500 Billion per Year, and Scale Up Positive Incentives for Biodiversity

Target 23 Ensure Gender Equality and a Gender-Responsive Approach for Biodiversity Action

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RISK MANAGEMENT → OPPORTUNITIES

AVOID

The first and most important step a company should take is to avoid or eliminate the most harmful practices, especially any known mistreatment of workers and harm to biodiversity of greatest conservation concern. While this list is not exhaustive, a company should at least avoid:

Overfishing

- **Avoid fishing, farming or sourcing species identified by the International Union for the Conservation of Nature's (IUCN) Red List as either** Endangered or Critically Endangered. For farmed species on the Red List, juveniles must be from closed cycle hatcheries. (**Targets** 4 15)
- **Avoid fishing, farming or sourcing species listed under Appendix I or II** of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). (**Targets** 4 15)
- Avoid fishing practices involving **shark finning**. (**Targets** 4 15)
- **Avoid fishing or sourcing from overfished stocks if management measures are not adopted within a specified timeframe.**[308] More specifically, for fisheries deemed to be critically overexploited (Fishing mortality rate (F) or standing stock biomass (B) beyond Flim or Blim, for example[309]) management must be adopted within three years. For all other overexploited fisheries, management must be in place within five years. (**Targets** 4 15)

Habitat conversion and ecosystem damage

- **Avoid farming or sourcing from aquaculture operations that result in conversion of natural habitats**, including mangroves. (**Targets** 1 15)
- **Avoid destructive fishing practices*** within Ecologically and Biologically Significant Marine Areas (EBSAs), Vulnerable Marine Ecosystems (VMEs) or other sensitive marine habitats. (*Defined as fishing activities that cause significant adverse environmental impacts that diminish ecosystem functions and services. This includes long-lasting habitat damage and/or long-term declines in marine species populations.) (**Target** 15)
- ***Avoid fishing or sourcing from fisheries using highly damaging fishing techniques,*** such as dynamite and poisoning. (**Targets** 1 15)

Protected areas or OECMs

- **Avoid** fishing or farming in or sourcing seafood from **IUCN protected area categories I–III.**
- **Avoid** fishing or sourcing fish using destructive fishing practices within marine protected areas. For further details, please refer to WWF's position on permissible fishing activities in MPAs, for important contextual information. Within OECMs, **avoid** destructive fishing practices in those areas designated as EBSAs, VMEs, or other sensitive marine habitats.
- Avoid farming or sourcing from aquaculture operations located in protected areas that are **incompatible with the management objectives** of the areas. (**Targets** 1 15)

IUU

- **Avoid** fishing or sourcing seafood known to be acquired or captured through **illegal, unreported or unregulated (IUU) fishing** (as defined by FAO).[310] (**Targets** 1 15)
- **Avoid** farming or sourcing from aquaculture farms known to be operating **without legal permits**. (**Targets** 1 15)

IMPROVE

After eliminating or avoiding the risks in step 1, it is essential to implement measures that further reduce harm to biodiversity by adhering to or working towards best practices to substantially improve existing activities. This process is a critical step toward achieving nature-positive outcomes. The seafood industry should consider:

Traceability

- Improve traceability by ensuring wild and farmed products are **traceable from point of capture to point of sale.** There should be proactive steps to implement traceability systems that can identify the point of origin of seafood products (whether fishing vessel/fishery or farm location) and are full-chain, digital, and interoperable across systems. (**Targets** 5 9 10 14)

Wild-caught fisheries

- Improve wild-capture fishing and sourcing by ensuring that fisheries are **MSC certified** and/or **actively making improvements** to the health of the target and non-target species, habitats, ecosystems, and fisheries management and governance through comprehensive fishery improvement projects (FIPs) posted on FisheryProgress.org. (**Targets** 1 5 9 10 14 15 21)

Wild-caught tuna

- In addition to the above, for wild-caught tuna, companies should also ensure that **tuna vessels are in compliance** with the International Seafood Sustainability Foundation (ISSF) conservation measures, meet the Vessels in Other Sustainability Initiatives (VOSI) requirements, and are listed on the Proactive Vessel Register. (**Targets** 5 9 10 14 21)

Farmed seafood

- Improve farming or sourcing by ensuring that farms/suppliers are **certified to the ASC standard or are in credible and structured improvement projects (AIPs)** that are managing and reducing impacts related to habitat degradation, wildlife (including genetic impacts), biodiversity, managing disease and animal health, freshwater use, water pollution, feed inputs, chemical and antibiotic use and energy uses. (**Targets** 6 7 9 10 14)

SCALE

Scaling efforts, in the broadest sense, should include targeted actions to expand progress made under the Improve step of the Seafood Improvement Hierarchy that accelerate ecosystem recovery and regeneration and address cumulative impacts from fishing and farming. Scaling efforts operate nationally or regionally to help advance responsible fishery and aquaculture practice and management at larger scales than a source fishery approach.

Traceability

- Participate in initiatives that **define and enable full-chain, digital and interoperable traceability** across seafood supply chains based on collaborative action, such as the Global Dialogue on Seafood Traceability (GDST). (**Target** 14)

Wild-caught fisheries

- **Collaborate across supply chains** to scale commitments to increased production of, or sourcing from sustainable seafood certified to the MSC standard or in comprehensive FIPs posted on FisheryProgress.org. For example, downstream actors could work with all their suppliers to implement FIPs and move all sourcing towards certification.
- Support the creation of or participate in **innovative financing structures** that support scaling fishery improvements globally, including supply chain financing in collaboration with financial institutions, that can unlock resources for suppliers to transition to sustainable production. (**Targets** 1 5 8 9 10 14 15 21)
- **Support robust data collection efforts**, particularly in data-limited fisheries, and encourage and participate in **science-based, effective decision-making** on the basis of this data in order to scale the number of fisheries that are improving. As part of this, for the purposes of building climate resilience, consider where future resource constraints and/or conflicts may arise (e.g., through Oceans Futures). (**Target** 8)
- Participate and/or invest in **technology innovations**, for example in methods to reduce bycatch (historic examples include circle hooks and gear illumination) and gear loss, to scale available mitigation measures across the industry. (**Targets** 4 19)

Wild-caught tuna

- In addition to the above, participate in tuna-specific initiatives for **action on sustainability,** including jurisdictional initiatives and relevant regional fishery management organizations (RFMOs) as well as industry platforms such as the International Seafood Sustainability Foundation (ISSF). (**Target** 20)

Farmed seafood

- Collaborate across supply chains to scale commitments to increased production of, or sourcing from sustainable seafood **certified to the ASC standard or in credible AIPs.** For example, downstream actors could work with all their suppliers to implement AIPs and move all sourcing towards certification.
- Support the **creation of or participate in innovative financing structures** that support scaling farm improvements globally, including supply chain financing in collaboration with financial institutions, that can unlock resources for suppliers to transition to sustainable production. (**Targets** 1 5 8 9 10 14 15 19 21)

GHG emissions

- **Increase the percentage of renewable energy in use for seafood-related infrastructure**, including onshore power to vessels, fish farms, processing plants, and the cold chain.
- **Increase the use of low-carbon fuels** in fishing fleets. (**Target** 8)

OPPORTUNITIES

TRANSFORM

Transformative change should happen concurrently with the other steps. Leading businesses in the seafood sector have a rich history of improvements, and some success in scaling them. For example, responsible industry actors have implemented traceability for supply chain transparency, supported improvements to fishery and aquaculture management, and tracked progress using credible, robust tools. In aquaculture, the way data are reported has improved transparency. The industry has transitioned to better feeds, and adoption of technologies to make feeding practices on farms more efficient has decreased pressures on the environment. To build on these efforts, it is important that all seafood companies adopt transformative actions. The table below articulates some of the transformative pathways contribute to nature-positive outcomes.

Policy advocacy

- **Advocate for the agreement and implementation of national, regional and global policies** which can improve management of fisheries and farms, and support the enabling environment for progress to be made through sourcing commitments and scaling efforts. Advocacy could include policies that work toward the following:
  - Sustainable fisheries management and related stock assessments (**Targets** 5 9 10)
  - Mitigating climate-related impacts (**Target** 8) on seafood and supporting peaceful and prosperous fishing and farming communities
  - Blue food security (**Target** 10)
  - Implementation of existing and developing international agreements (e.g. WTO fisheries subsidies agreement or the Port State Measures Agreement) (**Target** 18)
  - Tuna management priorities through RFMOs (e.g., RFMO harvest strategies, 100% observer coverage)
  - Compliance with and expansion of the US Seafood Import Monitoring Program
  - Marine Mammal Protection Act (MMPA) import provisions
  - Improved siting and reduced cumulative impact in aquaculture management
  - Global, national, and regional efforts to develop human rights due diligence, grievance mechanisms, networks including worker voices, and strengthening of laws (**Target** 22)
  - Policies at national and regional scales to address forced labor, other human rights abuses, and worker safety (**Target** 22)
  - Social policies addressing equity and fairness in seafood production and trade (**Target** 22)

Investing in climate resilience and mitigation

- **Participate and/or invest in understanding how climate will impact seafood supply chains,** including, for example, through moving or declining stocks, and greater risks of IUU fishing, human rights violations, and forced labor (**Targets** 8 19). Actions might include utilizing the Oceans Futures platform,[311] which aims to reduce the risk of climate-driven fisheries conflict around the world and build climate-smart fisheries solutions.
- **Adopt and promote ecosystem-based, adaptive fisheries management** for sustainable fisheries management that is responsive to climate change to enable long-term resilience and the continued health of target fisheries and associated ecosystems
- **Commit to science-based emissions reporting and reduction target**s such as decarbonizing vessels in the wild-caught sector and delivering low-carbon production solutions and reduced energy demand in the aquaculture sector.

Domestic small-scale fisheries

- **Support interventions that strengthen local, small-scale fisheries management initiatives** such as fisher-science collaborations as well as initiatives that improve market access for locally sourced, sustainable seafood. Strengthening local governance brings additional benefits including improved social equity, and can contribute to enhanced food security (**Targets** 20 21).

Sustainable livelihoods

- **Support sustainable livelihoods and infrastructur**e appropriate to each place, toward nature- and people-positive goals, for example, including engaging participating in funding vehicles for local communities in the protection of intact mangrove areas and restoration of deforested areas (**Target** 19).

Integrated seascape management

- **Engage with actors including within other sectors to address drivers of nature and biodiversity loss at scale across a seascape** (**Target** 22). This could include engaging in inclusive, science-based marine spatial planning efforts alongside other sectors that operate in or make use of the same spatial area; or participating in a jurisdictional initiative.[312]

Target-setting

- **Setting targets informed by science, such as the Science Based Targets Network (SBTN),** can help companies understand and work to address their nature-based impacts, dependencies, risks, and opportunities. As part of a broader multi-commodity effort, companies that sell seafood can complete SBTN steps 1 and 2 to identify environmental issues and locations to focus on for target-setting, set seafood targets developed by SBTN Ocean Hub, and take action that aligns with the Avoid-Impact-Scale actions for seafood suggested above, followed by monitoring and reporting through SBTN's validation process.

CASE STUDY

BOLTON AND WWF — A TRANSFORMATIONAL SEAFOOD PARTNERSHIP

Authors: Robin Davies and Dora Dabizzi

WWF and the food business unit of Bolton first entered into an international multi-year partnership in 2017, with ongoing efforts focused on sustainable tuna sourcing. Strengthened through years of collaboration, the partnership is an example of an effort that augments essential conservation measures with transformational initiatives. To this end, the partnership aims to source from healthy stocks, with spawning-stock biomass levels that support robust tuna populations and contribute to ocean health; engage in efforts that go beyond baseline sustainability measures through advocacy at relevant international fora; invest in habitat conservation initiatives; and acknowledge and communicate the real value of tuna to marine ecological health, in addition to human nutrition and employment.

The partnership is significant because Bolton has committed to transformational elements that go beyond business-as-usual actions. For example, while committing to sourcing from MSC certified fisheries significantly, Bolton incorporates stricter sourcing measures in line with robust criteria developed specifically for the partnership in a manner consistent with WWF's sustainable tuna strategy. To contribute to reaching this ambition, by 2030, Bolton commits to progressively increase sourcing tuna from fisheries that operate on stocks with biomass levels higher than that needed to achieve the maximum sustainable yield—a frequently used fisheries management threshold. This sourcing strategy therefore serves as an additional sustainability guardrail.

Together with Bolton's transparent traceability system, the partnership has initiated numerous advocacy activities aimed at strengthening responsible management of tuna stocks globally, and pushing institutions towards higher sustainability ambitions. This includes engagement with policymakers and other actors to advocate for stronger governance of marine resources, and ensuring that conservation efforts extend beyond individual companies to shape the broader seafood sector. Bolton also contributes to conservation beyond their direct interests by supporting initiatives in the Solomon Islands and Ecuador, including advocating for a protected area in the Solomon Islands[326] and supporting mangrove protection in Ecuador.[327]

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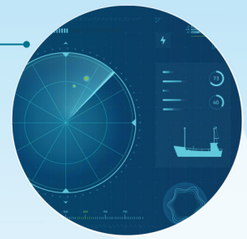
Source: cancilleria.gob.ec

SEAFOOD: WILD-CAPTURE FISHERIES AND AQUACULTURE

A nature-positive vision for seafood: Visualizing illustrative pathways for the sector.
(Note: Figures are not to scale, and do not depict all actions recommended herein.)

AVOID FISHING, FARMING OR SOURCING SPECIES IDENTIFIED ON IUCN RED LIST
as endangered or critically endangered or CITES Appendix I or II

SUPPORT ROBUST DATA COLLECTION EFFORTS,
and participate in science-based, effective decision-making. Electronic monitoring and Wi-Fi can support data collection at sea

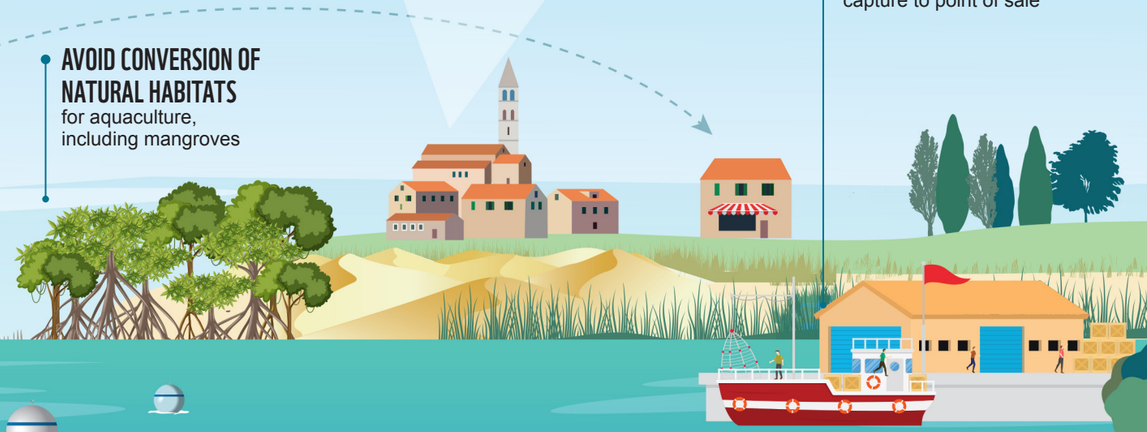


IMPROVE WILD-CAPTURE FISHING AND SOURCING
by ensuring that fisheries are MSC certified and/or actively making improvements to the health of the target and non-target species, habitats, ecosystems, and fisheries management and governance through comprehensive fishery improvement projects (FIPs)

ENGAGE WITH ACTORS ACROSS SECTORS
to address biodiversity loss at scale across a seascape and support interventions that strengthen local, small-scale fisheries management initiatives

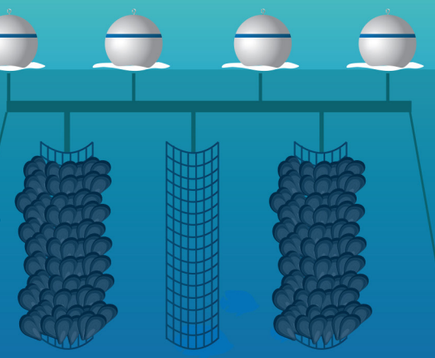
IMPROVE TRACEABILITY
by ensuring wild and farmed products are traceable from point of capture to point of sale

AVOID CONVERSION OF NATURAL HABITATS
for aquaculture, including mangroves

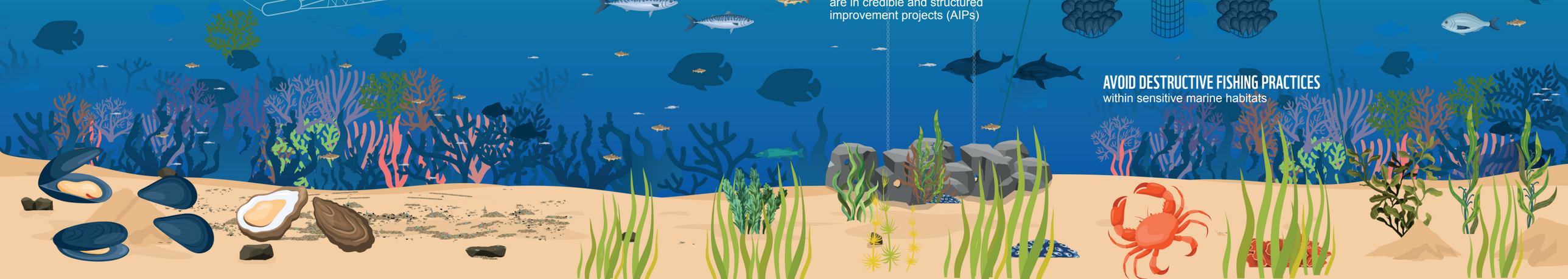


PARTICIPATE AND/OR INVEST IN TECHNOLOGY INNOVATIONS
to reduce bycatch like Turtle Excluder Devices

IMPROVE FARMING OR SOURCING
by ensuring that farms are certified to the ASC standard or are in credible and structured improvement projects (AIPs)



AVOID DESTRUCTIVE FISHING PRACTICES
within sensitive marine habitats



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CONCLUSION

A nature-positive economy—one in which the net result of all economic activities combined leads to an absolute increase in nature towards full recovery[330] is possible, desirable, and must be pursued urgently.

The journey toward this goal requires a global societal effort that brings together all actors to innovate, be ambitious, and create together—and the private sector has a critical role to play.

Historically, the private sector has often been excluded from conservation efforts due to its pressures and impacts on nature. However, because of these impacts and its dependencies on nature, the private sector can and should be part of the solution, becoming champions for change by taking actions to Avoid and Reduce impacts on nature, thereby minimizing risks; to Restore and Regenerate nature, thereby enabling opportunities; and to Transform broader systems to collectively reach the nature-positive goal. With its market leverage and resources, the private sector is uniquely positioned to drive significant progress.

The sectors in the blue economy rely on the health of natural systems for sustainability and profitability. When nature thrives, society prospers, as everything we do is interconnected with and underpinned by the natural world. The private sector can lead by example, inspiring and motivating others to contribute to a better future.

While realizing a nature-positive future for the blue economy may seem daunting, this report outlines clear and achievable pathways to reach these goals. Meaningful change requires collaboration and informed action, and the blue economy sectors are well positioned to lead in this space.

It is essential to start now, without waiting for perfect answers or data. Leaders in this field have a significant opportunity to contribute, mitigate risks, and inspire others to join the journey towards a nature-positive and prosperous future.

APPENDICES

GUIDANCE ON MESSAGING FOR NATURE POSITIVE: CONTRIBUTION VS ATTRIBUTION

Contribution: Nature positive is a global, collective, societal goal to which all actors must contribute in different ways in order for the goal to be achieved. Nature positive, which is often assumed to be focused exclusively on biodiversity, can be positioned alongside critical goals to address climate change and social inequality, as all three are intertwined and must be addressed together for any of them to be achieved effectively, equitably, and durably. Although for the purposes of this publication, the definition of "nature" includes climate, people, AND biodiversity, some audiences may not be familiar with this holistic terminology. Therefore, as a shorthand, it may be appropriate to discuss all three global goals in tandem, referring to the Global Biodiversity Framework, the Paris Agreement, and the Sustainable Development Goals together: "a nature-positive, net-zero, and equitable future."

Attribution: No individual entity or action (e.g., company, financial institution, business model, strategy, intervention) can "be" nature-positive given the fundamental challenges of attributing state-of-nature outcomes to an individual entity or action. There are also issues of defining the scale of measurement of state-of-nature outcomes; a company may take positive actions in one region, but have negative impacts elsewhere that are not accounted for. Describing individual entities or actions as "nature-positive" (e.g., "a nature-positive business") is inaccurate and opens the door to greenwashing. We therefore do not recommend that companies pursue nature positive as a marketing claim, or describe themselves as nature-positive.

For more information, please see the Nature Positive Initiative's messaging guide.

PREVIEW OF A FOLLOW-UP REPORT ON QUANTITATIVE REVIEW TO SUPPORT NATURE-POSITIVE OCEANS

As a follow-up to this report, which provides qualitative recommendations, we will provide a complementary report that offers quantitative guidance to shape contributions to nature positive in the blue economy. This report will focus on various aspects that are crucial for effective measurement and tracking of progress toward nature-positive goals, especially those contributions that the private sector can make. Similar to this report's positioning as complementary to existing initiatives, we will aim to add value to the emerging landscape of initiatives that exist, including the SBTN, TNFD, and efforts to map state-of-nature metrics by the Nature Positive Initiative.

Topics complementary to existing efforts may be included, such as an in-depth review of available marine metrics, and an exploration of initiatives, data, tools, and platforms that can support these efforts. Additionally, the report may include an examination of different metric sets, what they measure, and the considerations around them to ensure their relevance and effectiveness in achieving nature-positive outcomes. The report may also address the measurement of various actions aimed at reducing pressures on nature and contributing to the broader nature-positive objective. This will involve identifying use cases and seascapes where such metrics and initiatives can be applied. Further, the report may provide insights into resources related to monitoring, evaluation, and learning, as well as assurance processes to ensure credibility. Finally, there will be an emphasis on learning from other sectors, including some based on land and freshwater, to draw lessons on how best to apply these frameworks in the context of other ocean-based sectors.

GLOSSARY: DEFINITIONS OF NATURE POSITIVE AND OTHER KEY TERMS

This glossary provides definitions of key terms that are integral to understanding nature-positive framing, including for the ocean. Inclusion of terms here does not indicate WWF endorsement of associated instruments or policies.

Biodiversity: The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.[331]

Biodiversity credits: A certificate that represents a measured and evidence-based positive biodiversity outcome from nature restoration, conservation or stewardship activities, that is not purchased for the purpose of offsetting residual negative impacts caused to biodiversity.[332] WWF recognizes both the role that voluntary biodiversity credits (VBCs) could play in biodiversity conservation, and the potential risks of such an instrument. WWF will not develop, endorse, promote or encourage sale of VBCs unless clear conditions are met for: 1. Biodiversity credits buyers: no offsetting, strict buyer eligibility criteria, robust buyers' claims, and no secondary market trading; 2. Biodiversity credits projects: respect and uphold human rights, the rights of Indigenous peoples, local communities and other rights-holders directly or indirectly affected by projects, focus on areas of highest importance for biodiversity, contribute to national or sub-national biodiversity priorities, achieve and measure demonstrated biodiversity outcomes, apply practical and flexible principles for demonstrating additionality and durability; and 3. Adequate governance arrangements in place for both buyers and projects.

Biodiversity offsets: "For the protection and conservation of biodiversity, the mitigation hierarchy includes biodiversity offsets, which may be considered only after appropriate avoidance, minimization, and restoration measures have been applied. A biodiversity offset should be designed and implemented to achieve measurable conservation outcomes that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity; however, a net gain is required in critical habitats. The design of a biodiversity offset must adhere to the 'like-for-like or better' principle and must be carried out in alignment with the best available information and current practices. When a client is considering the development of an offset as part of the mitigation strategy, external experts with knowledge in offset design and implementation must be involved."[333]

Do no significant harm: This implies that the proposed actions or projects should be designed and executed to avoid or minimize adverse effects on the environment, especially on biodiversity and ecosystems. This principle is often embedded in environmental laws, regulations, and international agreements. The criteria cover both the environmental impact of the activity itself and the environmental impact of the products and services provided by that activity throughout their life cycle, in particular by considering the production, use, and end of life of those products and services.[334]

Ecosystem resilience: This is a measure of how much disturbance (like storms, fire or pollutants) an ecosystem can handle without shifting into a qualitatively different state. It is the capacity of a system to both withstand shocks and surprises and to rebuild itself if damaged.[335]

Ecosystem services: This describes the benefits people obtain from ecosystems encompassing a wide range of resources, processes, and conditions provided by natural environments. In the Millennium Ecosystem Assessment, ecosystem services can be divided into supporting, regulating, provisioning, and cultural. This classification, however, is superseded in IPBES assessments by the system used under "nature's contributions to people," as IPBES recognizes that many services fit into more than one of the four categories. For example, food is both a provisioning service and also, emphatically, a cultural service, in many cultures.[336]

Nature: The natural world, with an emphasis on the diversity of living organisms (including people) and their interactions among themselves and with their environment.[337] Nature includes biodiversity, climate, and people.

Nature's contributions to people: All the contributions, both positive and negative, of living nature (i.e., all organisms, ecosystems, and their associated ecological and evolutionary processes) to people's quality of life.[338]

Nature-based solutions: Actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously benefiting people and nature.[339]

Nature positive: Nature positive is a global societal goal defined as "Halt and reverse nature loss by 2030 on a 2020 baseline, and achieve full recovery by 2050." This means that by 2030 biodiversity loss is halted and reversed, with nature visibly and measurably on the path to recovery on a 2020 baseline; while by 2050, nature must recover so that thriving, high-integrity ecosystems and nature-based solutions support future generations and the diversity of life.[340]

Nature-inclusive design: This describes the integration of habitat features into the design and construction of coastal and marine infrastructure to create habitats for native species.[341] It is typically intended as a mitigation and reduction tactic rather than for restoration. It is creating new habitat for settlement which can contribute to biodiversity value.[T]

Net: This term represents the overall change after accounting for both positive and negative changes.

No net loss: No net loss of biodiversity implies achieving a balance between the gain and loss of biodiversity in a system. The overall impact is neutral, wherein any negative effects are counterbalanced by equivalent positive actions. Biodiversity gains attributable to a project must at least match the losses as compared to a counterfactual scenario that estimates what would have happened in the absence of the project; the counterfactual estimate should use recent trends in biodiversity and control sites.

Note that in the context of biodiversity policies, there are various definitions of no net loss depending on whether it is defined relative to a fixed or dynamic reference.[342]

Net positive (i.e., net gain): In the context of biodiversity, this describes when gains outweigh losses as measured by biodiversity outcomes.[343] Net gains are additional conservation outcomes that can be achieved for the biodiversity values for which the critical habitat was designated. Net gains may be achieved through the development of a biodiversity offset and/or through the implementation of programs that could be implemented in situ (on-the-ground) to enhance habitat, and protect and conserve biodiversity.[344]

Relative net gain: In the context of biodiversity, this is a measured increase of biodiversity outcomes as compared to the no-net-loss trajectory. The relative net gain slope is negative, but is less steep than the no-net-loss trajectory. (Figure 3)

Absolute gain: In the context of biodiversity, this is a measured increase in biodiversity outcomes as compared to a static baseline. Absolute gains are required to contribute to a nature-positive future (Figure 3).

Mitigation hierarchy: In the context of biodiversity, the mitigation hierarchy is a widely-used tool and decision support framework to assess and reduce impacts to biodiversity from human development and enable biodiversity enhancement. The hierarchy is sequential—the steps go in order—and can be applied iteratively to account for multiple stages of impact. Measurement of biodiversity, including a baseline, is a key component of ensuring adherence to the mitigation hierarchy.[U]

Traditional mitigation hierarchy definitions:

- **Net impact:** the sum of damaging and beneficial effects on biodiversity as measured through biodiversity indicators (e.g., drivers, pressures, states, intervention, responses).
- **Avoid:** the impact on biodiversity foregone due to the elimination of certain damaging activities in general and in certain locations.
- **Minimize:** the impacts on biodiversity reduced through actions that reduce the duration, intensity, and/or extent of impacts that cannot be avoided.
- **Restore:** the creation of benefits for biodiversity (e.g., new or enhanced habitats, direct reintroduction of species) for activities that cannot be avoided or minimized.
- **Offset:** compensatory actions—see "Biodiversity offsets" above.
- **Residual impact:** the remainder of negative biodiversity impacts estimated to have occurred as a result of a particular development after accounting for each step taken in the mitigation hierarchy (avoid, minimize, restore, offset) to date. Residual impact may still be present even after all steps in the hierarchy are taken. No net loss is achieved only when the actions taken in the hierarchy cancel out the residual impact, and net positive is achieved only when the actions taken go beyond no net loss toward net gain of nature.

T For example, Sella et al. (2021) used bioenhanced concrete (ECOncrete) with complex design to enhance coastal marine infrastructure. The study found that these interventions increased richness and diversity of sessile assemblages as compared to control blocks, and supported a higher abundance of mobile species. Unlike restoration initiatives, there is a lack of data on nature inclusive designs. Thus, NID approaches should be carefully implemented, followed up with in situ experiments and science-based monitoring to evaluate success and implement adaptive management as needed (Prado et al. 2023).

U Outlined in IFC PS6.

SBTN AR3T Hierarchy definitions[345]

- **Avoid:** Prevent impact happening in the first place, eliminate impact entirely.
- **Reduce:** Minimize impacts, from a previous baseline value, without eliminating them entirely.
- **Restore:** Initiate or accelerate the recovery of an ecosystem with respect to its health, integrity, and sustainability with a focus on permanent changes in state.
- **Regenerate:** Actions designed within existing land uses to increase the biophysical function and/or ecological productivity of an ecosystem or its components, often with a focus on specific nature's contributions to people (e.g., on carbon sequestration, food production, and increased nitrogen and phosphorus retention in regenerative agriculture).
- **Transform**: Through these steps, take actions contributing to system-wide change, notably to alter the drivers of nature loss.

Full recovery: This defines the state of nature recovered to a level comparable to a fixed historical baseline that is determined as appropriate to a particular species, ecosystem, and place (noting that achieving "full recovery" by 2050 is empirically impossible for terrestrial ecosystems globally).[346] Substantial recovery may be possible for marine systems by 2050 if major pressures are addressed, including climate change, pollution, habitat loss, and overfishing.[347] "Full recovery" can be defined at the seascape scale through science-based and locally appropriate processes that consider ecological, economic, and social factors. Full recovery can also be defined as nature recovers so that thriving ecosystems continue to support future generations.

Transformative change: This encompasses fundamental, system-wide shifts in views, structures and practices. Views are ways of thinking, knowing and seeing; structures are ways of organizing, regulating and governing; and practices are ways of doing, behaving and relating. Deliberate transformative change for a just and sustainable world shifts views, structures, and practices in ways that address the underlying causes of biodiversity loss and nature's decline. Transformative change is required in order to respond to global environmental challenges and crises, including biodiversity loss.[348]

Sustainable Blue Economy: This is an approach to the ocean-based economy that provides essential benefits for current and future generations; restores, protects and maintains diverse, productive and resilient ecosystems; and is based on clean technologies, renewable energy and circular material flows.[349]

Nature-positive economy: This describes an economy in which the net result of all economic activities combined leads to an absolute increase in nature towards full recovery.[350]

Resilience: This describes the capacity to deal with change and continue to develop.[351]

Social resilience: This describes the ability of human communities to withstand and recover from stresses, such as environmental change or social, economic or political upheaval. Resilience in societies and their life-supporting ecosystems is crucial in maintaining options for future human development.[352]

LANDSCAPE ANALYSIS

In preparation for this body of work and to inform future work by SBTN, a landscape analysis was conducted to identify the current standards, frameworks, and guidance for companies that address ocean health. Twenty-five frameworks[22] relevant to marine industries in marine renewables, shipping, coastal tourism, and coastal development were evaluated to understand the scope of each, identify gaps in applicability and effectiveness, and inform approaches to science-based target-setting. This analysis found that many existing frameworks lack robust, consistent metrics for companies to measure their impacts on the ocean, and that mitigation strategies vary across frameworks. For example, many frameworks include avoidance and reduction strategies, but restorative, regenerative, and transformative efforts are largely excluded; this Nature-Positive Oceans Pathways report fills this critical gap.

In addition to the 25 frameworks highlighted in the landscape analysis, it is important to note there are many other existing and emerging efforts that address biodiversity loss, and encourage contributions to nature-positive outcomes. WWF engages in many of these efforts and strives to be as complementary, coordinated, collaborative, and informed by other work as possible. The table below includes several relevant initiatives, frameworks, standards, disclosures, and classifications.

NAME	DESCRIPTION	TYPE	SECTOR
CDP Biodiversity	CDP is a voluntary disclosure framework for companies, cities, and governments for their climate impact, deforestation, water security and continues to grow by expanding to new areas such as biodiversity, plastics and oceans, and recognizing the interconnectedness of nature and Earth's systems.	**Disclosure Framework**	**Cross-sector**
Taskforce on Nature-related Financial Disclosure (TNFD)	The TNFD Recommendations and guidance are designed to help organizations to report and act on evolving nature-related issues with the ultimate aim of supporting a shift in global financial flows away from nature-negative outcomes and toward nature-positive outcomes. The additional TNFD LEAP document provides guidance on the integrated approach that TNFD has developed for the identification and assessment of nature-related issues to inform disclosure statements aligned with its recommendations.	**Disclosure Framework**	**Cross-sector**
Global Biodiversity Framework (GBF)	The purpose of the Kunming-Montreal Global Biodiversity Framework (GBF) is to set out guidelines for countries to protect biodiversity, ensure sustainable use, and promote fair and equitable benefit sharing. It aims to halt and reverse biodiversity loss by 2030 and achieve a world living in harmony with nature by 2050.	**Guidance Framework**	**Cross-sector**
Global Reporting Initiative (GRI)	The purpose of the framework GRI 101: Biodiversity 2024 is to provide organizations with disclosures to report their biodiversity-related impacts and how they manage these impacts. It aims to promote sustainability reporting concerning biodiversity, which is crucial for maintaining ecological balance. GRI 101 will be effective for reporting on biodiversity published on or after January 1, 2026. Early adoption is encouraged.	**Disclosure Framework**	**Cross-sector**
European Sustainability Reporting Standards (ESRS)	The ESRS framework aims to standardize and enhance the transparency of environmental, social, and governance (ESG) reporting across Europe, providing a clear, comparable view of a company's sustainability impacts, risks, and opportunities.	**Standards & Certifications**	**Cross-sector**
ACT-D Framework (Business for Nature)	ACT-D stands for Assess, Commit, Transform and Disclose. ACT-D guides businesses through the various tools, frameworks and initiatives available in the market to support them in assessing their relationships with nature, committing to action and target setting, transforming their practices and disclosing nature-related information.	**Guidance Framework**	**Cross-sector**
UNEP FI Setting Sail Guidance Criteria	The manual enables financial institutions to set targets that align with the Sustainable Blue Economy Finance Principles (SBEFP) and support the transition to a Sustainable Blue Economy.	**Guidance Framework**	**Cross-sector**
UNEP FI Turning the Tide Guidance	This is a practical guide for financial institutions on financing a sustainable blue economy. It covers five key ocean sectors: seafood, ports, maritime transportation, marine renewable energy, and coastal & marine tourism. It points the way to the Sustainable Blue Economy Finance Principles, the keystone for financing activities in the ocean economy.	**Guidance Framework**	**Cross-sector**
Net Positive Impact (IUCN)	The purpose of the framework is to outline the business case for companies adopting a Net Positive Impact (NPI) approach to managing their biodiversity impacts.	**Guidance Framework**	**Cross-sector**
Align Project (Capitals Coalition)	The framework aims to provide businesses and financial institutions with principles and criteria for measuring and valuing their impacts and dependencies on biodiversity, addressing the urgent need for effective biodiversity measurement and valuation practices.	**Guidance Framework**	**Cross-sector**
Finance for Biodiversity Foundation Pledge	The purpose of the Finance for Biodiversity Pledge is for financial institutions to commit to protecting and restoring biodiversity through their finance activities and investments.	**Guidance Framework**	**Cross-sector**
Bonds to Finance the Sustainable Blue Economy: A Practitioner's Guide	This is the first environmental accounting standard that measures the state of ecosystems and natural capital, at both property (enterprise) and ecosystem (regional) scales, as well as certifying businesses' environmental accounts, which can then report on and manage their environmental assets.	**Guidance Framework**	**Cross-sector**
Accounting for Nature (AfN) Framework and Certification	The purpose of the Finance for Biodiversity Pledge is for financial institutions to commit to protecting and restoring biodiversity through their finance activities and investments.	**Standards & Certifications**	**Cross-sector**
Corporate Sustainability Reporting Directive (CSRD)	A European Union directive that requires large and listed companies to report on environmental, social, and governance (ESG) factors. It standardizes sustainability reporting, and reporting must follow the ESRS. The purpose of the regulation is to improve transparency, comparability, and accountability in corporate sustainability efforts, as well as to help investors and consumers assess performance.	**Disclosure Framework**	**Cross-sector**

NAME	DESCRIPTION	TYPE	SECTOR
Sustainable Finance Disclosure Regulation (SFDR)	This legislation applies to asset managers, pension funds, insurance firms, and financial advisers, aiming to increase transparency in how the finance sector integrates sustainability risks and ESG factors into investment decisions and advice.	**Disclosure Framework**	**Cross-sector**
International Sustainability Standards Board (ISSB) Biodiversity, Ecosystems, and Ecosystem Services Disclosure Framework	The ISSB is currently developing this framework to guide companies on how they should disclose sustainability-related risks and opportunities, specifically associated with biodiversity, ecosystems, and ecosystem services. The goal of the disclosures is to provide investors with data on biodiversity and ecosystem risks and opportunities for informed decision-making.	**Disclosure Framework**	**Cross-sector**
Taskforce on Inequality and Social-related Financial Disclosures (TISFD)	A global initiative to develop recommendations and guidance for businesses and financial institutions to understand and report on impacts, dependencies, risks, and opportunities related to people.	**Disclosure Framework**	**Cross-sector**
European Union Corporate Sustainability Due Diligence Directive (CSDDD)	This European law mandates companies to conduct due diligence on their global value chains to prevent and mitigate negative impacts to humans and the environment. It requires companies to identify, avoid, and reduce potential impacts, and mitigate or end current ones in their entire operational value chain including subsidiaries and business relationships.	**Guidance Framework**	**Cross-sector**
United Nations Sustainable Development Goals (SDGs)	A set of 17 global goals adopted by all UN member states in 2015, aiming to eradicate poverty, protect the planet by tackling climate change and preserving our oceans and forests, and ensure that all people enjoy peace and prosperity by 2030.	**Guidance Framework**	**Cross-sector**
United Nations Principles of Responsible Investment (UN PRI)	A framework for international investors to incorporate ESG factors into investment processes and decisions. It promotes sustainable investing that considers the long-term impact on society, environment, in addition to financial returns.	**Guidance Framework**	**Cross-sector**
UNEP FI Sustainable Blue Economy Finance Principles	Launched in 2018, the Principles are the world's first global guiding framework for banks, insurers and investors to finance a Sustainable Blue Economy. They promote the implementation of SDG 14 (Life Below Water), and set out ocean-specific standards, allowing the financial industry to mainstream sustainability of ocean-based sectors. The Principles were developed by the European Commission, WWF, the World Resources Institute (WRI) and the European Investment Bank (EIB) and are hosted by UNEP FI as part of the Sustainable Blue Economy Finance Initiative.	**Guidance Framework**	**Cross-sector**
Glasgow Financial Alliance for Net Zero (GFANZ)	GFANZ is a private-sector-led initiative that mobilizes capital and removes investment barriers to support the global transition to net zero. It convenes financial firms that understand the opportunity created by the transition to unlock private capital at scale by supporting innovative financing opportunities and solutions.	**Guidance Framework**	**Cross-sector**
Science Based Targets Network (SBTN)	The Science Based Targets Network is a civil society and science-led initiative founded in 2019 by a group of global NGOs who have come together to help collectively define what is necessary for companies and cities to do "enough" to stay within Earth's limits and meet society's needs. It is developing science-based targets for nature both for companies and cities, so they can comprehensively address their environmental impacts across biodiversity, land, freshwater and ocean, in addition to climate through the Science Based Targets initiative.	**Standards & Certifications**	**Cross-sector**
Science Based Targets initiative (SBTi)	The Science Based Targets initiative (SBTi) is a corporate climate action organization that enables companies and financial institutions worldwide to play their part in combating the climate crisis. It develops standards, tools and guidance which allow companies to set greenhouse gas (GHG) emissions reductions targets in line with what is needed to keep global heating below catastrophic levels and reach net zero by 2050 at latest.	**Standards & Certifications**	**Cross-sector**
World Economic Forum (WEF)	WEF is an international organization that brings together government, businesses, and civil society, acting as a platform for collaboration on global challenges. Specifically, WEF has started a Nature Positive Transitions Initiative to inform sectoral approaches for business, guiding the finance sector, and helping cities with their relationship with nature, aligning with the GBF to protect and restore natural world. WEF has produced reports on nature positive for offshore wind, ports, financing the transition in cities, among others.	**Initiatives**	**Cross-sector**
Global Initiative for Nature, Grids, and Renewables (GINGR)	The Global Initiative for Nature, Grids and Renewables (GINGR) aims to support the just and sustainable energy transition by providing assessment tools to quantify contributions to nature- and people-positive goals. Specifically, it seeks to identify the contributions of the wind, solar and electricity grid sectors to the targets set by the Kunming-Montreal Global Biodiversity Framework. It intends to develop monitoring and reporting systems that are globally aligned and standardized	**Initiatives**	**Cross-sector**
Sustainable Markets Initiative (SMI)	SMI is a global, private sector organization founded by His Majesty King Charles III with a primary goal to accelerate the transition to a sustainable future through global markets and value creation, working with governments, businesses, and other actors on sustainable business approaches. SMI operates with sector-specific taskforces to address challenges and opportunities in various businesses with a focus on demonstrating that sustainability and profitability can coexist.	**Initiatives**	**Cross-sector**
World Trade and Tourism Council (WTTC)	WTTC focuses on the inclusive and sustainable growth potential of the travel and tourism sector. It partners with governments, destinations, communities, and other actors to support economic development, create jobs, reduce poverty, and foster peace, security, and understanding.	**Initiatives**	**Coastal and marine tourism**

NAME	DESCRIPTION	TYPE	SECTOR
Nature Positive Initiative (NPI)	An initiative to promote the integrity and implementation of the nature-positive global societal goal by 2030. It provides tools and guidance for business, government, or other actors to contribute to nature positive and advocates for full implementation of the GBF by governments and other actors.	**Initiatives**	**Cross-sector**
World Sustainable Hospitality Alliance (WSHA)	The WSHA brings together hospitality companies and the wider value chain of the industry to accelerate contribution to net positive hospitality through industry leadership, collaboration, metrics, and regenerative solutions.	**Initiatives**	**Coastal and marine tourism**
Sustainable Stock Exchange Initiative	The initiative is a UN Partnership Programme organized by UNCTAD, the UN Global Compact, UNEP FI and the PRI. The SSE's mission is to provide a global platform for exploring how exchanges, in collaboration with investors, companies (issuers), regulators, policymakers and relevant international organizations, can enhance performance on ESG issues and encourage sustainable investment, including the financing of the UN Sustainable Development Goals.	**Initiatives**	**Cross-sector**
Making the Oceans Count II	This project seeks to ensure that material marine ecosystem-related risks and opportunities are better integrated into the decision-making process of key actors within the blue economy. It will develop indicators and metrics for measuring impacts and dependencies from human activities on nature.	**Initiatives**	**Cross-sector**
Ocean Breakthrough	The ocean breakthroughs are transformative pathways covering five key ocean sectors, where accelerated action and investments could deliver up to 35 percent GHG emissions reduction and contribute to a resilient, nature-positive and net zero future by 2050 and for a healthy and productive ocean	**Initiatives**	**Cross-sector**
Mangrove Breakthrough	Mangrove Breakthrough supports investment of US$4 billion to secure the future of 15 million hectares of mangroves globally by 2030 through collective action on halting mangrove loss, restoring half of recent losses, doubling protection of mangroves globally, and ensuring sustainable long-term finance for all existing mangroves.	**Initiatives**	**Cross-sector**
Network of Central Banks and Supervisors for Greening the Financial System (NGFS)	NGFS is a group of central banks and supervisors, who on a voluntary basis, share best practices and contribute to the development of environment and climate risk management in the financial sector and mobilize mainstream finance to support the transition toward a sustainable economy	**Initiatives**	**Cross-sector**
World Benchmarking Alliance (WBA)	The alliance represents organizations working at global, regional, and local levels to shape the private sector's contributions to achieving the SDGs. It focuses on benchmarking and cross-sector partnerships to drive progress on the SDGs.	**Initiatives**	**Cross-sector**
UNEP FI Sustainable Blue Economy Finance Initiative	The initiative is a UN-convened global community focused on the intersection between private finance and ocean health, supporting the implementation of the SBEFP. It provides guidance and frameworks to ensure investment, underwriting, and lending activities are aligned to SDG 14, so that FIs contribute to rebuilding ocean prosperity, restoring biodiversity, and regenerating ocean health.	**Initiatives**	**Cross-sector**
Ocean Risk and Resilience Action Alliance (ORRAA)	ORRAA is a multi-sector collaboration connecting the international finance and insurance sectors, governments, non-profits, and stakeholders from coastal communities to pioneer finance products that incentivize investment into coastal and ocean nature-based solutions.	**Initiatives**	**Cross-sector**
Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)	IPBES is an independent intergovernmental body established by states to strengthen the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development. It harnesses expertise from across all scientific disciplines and knowledge communities to provide policy-relevant knowledge and to catalyze the implementation of knowledge-based policies at all levels in government, the private sector, and civil society. IPBES produces assessments, provides policy support, builds capacity and knowledge, and supports communications and outreach.	**Initiatives**	**Cross-sector**
European Union Taxonomy	The taxonomy is an EU-wide classification system for sustainable activities that defines criteria for economic activities aligned with a net-zero trajectory by 2050 and the broader environmental goals other than climate. It is a transparency tool to help direct investments to the economic activities most needed for the transition, in line with the EU Green Deal objectives.	**Sustainable/Green Classification Systems**	**Cross-sector**
United Kingdom Green Taxonomy	The UK taxonomy defines which economic activities and investments can be considered environmentally sustainable. It seeks to create a common understanding of what constitutes a "green" investment, helping companies and investors make informed decisions and combat greenwashing. The taxonomy is focused on aligning investment with net-zero and nature-positive goals.	**Sustainable/Green Classification Systems**	**Cross-sector**
Indonesia Green Taxonomy	The Indonesian taxonomy is a voluntary framework for classifying sustainable financing and investment activities in Indonesia. It categorizes economic activities based on environmental impact, aligning with national environmental objectives and promoting sustainable development.	**Sustainable/Green Classification Systems**	**Cross-sector**
Singapore-Asia Taxonomy for Sustainable Finance	The Singapore-Asia taxonomy is a framework that categorizes activities based on contribution to environmental objectives in eight different sectors that serves as a practical guide for FIs to identify investments that contribute to environmental outcomes. The environmental objectives include climate change mitigation, climate change adaptation, protecting healthy ecosystems and biodiversity, promoting resource resilience and circular economy, and pollution prevention and control.	**Sustainable/Green Classification Systems**	**Cross-sector**

NAME	DESCRIPTION	TYPE	SECTOR
Colombia Green Taxonomy	The Colombia Green Taxonomy is a classification system for economic activities and assets that contribute to Colombia's environmental goals, including climate mitigation and adaptation. It acts as a guide for investors and FIs to identify and evaluate investments that meet specific environmental criteria and are considered "green" or sustainable.	**Sustainable/Green Classification Systems**	**Cross-sector**
WBCSD Roadmap to Nature Positive	Provides an initial materiality screening, documenting the risks, opportunities, impacts and dependencies across the value chain, as well as step by step guidance to prioritize practical actions for both reducing negative impact and restoring damaged ecosystems, as well as help prepare for transparent reporting.	**Guidance Framework**	**Offshore wind**
Climate Bonds Initiative: Marine Renewable Energy Criteria	Set of guidelines designed to ensure that marine renewable energy projects qualify for Climate Bonds Certification.	**Guidance Framework**	**Offshore wind**
TNFD (additional) Sector Guidance (Electric utilities and power generators)	The TNFD Recommendations and guidance are designed to help organizations to report and act on evolving nature-related issues with the ultimate aim of supporting a shift in global financial flows away from nature-negative outcomes and toward nature-positive outcomes. It has published this additional sector guidance to help organizations with business models or value chains in the electric utilities and power generators sector to apply the TNFD LEAP approach to their context.	**Disclosure Framework**	**Offshore wind**
Clean Shipping Index	This is a voluntary environmental labelling scheme aimed at promoting environmentally friendly practices in the shipping industry by providing a rating system for ships based on their operational impact on the environment as well as economic advantages for efforts towards cleaner shipping practices.	**Standards & Certifications**	**Shipping**
Climate Bonds Initiative: Shipping Criteria	This set of guidelines is designed to help the shipping industry invest in projects that reduce emissions and act as a roadmap for the shipping industry to transition towards a low-carbon future, to help them get qualified for climate bonds.	**Guidance Framework**	**Shipping**
International Maritime Organization (IMO) Marine Environmental Protection Committee	The Committee adopts resolutions and guidelines to address environmental issues related to shipping, including the International Convention for the Prevention of Pollution from Ships (MARPOL). The resolutions cover topics ranging from GHG emissions to ballast water management to ship recycling.	**Guidance Framework**	**Shipping**
Poseidon Principles	The Poseidon Principles are a global framework for assessing and disclosing the climate alignment of financial institutions' shipping portfolios. Developed by a group of banks and insurance companies, the principles aim to promote the decarbonization of maritime transportation by aligning financing and insurance practices with the climate goals of the IMO.	**Guidance Framework**	**Shipping**
Green Marine Certification Framework	The Green Marine environmental certification program offers a comprehensive framework for maritime companies to benchmark and then reduce their environmental footprint. The performance indicators address issues related to biodiversity, air, water, soil quality, and community relations. To obtain the certifications, participants must demonstrate continual and measurable improvement, and conduct annual self-evaluation, external verification, and publish results.	**Standards & Certifications**	**Shipping**
Global Sustainable Tourism Council (GSTC) Criteria	This establishes global standards and rules to guide tourism businesses in sustainable operations and management. The four broad criteria—Sustainable management, Socioeconomic impacts, Cultural impacts, and Environmental impacts—are used for education and awareness-raising, policymaking for businesses and government agencies and other organization types, measurement and evaluation, and as a basis for certification. The GSTC acts as an umbrella organization with its own criteria but also recognizes and accredits other certification programs that meet its standards.	**Guidance Framework**	**Coastal and marine tourism**
Green Globe Standard for Sustainable Tourism	This is a GSTC-recognized certification body (see above).	**Standards & Certifications**	**Coastal and Marine Tourism**
Framework for Measuring the Sustainability of Tourism	The Statistical Framework for Measuring the Sustainability of Tourism (SF-MST) is designed to support the recording and presentation of data regarding the sustainability of tourism. It aims to organize data about the economic, environmental, and social impacts of tourism in a holistic manner, facilitating better decision-making.	**Guidance Framework**	**Coastal and marine tourism**
FAST (Finance to Accelerate the Sustainable Transition)-Infra Label	The FAST-Infra Label is a globally applicable labelling system designed to identify and evaluate sustainable infrastructure projects, with the overarching objective of supporting infrastructure and creating a liquid asset class.	**Standards & Certifications**	**Coastal and Marine Tourism**
Eco-union Blue Tourism Initiative	The Blue Tourism Initiative aims to understand and evaluate the environmental impacts of coastal and marine tourism, at an international level (and in particular with a Mediterranean focus) in order to identify enabling conditions for the integration of environmental planning and sustainable management strategies. It conducts policy reviews, and supports multi-actor initiatives to strengthen sustainable blue tourism at local, national, regional, and international levels.	**Guidance Framework**	**Coastal and marine tourism**
WWF Guide Towards Sustainable Tourism Investment	This Guide is a WWF resource that aims to promote and encourage responsible tourism investments, particularly in vulnerable ecological areas. It focuses on how investors can contribute to the long-term sustainability of tourism by considering the environmental, social, and economic impacts of investments. The guide provides recommendations and assessment tools to help investors in decision-making that support environmentally sound tourism practices.	**Guidance Framework**	**Coastal and marine tourism**

NAME	DESCRIPTION	TYPE	SECTOR
United Nations Food and Agriculture Organization (UN FAO) Code of Conduct for Responsible Fishing	The code of conduct is a non-binding set of guidelines for sustainable fisheries management. It provides a framework for conservation, management, and development of living aquatic resources, with a focus on respect for the ecosystem and biodiversity. This code, adopted in 1995, is a voluntary, global framework intended to guide the behavior of all stakeholders involved in fisheries.	**Guidance Framework**	**Seafood**
FAO Guidelines for Sustainable Aquaculture	The guidelines are a comprehensive set of principles and practices that guide the development and management of aquaculture to ensure its sustainability. These guidelines, adopted by FAO, provide a framework for governments, organizations, and stakeholders to promote sustainable aquaculture practices globally.	**Guidance Framework**	**Seafood**
Marine Stewardship Council (MSC)	The MSC is an international non-profit organization that works to promote sustainable fishing practices and protect the health of the oceans. They achieve this through a certification program, where fisheries that meet their standards—a scientific measure of sustainable fishing—receive a blue label to display on their products, signifying that the seafood is sustainably sourced. This helps consumers make responsible choices when purchasing seafood.	**Standards & Certifications**	**Seafood**
Aquaculture Stewardship Council (ASC)	The ASC is an international non-profit organization that manages a certification and labeling program for responsible aquaculture. The ASC's goal is to promote environmentally sustainable and socially responsible fish-farming practices globally. It uses robust standards and assurance to ensure traceability and transparency throughout the supply chain	**Standards & Certifications**	**Offshore wind**

METHODOLOGY

To develop this report, we synthesized evidence from a variety of robust, science-based sources and inputs. Given that no comprehensive review exists of all conservation interventions—especially those available to the private sector—and their impacts on nature outcomes, we adopted a bottom-up approach to identify evidence and real-world examples of actions that can contribute towards the nature-positive goal.

This approach mirrors those used in qualitative evidence syntheses (e.g., by IPBES assessments), especially in data-poor scenarios, where we drew from the best available evidence and knowledge. We also considered the evidence hierarchy[313] as a guide, ensuring that we prioritized the most reliable sources while recognizing the value of different types of inputs (e.g., case studies, empirical studies, expert knowledge). Our qualitative synthesis that forms the basis of the sector chapters relied on primary sources, including case studies, empirical studies at regional and local scales, and expert knowledge. To support our findings, we incorporated examples that illustrate key points and add context to the analysis.

We included diverse and wide-ranging inputs. We reviewed scientific literature from the natural and social sciences (e.g., ecology, geography, economics), and focused on specific topics such as nature-positive outcomes, company actions on nature, and sector-specific practices and processes. We also used the findings from a recent landscape analysis of frameworks and standards relevant to ocean industries[354] to identify the added value and appropriate positioning of this report. Additionally, we included the existing AR3T mitigation hierarchy and the Sustainable Blue Economy principles, and where appropriate referred to existing WWF positions on related topics like the GBF, finance, offshore wind, coastal and marine tourism, shipping, and seafood. Credible private-sector guidance documents, such as UNEP FI's *Turning the Tide* and *Diving Deep* also informed our analysis.

Technical development

The drafting process was led by scientists, who synthesized the above sources, and gathered inputs from a working group of 41 academics and practitioners with relevant expertise (see acknowledgements). The development process included initial ideation, an internal zero draft, an in-person workshop, and two rounds of review.

Private sector engagement

We also sought feedback from the private sector via a series of engagements:

- In January 2025, representatives from three sector-relevant companies and one financial institution participated in a hybrid workshop, providing their perspectives on the need for sector-specific recommendations for how companies operating in the blue economy can credibly contribute to the nature-positive global goal.
- In March 2025, WWF co-hosted a closed-door roundtable at the Economist World Oceans Summit to soft-launch this work with a group of 26 corporate, finance sector, and civil society representatives. During this session we gathered feedback around how companies are currently approaching their nature impacts, dependencies and risk management, how the nature-positive concept is resonating, and what can be done to enhance progress at scale and at pace.
- Between March and May 2025, WWF convened nine bilateral consultations with sector-relevant companies to gather detailed feedback on the structure and content of the recommended nature-positive pathways and ground-truth the document's useability by the private sector. We incorporated select feedback received via these consultations into the final version of the report where relevant; alignment with the ambition of the nature-positive goal, scientific literature, and goals of this report was maintained. Key themes covered in these consultations included:
  - Orienting the nature-positive concept within how companies are currently looking at nature, in terms of business impacts, dependencies, risks and opportunities, discussing internal and external push and pull factors.
  - Major perceived challenges to operationalizing the recommended actions to support nature positive in both the short and long term, and opportunities to contribute to solutions.
  - Technical feedback on terminology used, and clarity of linkages to other relevant frameworks including TNDF, SBTN, CSRD, GBF, SDGs, etc.
  - We also noted companies' perspectives regarding the practicality and ambition levels of the recommended actions; we did not adjust the level of ambition in the content, but will use the feedback to contextualize application of the recommendations and provide the appropriate entry points for company engagement.
  - Practical next steps in how to most impactfully take this work forward to support companies operating in the blue economy to contribute to the nature-positive goal for the ocean at speed and at scale.

WWF authors made the final decisions about the content of this document.

ADDITIONAL RESOURCES FOR COMPANIES AS A STARTING POINT FOR DEEPER UNDERSTANDING OF UNDERLYING SCIENTIFIC CONCEPTS

The tables in this report provide a starting point to describe examples and characteristics of pathways towards nature-positive contribution. The examples are cited with resources accordingly, but there are many resources that exist to support the underlying science and deeper understanding of these pathways, and we have included some starting resources (not exhaustive) to assist with beginning the journey toward nature-positive contribution

Reef resources:

- As **active restoration** has been well documented, it is recommended to reference peer-reviewed guides or handbooks, such as A Manager's Guide to Coral Reef Restoration Planning and Design or the USCRTF Handbook on Coral Reef Impacts: Avoidance, Minimization, Compensatory Mitigation, and Restoration to ensure a robust process is deployed to support restoration success.

Artificial reef and modules resources:

- Turbine Reefs pp. 25–35: **Examples of modular structure**s available on the market for mitigation and restoration (specifications, estimated costs, suppliers).
- Pioch and Souche (2021) identified the **artificial habitat design characteristics needed** to target different species based on behavior and natural habitat type. Fish species that exhibit benthic behavior, for example, usually prefer habitats with hard substrates and dark, small, and complex cavities. The table below is a summary:

Translate into AR design

Types of target species	Behaviors	Natural habitats sought	Adapted AH categories	Complexity of the eco-designed module			Species requirement
A	Benthic Low displacement Local scale	Hard substrates with dark and complex cavities	1	Numerous and complex shelters	Low cavity height ≥ target species	Internal spaces close to the size of benthic species (narrow, often cryptic cavities)	Majority or part of the body in contact with the artificial habitat
B	Demersal Medium to large displacement Regional and national scale	Hard substrates with medium to large cavities	2	Low complexity shelters	Average cavity height > target species height and width	Internal spaces large enough for demersal fish to visually identify themselves fully and move through cavities without coming into contact with the AH	Little physical contact with the artificial habitat but swimming in the vicinity
C	Pelagic Major migratory movements International scale	Open water and the proximity of steep or very steep upwelling	3	No shelters	Greater or lesser cavity height	Shape creating current disturbances and/or a position between the surface and the middle of the water column above the mean thermocline	Away from the AH and living in open water

Table 3.4. *Relationship between target species types and eco-design (S. Pioch)*

Pioch et Souche, 2021, Whiley ed.

- **Example study: Reef modules** deployed in Mexico in response to beach and habitat loss were found to recover the natural sediment transport dynamics, while also providing new settlement habitat for native species.
- Example studies demonstrating the **importance of modeling solutions before deployment** (PDF) Modular Coral Shaped Artificial Reefs acting as Beach Protection Barriers and Dissipation of wave energy by a hybrid artificial reef in a wave simulator: implications for coastal resilience and shoreline protection - Ghiasian - 2021 - Limnology and Oceanography: Methods - Wiley Online Library
- FAO-Studies and Reviews: Practical Guidelines for the Use of Artificial Reefs in the Mediterranean and the Black Sea

Example of species characterization data:

- Hermans et al. (2020) provides a robust example of **characterization of species** in terms of life cycle, habitat requirements, settlement preferences, and breeding patterns. These types of data sources should be referenced to ensure designed habitats are meeting the ecological and biological needs of target species in the context and ecosystem type of your project location.

Oyster restoration resource:

- Frontiers | Contemporary Oyster Reef Restoration: Responding to a Changing World Figure 2. Contemporary roadmap of design considerations for **oyster reef restoration projects**

Mangrove, wetland and salt marsh resources:

- **The Global Mangrove Alliance** has designed comprehensive best practice guidelines for restoration that bring together local and scientific knowledge. The guidelines lay out best practices based on the best available science and an emphasis on an inclusive mangrove restoration process. The guide walks through the key steps and decision trees for approaching and carrying out successful mangrove restoration from setting goals, assessing feasibility, project design, engagement and implementation, to monitoring and evaluation, with case study examples. It also touches on blue carbon projects and how to appropriately design them.
- **The Global Mangrove Watch platform** is a tool that can be used by the private sector to identify restoration opportunities. The platform shows areas on a map at a national scale where there is potential for restoration. While it identifies regions with the highest potential and opportunity, selected regions need to be ground-truthed in situ to identify the feasibility of a restoration project and ensure the appropriate due diligence is conducted.
- As in this example and in many cases where a mangrove system is degraded, **restoring hydrology** is the most effective restoration tool. The situation is similar for **salt marsh restoration**.

Dune resources:

- **Dune restoration** case studies and examples pp. 8–10 and 12–15.
- **Modeling of different dune types**, demonstrating importance of vegetation in dune stabilization and erosion prevention.

Seagrass resource:

- **Global analysis of seagrass restoration**

Kelp resource:

- **Kelp restoration** principles and pathways

Coastal and marine tourism resource:

- Designing greener buildings and integrating biodiversity into building design, pp. 38–44.

Databases:

- Key Biodiversity Areas
- A global standard for the identification of Key Biodiversity Areas : version 1.0 | IUCN Library System
- Vulnerable Marine Ecosystems
- Ecologically or Biologically Significant Marine Areas
- PADDD tracker

Offshore wind resources:

- Marine mapping tool for OSW in the US Atlantic region: includes high-level data on habitat types, important features, species, diversity, and community impact in the areas where OSW has been developed. This is a helpful starting point to understand potential nature-related risks, pressures, and impacts for companies planning to develop in this region.

General mapping resources:

- Hub Ocean data portal

Global goals:

- The **mangrove breakthrough**
- The **ocean breakthroughs**

Infrastructure resources:

- **A Playbook for Nature-Positive Infrastructure Development**
- From the Outside in: Buildings and Biodiversity

Science tools:

- Ocean health index –national-level index to score ocean health.
- WWF Risk Filter Suite to identify priority areas relevant to coastal ecosystems, and applicable to the coastal tourism sector.
- A Playbook for Nature Positive Infrastructure Development
- Ocean Impact Navigator | 1000 Ocean Startups Coalition: open source impact KPI framework designed to simplify, harmonize, and strengthen impact measurement and reporting for the ocean impact innovation ecosystem.
- Global Biodiversity Information Facility: free and open access to biodiversity data.
- ELINOR: free and open source monitoring tool that helps users gather, store, share and use data on environmental governance and management to support effective are-based conservation.
- Mermaid: manage coral data, and coral reef health indicators
- Carbon Disclosure Project: encourages businesses, cities, and states to voluntarily report on their environmental impacts. Serves as reporting platform for monitoring climate, supply chain and environmental indicators, promoting transparency and action towards building a sustainable economy by providing data for companies and investors.
- SeaBASS: archive of publicly shared in situ oceanographic and atmospheric data maintained by NASA's ocean biology process group.

Guidance:

- UNESCO marine intergovernmental oceanographic commission criteria and guidelines
- UNESCO marine spatial planning—a step-by-step approach toward ecosystem-based management
- UN Global Compact Sustainable Ocean Business Action Platform
- WWF carbon markets position
- Seafood business for ocean stewardship
- State of the Practice: sustainability standards for infrastructure investors
- WWF Environmental and Social Safeguards Framework

Finance tools:

- OECD Development Finance Institution guidance: development finance standards and best practice self-assessment tool to help actors working in development finance to manage projects to generate positive impact on people and planet and improve transparency.
- IFC Ocean Guidance
- Global Biodiversity Framework Fund to scale up financing for implementation of the GBF.
- Net-Zero Banking Alliance: global member-led initiative supporting banks to lead on climate mitigation in line with the goals of the Paris climate agreement.
- Glasgow Financial Alliance for Net Zero: private sector-led initiative focused on mobilizing capital and removing investment barriers for the global transition to net zero.
- The Sea Change Impact Financing Facility (through ORRAA): collaborative effort to develop an open ocean financing architecture designed to mobilize broader finance capital and drive US$1 billion of private investment into coastal and ocean ecosystems with a focus on the Global South by 2030.
- Green Impact Exchange: the US Securities and Exchange Commission (SEC) has approved the Green Impact Exchange (GIX) as a national securities exchange. This approval marks a significant step toward integrating environmental, social, and governance (ESG) principles into the core of capital markets.

Governance, regulations, and policies

- National-level biodiversity strategies and action plans (NBSAPs) and associated national legislation. NBSAPs are in development in many countries, and reflect national-level contributions towards the GBF targets and goals. For example: the UK's Biodiversity Net Gain regulation, Australia's Nature Repair Market, France's Biodiversity Law, Germany's Federal Nature Conservation Act, and New Zealand's National Policy Statement on Indigenous Biodiversity.
- The Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction (High Seas Treaty, UNBBNJ). The UNBBNJ plays a critical role in establishing how governments can collaboratively protect ocean biodiversity in the high seas, in areas beyond national jurisdiction.
- The Economist Group Coastal Governance Index
- IUCN Red List
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) 1973
- UN Convention on the Conservation of Migratory Species 1979 (CMS): environmental treaty and global platform for conservation and sustainable use of terrestrial, aquatic and avian migratory animals and their habitats.
- United Nations Fish Stock Agreement treaty
- World Trade Organization Agreement on Fisheries Subsidies: global rules to curb harmful subsidies provided by governments to the fishing sector
- United Nations Convention on the Law of the Sea (UNCLOS)
- Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)
- EU Nature Restoration Regulation: law to restore damaged ecosystems and improve biodiversity across the EU which sets binding targets for the restoration of various habitats and species with the goal of covering at least 20% of EU land and sea by 2030.
- Ramsar: The Convention on Wetlands 1971

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