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THE FUTURE OF THE BLUE ECONOMY FROM RISK MITIGATION TO BUSINESS OPPORTUNITY

This paper examines the often-overlooked risks that businesses pose to coastal and marine ecosystems, highlighting both direct and indirect pressures on the ocean. While many companies take a reactive stance toward ocean conservation, a growing number are recognizing the potential for proactive engagement. The analysis shows that engaging in ocean restoration efforts not only mitigates risk, but also unlocks significant business opportunities, ranging from sustainable fisheries management to innovative digital technologies.

BLUE ECONOMY//SUSTAINABILITY//BLUE BUSINESS OPPORTUNITIES//NATURE-BASED SOLUTIONS (NBS)//CLEAN TECH

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Often unaware of the risks associated with ecosystem degradation, businesses exert both direct and indirect pressures on the ocean. The diverse and interconnected nature of these pressures makes the protection of coastal and marine ecosystems a key challenge for most companies, regardless of their sector. However, while marine restoration activities present significant challenges, they can also provide solid business opportunities that create value for all stakeholders while addressing global threats to our current and future well-being.

Drawing on insights from recent research, partly using Generative Artificial Intelligence (GenAI) (One Ocean Foundation et al., 2023), the purpose of this paper is to analyze some of the opportunities related to the protection and restoration of marine ecosystems that remain largely unknown to most companies.

The results of the study, which analyzed the behavior of approximately 2,500 of the world's

largest companies by market capitalization across 17 industries, reveal that the majority of companies that recognize the importance of the ocean challenge are still taking a predominantly “reactive” approach. Specifically, 50 percent of the companies in the sample prioritize a mitigation-oriented approach, focusing on risk management and compliance with regulations and standards. For instance, these companies implement strategies by establishing risk assessment processes to identify and mitigate pressures on water resources, or by implementing preventive measures to avoid hazardous spills. Additionally, some companies form partnerships, at times with nongovernmental organizations, to support ecosystem protection and restoration projects to mitigate the physical and

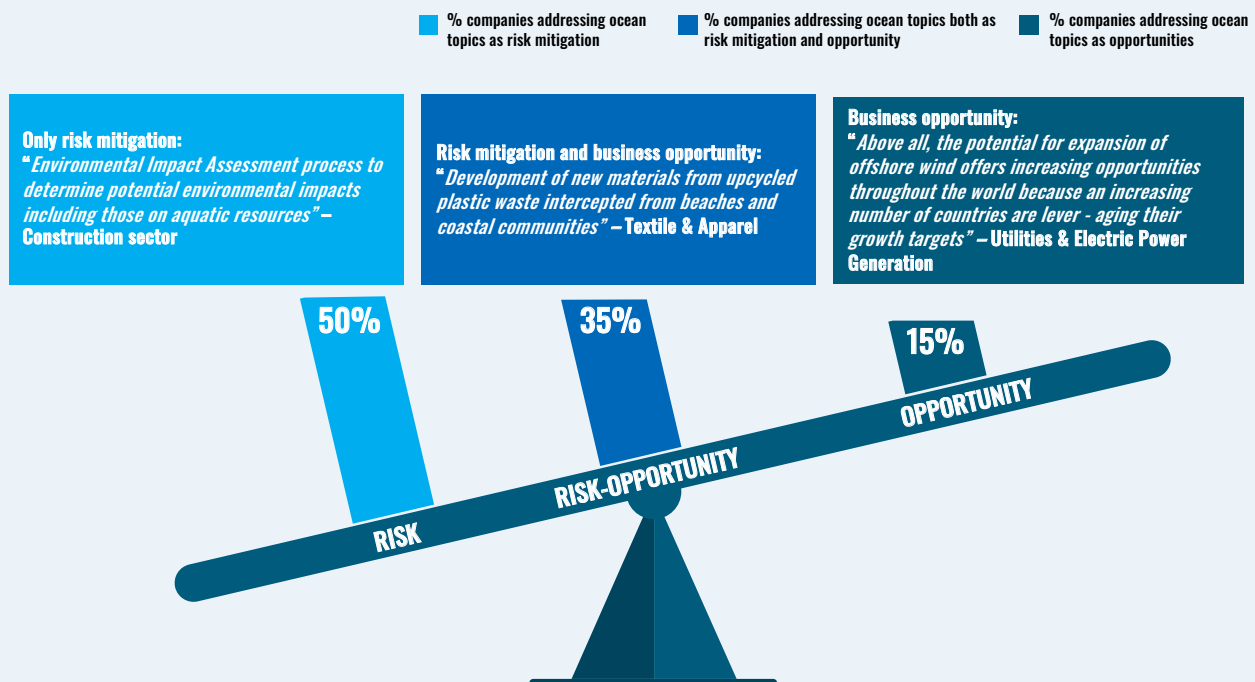
reputational risks associated with their operations. Conversely, only a small proportion of companies, 15 percent (Figure 1), view the marine environment as a genuine source of opportunities for developing new markets or increasing productivity. Examples include companies dedicated to producing energy derived from the sea or those operating in the fish industry and marine aquaculture sectors.

The remaining companies surveyed (35 percent) acknowledge the importance of an approach that combines risk mitigation with the potential to create value through marine conservation. Some of these companies are investing in projects to develop new products from plastics recovered from the ocean, while others are focusing on restoring marine biodiversity through carbon sequestration

FIGURE 1. RISK MITIGATION AND OPPORTUNITY ANALYSIS ON COMPANIES ACTIVE IN AT LEAST 1 OCEAN-RELATED ODI DIMENSION¹

Risk mitigation and opportunity analysis on companies active in at least 1 ocean-related ODI-dimension¹

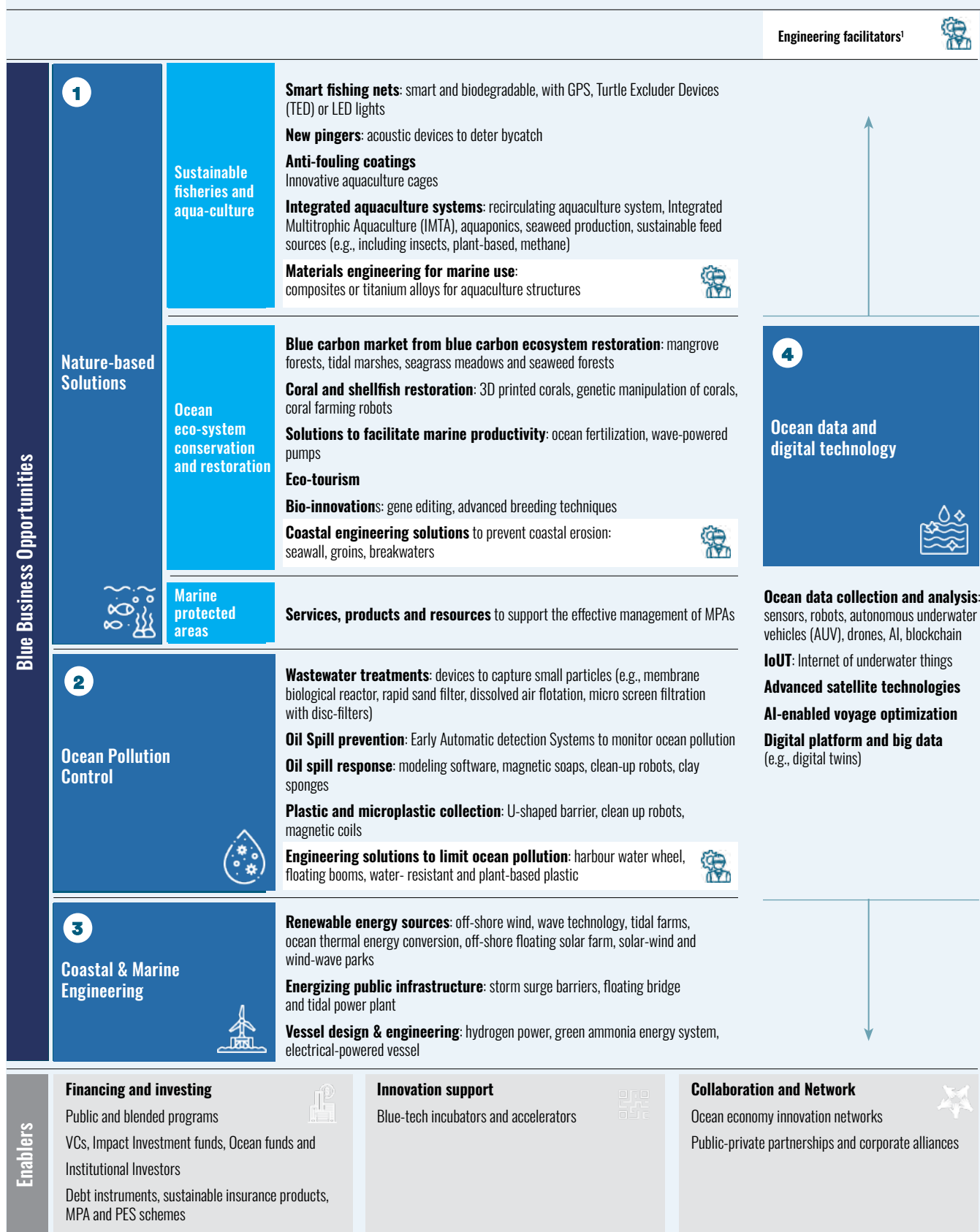
of actions achieved in each ODI dimension/total # actionable initiatives available in each ODI dimension by level of activation, %



1. Excluding indirectly ocean-related managerial dimensions (i.e., product, process and supply chain innovation)

Source: Authors' elaboration: GenAI approach applied on a sample of 163 Sustainability or Annual Reports (2021) of companies belonging to 6 sectors (Textile & Apparel, Fishing & Aquaculture, Construction, Agri-food, Mining Oil & Gas, Utilities & Electric Power Generation)

FIGURE 2. BLUE BUSINESS OPPORTUNITIES AND ENABLERS



initiatives. Additionally, some companies are investing in technologies that use the ocean to produce clean energy while minimizing potential damage to the marine ecosystems in which they operate.

Although this percentage is still relatively small, analyses indicate that a growing number of companies from various sectors – not just ocean-related industries – are able to recognize the potential of marine natural capital as an opportunity. Increasingly aware and mature companies are beginning to understand that the blue economy can unlock new avenues for value creation. This realization is evident in innovative approaches to mitigating pressures or adopting nature-based solutions, strategies aimed at protecting ecosystem services and conserving the ocean through sustainable practices that benefit both businesses and the marine and coastal environment.

TOWARD NEW BLUE BUSINESS OPPORTUNITIES

Business opportunities associated with natural blue capital have the potential to generate value for companies by reducing costs, improving efficiency, creating new revenue streams, building business resilience, and enhancing reputation and brand image. Some companies are starting to acknowledge this potential, which, if properly leveraged, could profoundly influence the trajectory of innovation, channeling new investments toward the adoption of sustainable practices aimed at protecting marine and coastal ecosystems.

Through research and the gathering of best practices, various ocean-related business opportunities and key enabling factors have been analyzed and categorized into a framework, as illustrated in the table. Specifically, the first category is nature-based solutions¹ and

includes sustainable fisheries management, the conservation and restoration of marine ecosystems, and the establishment and management of marine protected areas.

The second category corresponds to solutions for marine pollution control. The third category includes initiatives related to coastal and marine engineering. Lastly, the fourth category, which intersects with the others, comprises digital technology and ocean-related data management

Nature-based solutions include:

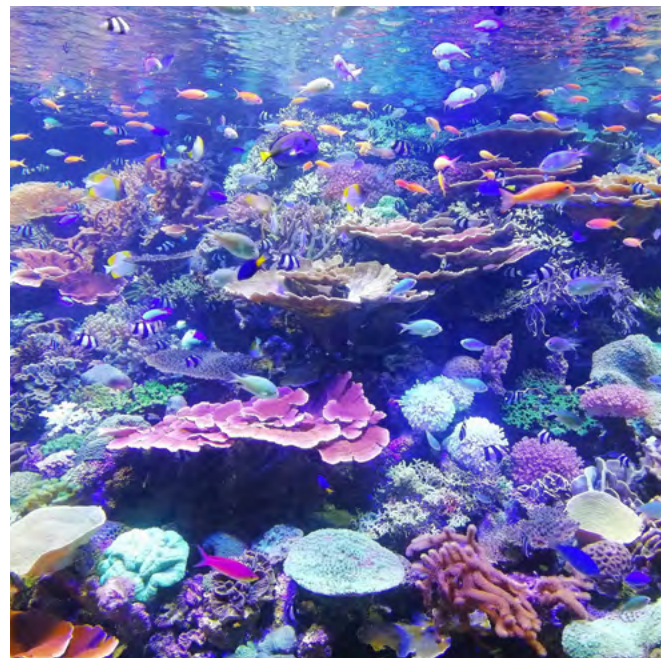
- ***Sustainable fisheries and aquaculture.*** Technologies that facilitate the introduction of more sustainable fishing practices fall into this category. Examples include the development of “smart” fishing nets and acoustic devices (*pingers*) capable of deterring non-target species. Promising solutions to alleviate pressure from the aquaculture sector also involve the introduction of new cage designs to prevent the escape of farmed species, the integration of aquaculture farming systems with algae production, and the use of feeds derived from more sustainable sources such as insects and plants. Additionally, engineering solutions that promote sustainability include the use of advanced materials like composites or titanium alloys to build more durable aquaculture structures.
- ***Ocean conservation and restoration.*** Nature-based solutions that increase blue carbon storage capacity offer development opportunities for companies specializing in carbon offsets and credits. These organizations can assist other companies in offsetting CO₂ emissions by investing in *carbon capture and storage projects*, such as the conservation and restoration of mangrove forests, marshes, and marine grasslands. Another intervention type involves

¹ Nature-based solutions include, for example, technologies and innovations designed to mitigate climate change by preserving and increasing natural resources.

innovation in *coral reef restoration*, employing both biological and engineered solutions. Equally interesting are solutions centered on the *cultivation of mollusks*, which, as filter-feeding organisms, contribute to the recovery of contaminated ecosystems. *Ocean fertilization* and the installation of *wave energy-powered pumps* to facilitate nutrient upwelling to the surface are additional methods to enhance sea productivity and vitality. *Ecotourism*, when aligned with marine protection and conservation policies and objectives, presents another business opportunity for companies and local communities aiming to safeguard natural resources, especially biodiversity, while offering tourists an enriching experience (Casimiro et al., 2022). Finally, certain engineering solutions aimed at mitigating coastal erosion, such as the installation of barriers, panels, and breakwaters built from sustainable materials, fall within this category.

- **Marine Protected Areas (MPAs).** The scientific consensus underscores the necessity for establishing new MPAs to reinforce coastal and marine protection efforts. Numerous studies² (O’Leary et al., 2016) indicate that MPAs are among the most effective means to conserve biodiversity and create or maintain resilience in marine and coastal ecosystems. They aid in the preservation and restoration of habitats while fostering economic value creation and social well-being. In essence, MPAs represent valuable assets that remain largely underappreciated and possess the potential to yield significant economic and financial returns over the long term (Davis et al., 2019). Historically, governments and nonprofit organizations have primarily shouldered the responsibility for funding MPAs. However, research indicates

emerging opportunities for private investment. Specifically, certain MPAs³ (Al-Abdulrazzak et al., 2012) offer opportunities for activities in the fisheries, marine, aquaculture, or tourism sectors (Rodríguez-Rodríguez et al., 2015). In these instances, revenues generated from industrial and service activities serve as income sources for both MPA management and investors (Pascal et al., 2021). Moreover, the development of new blended financial instruments, combining public and private funding, addresses the need for additional resources to effectively manage MPAs (Friends of Ocean Action et al., 2020). Consequently, stakeholders – be they public or private – are encouraged to form partnerships and deliver services, products, and resources for the efficient management of these areas. Such collaboration is essential for preserving the health of marine ecosystems and ensuring the creation and equitable distribution of value.



² This study involves an extensive peer-reviewed scientific literature search and review of relevant articles that identify Marine Protected Areas (MPAs) as one of the primary tools for conserving and maintaining biodiversity and ecosystem services, as well as mitigating the negative effects of anthropogenic activities.

³ The term “Marine Protected Areas” allows for different levels of protection that may either permit or prohibit certain types of activities.

MARINE POLLUTION CONTROL

There are several ways to mitigate the many sources of pollution, including liquid and solid wastes that can alter the chemical and physical parameters of seawater. Regarding *wastewater management*, these options include the development of innovative membranes capable of filtering water and capturing pollutant particles of varying sizes, as well as the installation of specific barriers.

Regarding chemical pollution, oil remains the primary threat to the ocean. Therefore, *preventive measures* such as early detection systems and responsive actions such as utilizing cleaning robots, magnetic soaps, and clay sponges are among the main alternatives available. Other potential solutions to reduce marine pollution include, in terms of prevention, the development of plant-based, biodegradable, waterproof plastics, and the use of water wheels in harbors to collect debris. Additionally, in terms of mitigation, floating barriers designed to trap plastic debris represent a viable approach.

COASTAL AND OCEAN ENGINEERING

The development and implementation of engineering solutions grounded in sustainable innovation for coastal infrastructure are vital for preserving the health of the ocean.

Transitioning to *renewable energy sources*, for example, requires new solutions such as the construction of offshore wind farms, floating solar panels at sea, thermal and wave technology, tidal power plants, and offshore parks that generate electricity from multiple sources.

Another important aspect is *public infrastructure* and the integration of smart solutions such as flood barriers and floating bridges. Furthermore, green solutions in *maritime transportation and ship design*, including the use of clean energy from hydrogen, fuel cells, ammonia, and new propulsion systems, offer compelling alternatives to traditional fuel-based energy sources.

DIGITAL TECHNOLOGY AND OCEAN DATA

The development and use of smart devices such as advanced sensors, cameras, smart buoys, specialized robots, drones, and satellite technology, have the potential to enhance the quantity and quality of ocean data collected.

This is essential for monitoring and predicting ocean conditions, tracking the behavior of marine animals, improving ocean mapping, and preventing pollution. Real-time data acquired through the Internet of Underwater Things can aid in identifying short- and long-term trends and contribute to digital platforms.

Finally, artificial intelligence is expected to play a pivotal role in data analysis, forecasting, responding to ocean-related challenges, and optimizing maritime operations such as route calculation.

ENABLING FACTORS

The ocean-related innovations and business opportunities mentioned above often rely on the support and involvement of various *enablers* that facilitate their financing, development, and promotion.

Financial instruments and actors can support the creation and growth of businesses in these areas by providing the necessary resources to startups and innovators working on ocean-related solutions. For example, debt instruments such as *blue bonds* and sustainability-related loans, sustainable insurance products, public and blended financing programs, or MPA-specific financing schemes, often provided by conservation trust funds, can be utilized.

In addition, venture capital, impact investing funds, dedicated ocean funds, and institutional investors can serve as catalysts for the creation of large-scale blue business opportunities.

In this regard, according to an analysis on international financial markets conducted by Morgan Stanley in 2022, nearly 500 equity funds had an average exposure of more than 3 percent

to SDG 14 “Life Below Water,” and more than 100 had an exposure of 10 percent or more (Stanley, 2023). Some of these funds are thematic, focusing on water and the ocean, while others encompass broader sustainability-related themes in sectors such as agribusiness and the transition to clean energy, where preserving the health of marine ecosystems remains a critical issue.

In recent years, attention towards the creation of blue businesses has increased, supported by instruments and actors in the field of sustainable innovation and clean tech.

For example, the European Commission initiated the *BlueInvest* investment platform to foster investment, innovation, and sustainable growth in the blue economy. On a broader scale, this initiative is aligned with investments related to the *European Green Deal* (European Commission, 2021), which aims to transform Europe into the world’s first zero-emissions continent.

However, the pivotal role played by technology incubators and accelerators in supporting innovation is essential for the development, commercialization, and widespread adoption of ocean-related innovations. These entities provide a nurturing environment for entrepreneurs and innovators, granting access to specialized expertise and industry networks, offering financial assistance, bridging gaps between research and industry, and facilitating the establishment of partnerships and market access.

Cooperation and networks, such as public-private agreements, business alliances and innovation networks, play a key role in mobilizing the stakeholders necessary to accelerate the development of these solutions. These collaborative initiatives bring together diverse entities, including corporations, SMEs, startups, public organizations, research centers, and universities, so that collectively they can drive progress in the ocean economy.

In conclusion, our research underscores the urgent need for heightened focus on ocean protection and a transition from a predominant

approach centered on risk mitigation to one that prioritizes seizing opportunities within the blue economy. However, our work also indicates that a subset of companies appears to be moving in the right direction. As awareness of the challenges facing the ocean grows, we anticipate a rising interest in creating value through the adoption of more sustainable practices, which can yield competitive advantages for companies, benefits for communities, and safeguarding of marine and coastal ecosystems.



REFERENCES

- Casimiro, D. et al. (2023). “Ecotourism in Marine Protected Areas as a tool to assess natural capital and enhance good marine governance: A review.” *Front. Mar. Sci.* 9:1002677. [doi](#).
- Dalal Al-Abdulrazzak, Stephen C. Trombulak (2012). “Classifying levels of protection in Marine Protected Areas.” *Marine Policy*, Volume 36, Issue 3, 576-582, ISSN 0308-597X, [doi](#).
- Davis, K. J. et al. (2019). “Estimating the economic benefits and costs of highly-protected marine protected areas.” *Ecosphere*, 10(10):e02879. [doi](#).
- European Commission (2021). “Delivering the European Green Deal.” [commission.europa.eu](#).
- Friends of Ocean Action et al. (2020). *Impact Report. The Business Case for Marine Protection and Conservation*, [weforum.org](#).
- O’Leary, B. et al. (2016). “Effective Coverage Targets for Ocean Protection.” *Conservation Letters. A journal of the Society for Conservation Biology*, [doi](#).
- One Ocean Foundation et al. (2023). *Business for Ocean Sustainability. Third Edition. Capturing the Blue Opportunity*, [ocean.org](#).
- Pascal, N., et al. (2021). “Impact investment in marine conservation.” *Ecosystem Services*, Volume 48, 101248, ISSN 2212-0416, [doi](#).
- Rodríguez-Rodríguez, D. et al. (2015). “Assessing the socioeconomic effects of multiple-use MPAs in a European setting: A national stakeholders’ perspective.” *Environmental Science & Policy*, Volume 48, 115-127.
- Stanley, M. (2023). “4 ways to invest in a Sustainable.” *Blue Economy*, [morganstanley.com](#).