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INTEGRATED SEASCAPE MANAGEMENT

Applying Economic Analysis

to Marine Spatial Planning

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Contents

Acronyms

CBA	Cost-Benefit Analysis
CIP	Coastal Infrastructure Program
CZMAI	Coastal Zone Management Authority Institute
EEZ	Exclusive Economic Zone
GDP	Gross Domestic Product
GRDP	Gross Regional Domestic Product
IDB	Inter-American Development Bank
InVEST	Integrated Valuation of Environment Services and Trade-offs
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
ICZM	Integrated Coastal Zone Management
LSI	Land-Sea Interactions
LSMS	Living Standards Measurement Study
MPA	Marine Protected Areas
MSP	Marine Spatial Planning
MRV	Monitoring, Reporting, and Verification
NBS	Nature-Based Solutions
OECD	Organisation for Economic Co-operation and Development
PER	Public Expenditure Review
SCBA	Social Cost-Benefit Analysis
SNA	Standard System of National Accounts

Executive Summary

To protect the oceans' natural capital and promote sustainable economic growth, the world needs to move beyond a business-as-usual relationship with its marine resources. For increasing numbers of countries, the solution is the "Blue Economy" approach. It allocates ocean space across traditional sectors such as fisheries and new ones such as offshore wind farms, with a goal of protecting resources and benefiting current and future generations. Marine Spatial Planning (MSP) is a key element of these efforts, yet it rarely includes a comprehensive analysis of the economic impact that interventions will have on the ocean and its wide range of stakeholders. This paper argues that adding robust economic analysis to the MSP process will increase buy-in, foster livelihoods, attract finance, and advance the long-term Blue Economy objective of protecting the ocean's underlying resources and ecosystems. Although many reasons explain the limited uptake of MSP worldwide to date, implementation could be accelerated by better use of economic tools and innovative financial perspectives.

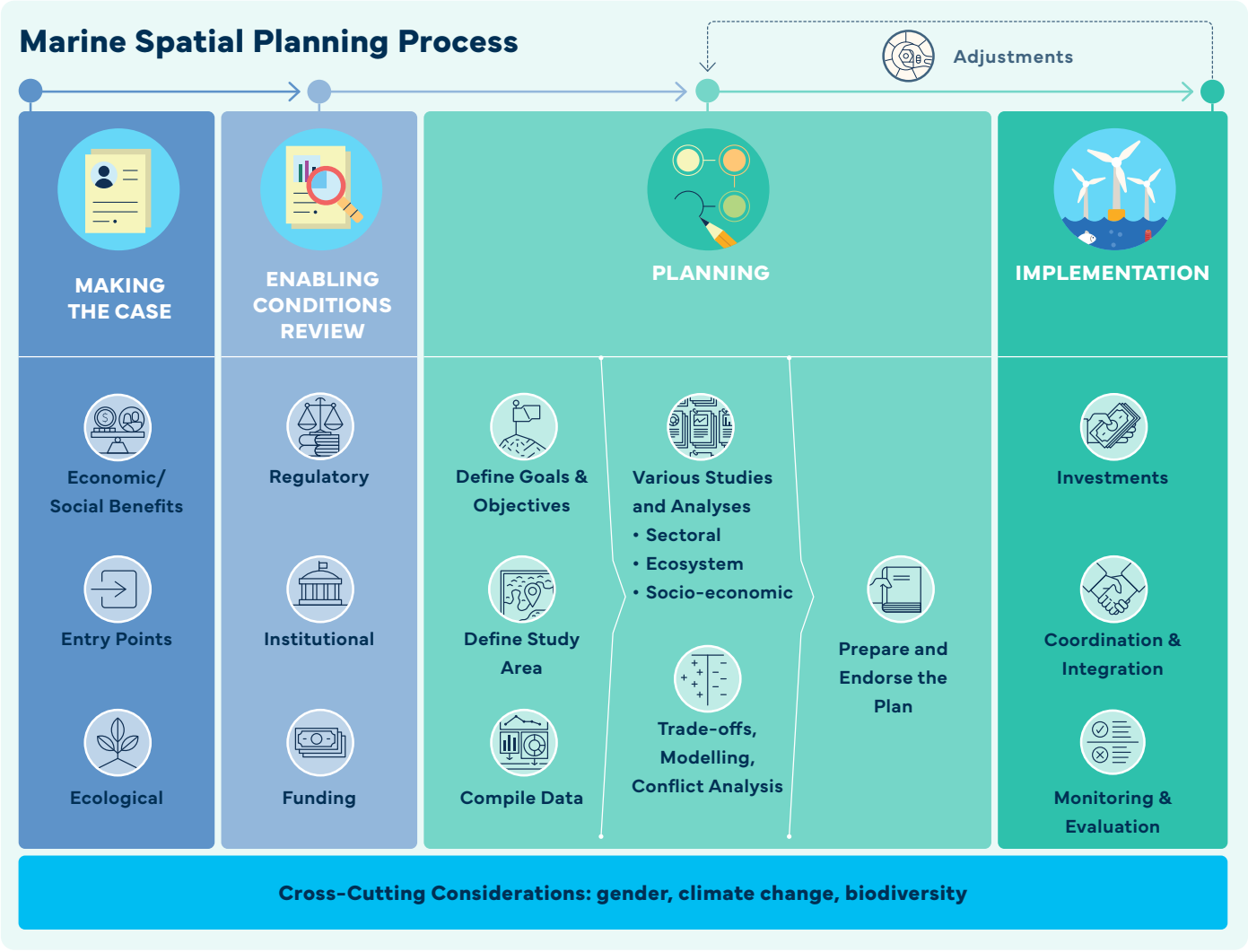
From an economics perspective, MSP can be defined as the spatially and temporally explicit allocation of scarce marine resources and services to competing uses, and the governance framework that designs, implements, and monitors this allocation. A deeper understanding of the economic trade-offs that come with MSP, and the winners and losers who emerge, can give policymakers insights they now lack into the needs and potentials of a sustainable ocean economy. By diffusing reliable information and clearly defining property rights, MSP can also help draw financing for marine projects at a sufficient scale and pace.

In economics, a policy can be considered desirable from the social point of view if the total benefits outweigh the costs. Importantly, the estimation of costs and benefits should not be limited to direct uses and should include ethical concerns and intrinsic values. Given scarce marine resources and multiple potential uses, the MSP process strives to allocate those resources to activities that generate the highest well-being. But to do that, planners need full data and analysis in hand, including economic analysis.

MSP also requires a suitable governance framework that ensures that the process involves all relevant stakeholders, including future generations.

The MSP process is not necessarily linear and sequential; it should be adaptive and dynamic, showing creativity in data-scarce and uncertain situations. As shown in Figure A, thee MSP process has four interconnected components: (1) making the case for MSP, that is, winning the support of governments, local communities, firms, and others, (2) a detailed review of starting conditions and enabling factors, (3) design, analysis, and allocation of marine resources to alternative uses, and (4) implementation and monitoring of progress once a program is underway.

Figure A. The MSP process



This report identifies six critical gaps in economic analysis of the components of the MSP processes described above. These gaps prevent a rapid uptake of the MSP concept worldwide and are associated to:

- Identification of trade-offs and winners and losers among competing users of resources
- Effects of externalities such as pesticide run-off from farmlands into the sea
- Scenario development and risk assessment
- Monitoring and course correction after the MSP process is complete
- Understanding of likely behavioral changes by people and organizations in response to MSP rules and regulations
- Flexible financing instruments to help private capital enter Blue Economy projects

The report briefly suggests a broad range of tools and methods for closing each of these gaps (See Figure B). They include, but are not limited to, software packages such as InVEST and ARIES, global datasets, consultative meetings to build buy-in among affected people, and innovative financial instruments such as the COAST insurance program. The common theme is that people carrying out MSP need to do all they can to fully grasp the likely future effects of their work. Economic analysis will allow them to look forward with much greater clarity. Nevertheless, the expectations need to be adjusted to the availability of data to apply the suggested tools. In many contexts, especially in developing countries, data limitations are fundamental and challenging to overcome in the short term. In these scenarios, an adaptive approach should be promoted to help accommodate different levels of technical precision about the different stages of MSP deployment.

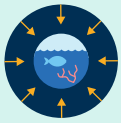
Figure B. Gaps and Tools in the Economics of MSP

GAP 1

Trade-offs, winners and losers in MSP are imperfectly identified, accounted.

Economic tools to close the gap:

- Apply cost-benefit analysis to all value sources, including monetary, social, and intrinsic.
- Analyze distributive impact of alternative designs.
- Complement with qualitative insights and participatory assessments.
- Use spatial software (e.g. InVEST, ARIES) to understand alternative scenarios better.
- Apply cost-effectiveness if the information on benefits is non-existent or too costly.



GAP 2

Externalities are not well integrated, valued in the MSP process.

Economic tools to close the gap:

- Use a systemic approach, with particular focus on land-sea interactions.
- Create an impact pathway to identify leverage points and interventions.
- Make an economic valuation of externalities.

GAP 3

Long-term impact, uncertainty, course corrections get insufficient attention.

Economic tools to close the gap:

- Nurture new insurance products to build confidence.
- Deploy blended capital packages to draw in the private sector.
- Apply special tools for probabilistic risk assessment.
- Tap community sentiments to better understand stakeholder uncertainty.
- Apply adaptive management to change direction as needed.

GAP 4

Monitoring and evaluation have limited scope, sophistication.

Economic tools to close the gap:

- Use a benchmarked MRV tool to measure progress towards goals, not activities.
- Use impact evaluation tools to establish a causal link between MSP and outcomes.
- Apply an ocean accounting framework to measure outcomes over time.

GAP 5

Behavioral patterns concerning rules compliance, perverse incentives are inadequately understood.

Economic tools to close the gap:

- Explore—and anticipate—behavioral shifts brought by limits on rights to marine resources.
- Consult closely with local communities, other affected actors.
- Use bioeconomic modeling to capture interrelation between productive and extractive sectors.

GAP 6

Innovative financial mechanisms to transform traditional sectors, foster new ones are in short supply.

Economic tools to close the gap:

- Define property rights clearly to encourage financing for MSP.
- Apply sustainability standards in existing sectors to attract new capital.
- Assemble packages of projects with scale, risk, and returns adjusted to different types of investors.
- Use existing tools (e.g. Public Expenditure Review) to raise efficiency of government spending.

The report offers the following recommendations for strengthening the four components of MSP and closing the six gaps:

1. Making the case

- Highlight the potential of MSP to improve biodiversity and ecosystem services outcomes.
- Use the best data available to argue that the cost of inaction is much greater than investing in an MSP process. Highlight business opportunities.
- Evaluate trade-offs between current and future competing uses of ocean space in monetary terms, showcasing win-win situations and suggesting ways to allay potential conflicts.
- Identify all economic value derived from MSP interventions and stress social goals.
- Develop an impact pathway that identifies the contribution of MSP to achieve Blue Economic goals.

2. Assessing the enabling conditions

- Develop ways to lower the risk of ocean investments and foster investors' confidence in the Blue Economy.
- Bolster data collection to build a baseline and track progress towards MSP implementation.
- Consider land-sea interactions more explicitly in MSP processes, especially for the benefit of coastal vulnerable communities affected by contamination originating inland.
- Identify and eliminate perverse subsidies in MSP and the Blue Economy approach.

3. Planning and executing

- Develop participatory scenario analysis and risk assessment to best understand the long-term consequences of MSP interventions.
- Deploy innovative financial and insurance products, science, and technology.
- Explore the use of economic incentives such as taxes and subsidies to foster compliance with MSP regulations.
- Pay special attention to impacts on vulnerable communities and devise ways to engage and benefit marginalized groups.

4. Implementing and monitoring

- Embrace a nimble, adaptive approach that can quickly change direction as needed, especially in data-scarce and uncertain scenarios.
- Allocate sufficient resources to monitor and enforce compliance with MSP regulations and incentives.
- Rigorously evaluate the impacts of MSP as they occur.
- Involve communities in small-scale finance and in-kind contributions to increase buy-in.

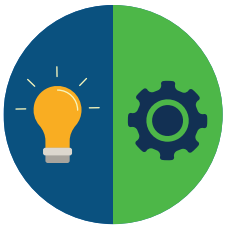
1 Introduction

Human society has relied on oceans for centuries, and this relationship appears set to become even more important over the coming years. Approximately one in ten people in the world now rely on fisheries and aquaculture for their livelihoods (FAO, 2016). Ocean-based tourism is forecast to double its contribution to global production by 2030 (OECD, 2016). Coral ecosystems alone provide the world economy with an estimated average annual value of US$172 billion (OECD, 2020). Oceans are fundamental for international commerce, with about 90 percent of all internationally traded goods traveling by ship (Stuchtey et al. 2020). Together, marine economic activities—fishing, aquaculture, tourism, shipping, carbon sequestration, and ocean-related education and biotechnology—provide the world economy with an estimated US$2.5 trillion per year, the so-called the gross marine product (Hoegh-Guldberg, 2015).

Nature is critical to human prosperity, yet we are fast degrading the biosphere—marine segments included—and encroaching on the boundaries of what our species needs for long-term survival. The enormous success in recent years in increasing glo bal standards of living has often come at the expense of marine resources, from overfishing and degradation of key ecosystems such as coral reefs and kelp forests to marine plastic pollution and ocean acidification (see e.g. Worm et al. 2009, World Bank 2021a). Climate change and pollution discharges from land-based activities threaten to modify oceans ecosystems irreversibly (IPCC 2019).

At the core of the problem is inadequate management of natural productive assets. These assets are valuable not only as inputs into production, but because of their intrinsic value. Marine resources provide perfect examples. On one hand, we tap the oceans constantly: fish populations provide food for people, sand and gravel are extracted for construction sites, and maritime

routes lie at the core of international trade. On the other hand, oceans are building blocks of the planet's climatic and ecological systems. They regulate carbon in the atmosphere, nurture countless forms of life, and supply spiritual and recreational solace to humans worldwide.



Two interrelated concepts and tools

To minimize harm to the oceans' natural capital and promote sustainable economic growth, societies need to overcome their *business-as-usual* relationship with oceans. This requires a cohesive planning approach to allocate ocean space across traditional and non-traditional sectors, to the benefit of not just current generations but those that will follow. In this quest, the Blue Economy concept has emerged as a "vision that is focused on the sustainable and integrated development of economic sectors in healthy oceans" (PROBLUE, 2020). It aims to promote synergies and manage trade-offs across sectors to better address the growing threats that oceans face, particularly from climate change.

Marine Spatial Planning (MSP) is an integral element of the Blue Economy approach (European Commission 2018, World Bank 2017, UNECA 2016). MSP has been defined as a "public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that are usually specified through a political process" (Ehler & Douvere, 2009, p. 18). MSP seeks to harmonize economic, social, and environmental trade-offs through the development of a long-term vision and framework for citizens. This vision encompasses multiple scales, balancing competing demands and guiding resource allocation decisions (Dasgupta, 2021).

Why this guidance note?

Despite growing use of MSP worldwide, important gaps remain in terms of the economics of this planning. So far, economic tools have scarcely been used in real cases of MSP worldwide. A deeper understanding of the trade-offs, the costs and benefits that come

with MSP from an economic and social perspective can help policy makers make the right choices as they seek to facilitate a sustainable ocean economy. This knowledge can also serve to ensure that financing flows to MSP at a sufficient scale and pace for successful implementation.

Specifically, this guidance note aims to:

- Conceptualize MSP using an economic perspective, explaining key principles and concepts in the context of the Blue Economy.
- Provide an overview of economic approaches and tools that at each stage of MSP can make or strengthen the economic case for MSP among stakeholders, highlighting potential trade-offs and distributive implications.
- Inform the scope, design and extent of MSP.
- Show how economics concepts and tools can guide and motivate a sustained flow of public and private finance into MSP goals.

In the hope of expanding their use in MSP worldwide, this guidance note presents real-world examples of these tools' application in marine and coastal management.

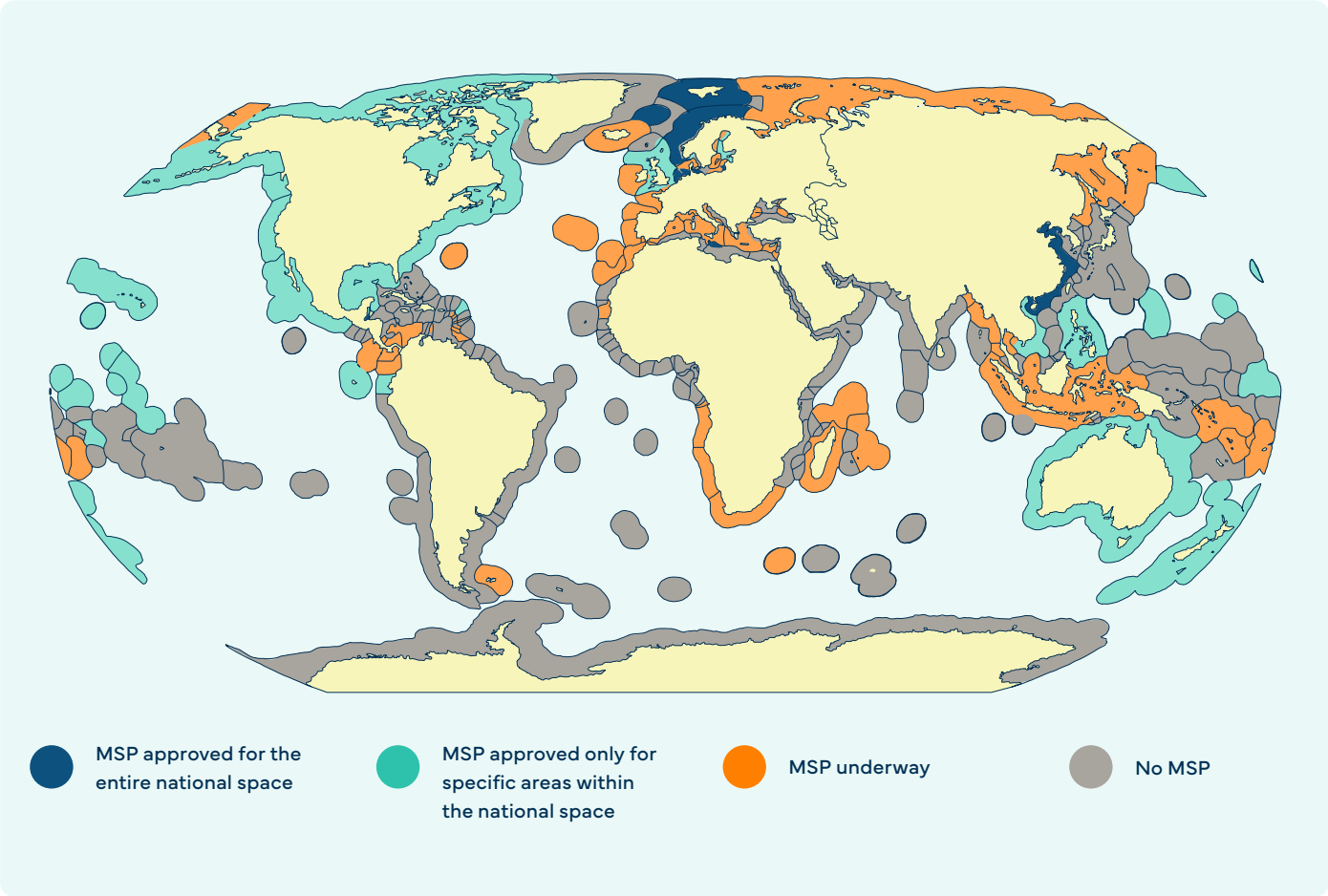
Marine Spatial Planning: A quick overview of applications

The pitfalls of interventions that center on a single issue (overfishing, for example) or sector (wind power) are well known—but MSP takes a more integrated approach. The need for a broad view is now well established (Groeneveld 2020 and Groeneveld et al. 2017). Integrated Coastal Zone Management (ICZM) and MSP are examples of the multisectoral approach. Of the two, MSP is larger in scope, dealing both with spatial and temporal uses of the marine space, and not only along coastlines.

For now, MSP is far from widely implemented. Most MSP initiatives are incipient, cover relatively small geographic areas, and are led by developed countries (Santos, et al., 2019). Just 50 percent of MSP plans that existed in 2017 were designed to cover the entire EEZ of the countries, about 40 percent covered

only the territorial sea, and 10 percent were limited efforts developed at the municipal or local level (IOC and European Commission, 2017). By 2018, about 70 countries and territories were preparing or had prepared about 140 MSP initiatives at the national, regional (within a single country), or local levels, ranging from early stages (new authority and funding arrangements) to plan revisions and adaptation (IOC-UNESCO, 2018). By the following year, the MSP efforts of 70 percent of these countries remained in the early phase. Today MSP plans are in place in only 22 countries, representing about 27 percent of the world's EEZs (Santos, et al., 2019).

Map 1: Global Status of MSPs in 2017.



Source: "Marine spatial planning" in *World Seas: An Environmental Evaluation* (pp. 571-592), by Santos, et al. 2019.

The greatest concentration of MSP recent activity is in Europe, where 37 percent of countries and territories have projects. This is largely due to the European Union's Integrated Maritime Policy, which established MSP as a key policy element. Planning concerns there have included offshore wind energy, sand extraction to strengthen coastal defenses, designation of MPAs, and inshore fisheries management (Jay, 2017). The Americas is the next highest region, at 28 percent of countries and territories. In the Middle East, in contrast, only two countries (3 percent) are currently developing MSP, at intermediate phases (Santos, et al., 2019). Map 1 shows the geographical locations of MSP in 2017.

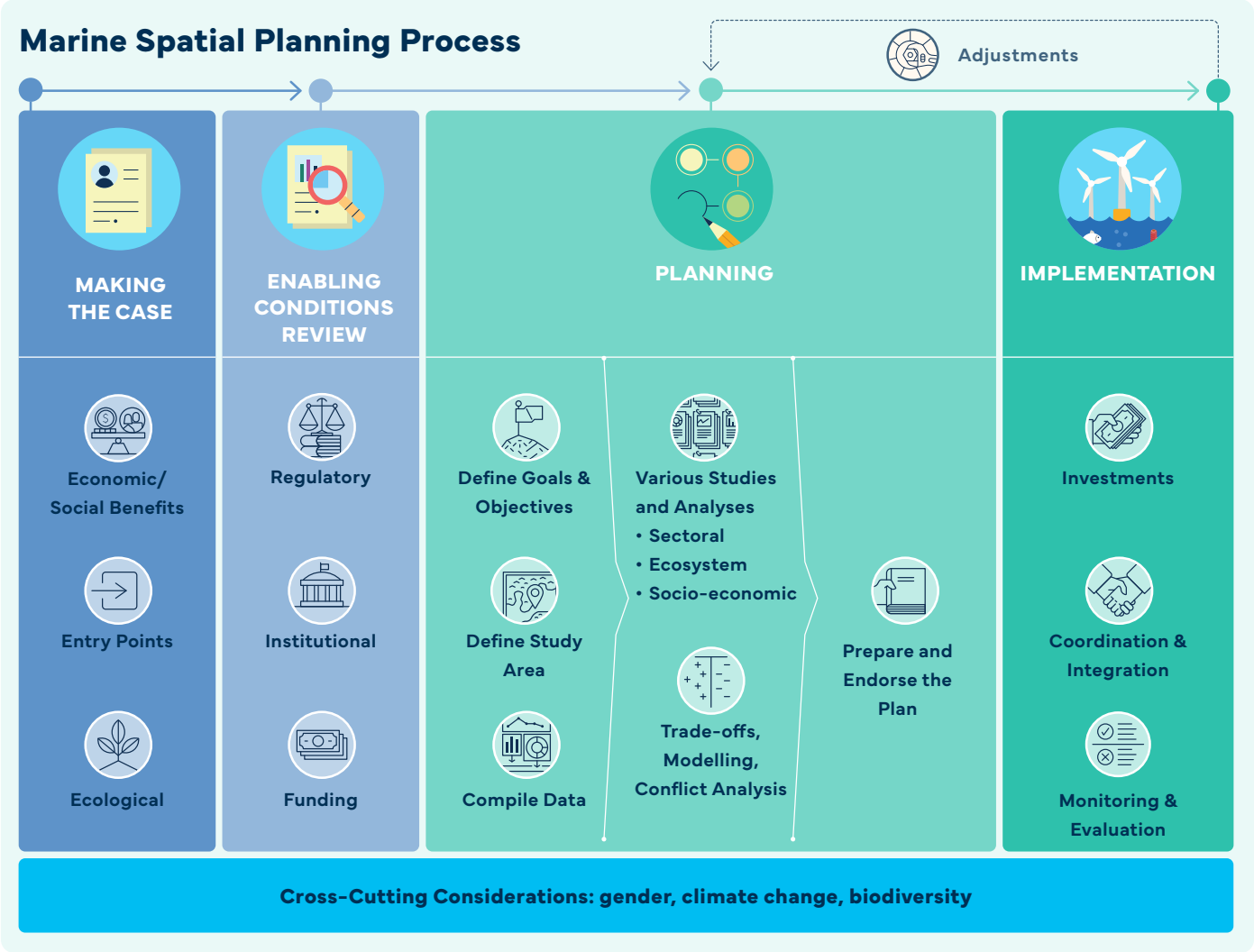
The MSP process

The MSP process has four interconnected components (see more details in Alder and Castaño-Isaza 2022). These are (1) making the case for MSP, (2) a review of starting conditions and enabling factors, (3) design, analysis, and final allocation of marine resources to alternative uses, and (4) implementation and monitoring of progress (Figure 1). Each of these components can be further unpacked into methodological steps. How far down or up a component hierarchy an actor needs to proceed depends on the specific conditions, and the objectives pursued. MSP should be envisioned as a multidisciplinary and participatory approach, but economics should be a decisive tool to enhance decision making and impact.

The MSP process represented in Figure 1 is nonlinear and not necessarily sequential; it should be adaptive and dynamic in nature, showing creativity in data-scarce situations. For example, the MSP process in the Dutch Exclusive Economic Zone (EEZ) in the North Sea is an instructive case, balancing the deployment of offshore windfarms against the needs for sustainable food (primarily fisheries) and nature conservation (European Commission 2021). This process started with an evaluation of the socio-economic and environmental consequences of the various MSP scenarios using cost-benefit analysis (CBA). This yielded a useful grasp of potential trade-offs. But it was just one part of an adaptive planning cycle in which the initial assessment, as part of the stakeholder participation process, helped identify shortfalls in knowledge

that would be needed further on for specific decisions, such as the exact locations of windfarms. Such an adaptive approach is especially important in data-scarce scenarios, and ones that have great uncertainty on the expected outcomes and future drivers of change.

Figure 1. The MSP Process.



Source: Adapted from Ehler and Douviere 2009.

2 MSP from an Economic Lens

Economic tools have generally not been part of the MSP toolbox, even though they provide a critical framework to understand potential outcomes of MSP, competition between resource users and inevitable trade-offs. Because MSP is a participatory allocation of maritime-related human activities in space and time (Ehler and Douvere, 2009), it can set the stage for future financial streams. In this sense, a good understanding of the economic underpinnings of this allocation of resources is a prerequisite for sustainable finance of MSP processes.

Having a definition of MSP based on economic concepts is pivotal role for this goal. This report proposes the following economic definition of MSP:

Marine Spatial Planning is: i. the spatially and temporally explicit allocation of scarce marine resources and services to competing uses, and ii. the governance framework needed to design, implement, and monitor such allocation.

This short definition requires a few further explanations.

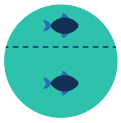
Property rights and the Blue Economy

Most marine areas and the resources within have been legally allocated to nation states or are under the jurisdiction of regional or national authorities. This is by no means surprising, given that most marine resources are considered public goods. **Public goods and services have two main characteristics, namely non-excludability and non-rivalry.** Non-excludability means that in the absence of a specific intervention, markets will fail to exist, as buyers cannot be excluded from enjoying the good even if they do

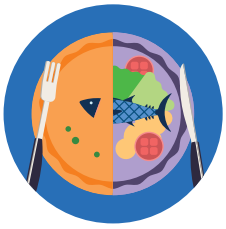
not pay for it. Non-rivalry means that the use of the resource by an agent does not exclude another agent's consumption of the good.

Table 1 shows a **typology of goods and services** (used as inputs or for final consumption) with examples from the marine environment. The table also highlights how **alternative institutional frameworks affect the excludability property.** For example, individually transferable fishing quotas, one of the most effective policy instruments to manage fisheries, are in essence an act of creating excludability in fishing access. Furthermore, the table also **differentiates between rivalry as an inherent characteristic of the good, and rivalry originating in resource degradation.** For example, a highly abundant fishery can be harvested as if there is no rivalry, but if the fish stock is degraded, then one party's catch is another's loss.

Table 1. Typology of Goods and Services (Selected Examples)

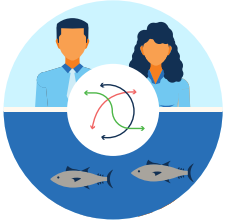
	Non excludable	Excludable due to inherent properties	Excludable by institutional construction
 **Non-rivalry**	**Pure public goods and services** • Flood and storm protection • Atmospheric and climate regulation • Recreation in marine areas	**Club goods** • Snorkeling and diving tours	**Club goods by design** • Tourism in Marine Protected Areas • Fish under fishing quotas or under well-managed common pool resource management • State-owned recreational areas
 **Rivalry due to inherent properties**	**Common pool resource** • Surface of the ocean	**Private goods and services** • Aquaculture • Wind farms • Coastal areas	**Private goods and services** • Oil and gas • Sand and gravel • Marine transportation routes • Surface of the ocean if allocated to specific activity
 **Rivalry due to resource degradation**	**Common-pool resource** • Recreation in congested areas • Fish if degraded and unregulated fish stocks	**Private goods and services** • Whale watching • Snorkeling and diving in congested reefs	**Private goods and services** • Fishing rights of degraded in-shore fishery

Source: Authors' own construction.



Scarcity and well-being

In this report's definition of MSP, scarcity is a key economic concept. Simply put, **scarcity arises from the fact that resources are limited, and the needs and demands are, in principle, unlimited.** It should then follow that scarcity is not a static concept. Rather, it changes with both resource abundance and human demands. Scarcity is defined in relation to a particular perspective. For example, commercial fish stocks might be scarce even if non-commercial marine biomass is abundant. Sometimes scarcity is defined specifically in space. This is the case, for example, of windfarms, aquaculture farms, and shipping routes that all compete for similar space near shores. Finally, scarcity is frequently determined by the inherent properties of the natural system: the growth rate of fish stocks, the resilience of ecosystems, or the capacity of the ocean to absorb pollutants. Given that scarcity is intrinsically dynamic, any allocation of resources should constantly be evaluated against stated goals, and transition paths between alternative allocations should be part of MSP design.



Marine resources and complex socio-ecological systems

Marine resources and services are difficult to measure. **The properties of the marine systems are complex and poorly understood (Groeneveld 2020); large areas of the deep seas remain largely unexplored (Rochet and Rice 2009 and St. John et al. 2016).** Even the interaction between land and sea in terms of wind, cooling, coastal defense, and nutrient exchange, to name a few interactions, is barely understood, and then only in highly site-specific studies. In other words, the allocation of scarce natural resources takes place with high uncertainty regarding those resources and the underlying functioning of most marine ecosystems.

Marine environments, irrespective of their size, should be conceptualized as complex socio-ecological systems. A systemic approach to MSP facilitates the identification of linkages between different systems within the marine environment and between it and other systems, and should help avoid oversimplifications.

Finally, a socio-ecological system approach should include consideration of all relevant stakeholders in the system. This is a prerequisite for inclusive and equitable outcomes.

Institutions and governance

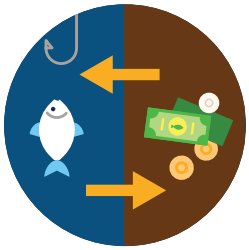
The spatially and temporally explicit allocation of scarce marine resources is implemented by institutions and a suitable governance framework. In economics, "institutions" refers to the basic legal and normative framework that supports the allocation of property rights and that regulates human activity in all its dimensions. This legal and normative framework is the basis on which markets operate, and hence provides for the efficient allocation of private and public goods, and everything in-between.

In most societies, **national governments are expected to set the basis for an effective normative framework** that can enforce the agreements reached under an MSP plan and provide for the involvement of all actors with a stake in the marine environment. This does not preclude the emergence of a local authority, for example, a community-led initiative or a co-management approach between governmental entities and community organizations.

Two important features of the normative and legal framework should be mentioned. **First, incentives and policy instruments never fall on a vacuum.** The design of these instruments should be attentive to the existing legal, business, and policy-related framework. Specifically, public sector incentives and disincentives must work in tandem with the underlying structure of the private sector, encouraging innovation and investment in the "right technologies" (Friends of Ocean Action, 2020). **Second, any incentive structure must be monitored frequently and carefully.** Irrespective of how much care and attention goes into policy design, any new incentive can potentially turn into a perverse incentive. There is a large literature looking at the effects of perverse incentives on environmental outcomes. The marine environment is no exception. For example, subsidies to the fishing industry can have disastrous effects on the environment and produce highly ineffective, overcapitalized industries (Sanchirico et al. 2002 and Lange et al. 2021).

3 Main Gaps in the Economics and Finance of MSP

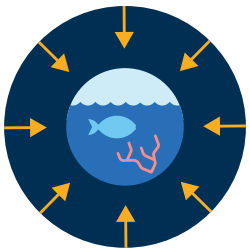
An analysis of the global status of MSP and policy frameworks supporting it provides a measure of how deeply economic and financial perspectives have been applied to the concept, design, and implementation of MSP processes. Although there are many reasons to explain the limited uptake of MSP worldwide, this report argues that implementation can be accelerated by better use of economic tools and innovative financial perspectives. Based on the overview of the global status of MSP and some of the methodological tools for implementing it, such as UNESCO´s step-by-step approach, (Ehler and Douvere 2009), this report identifies six critical gaps concerning the economics and finance of MSP:



1. **Trade-offs between competing uses are seldom subjected to an economic analysis as part of MSP design, and the distributive impacts on key stakeholders are not properly accounted for.** MSP aims at managing competing needs for a limited space. That means that, in principle, all competing users should be considered as part of MSP design. Planners should identify major trade-offs among competing, current, and potential activities, and decide which allocation of resources is more desirable in relation to defined goals. For instance, expanding no-take zones to protect ecologically valuable marine space might make sense from an ecosystem perspective, but would preclude opportunities for commercial fishers, transportation, and industry. Unfortunately, the distributive impacts that these decisions might have on underrepresented stakeholders such as income and gender groups, migrants, and indigenous peoples rarely get the attention they deserve.

Economic assessments and valuation of such trade-offs are rarely considered in MSP. Instead, marine spatial planners tend to use simpler, ad hoc decision tools to allocate resources. For example, conservation criteria are used when the focus of MSP design is conservation. Spatial tools are used when the focus is to allocate space between competing uses, rather than optimizing overall well-being.

Well-designed MSP processes typically identify the main trade-offs, use participatory approaches to assess possible conflicts among users of the ocean environment, and propose spatial management plans to deal with them. Yet, they scarcely use economic tools to demonstrate net benefits obtained under different scenarios, or how certain groups will end up better or worse off due to proposed regulations. A good economic trade-off analysis reveals the value of alternative designs of MSP, and their implications for multiple stakeholders: some may be winners, some may be losers under the proposed MSP. Furthermore, special attention should be given to tradeoffs occurring in developing countries where poor fishing communities are locked in a spiral of decreasing well-being and environmental assets. In these circumstances, the economic analysis should contribute to reduce the potential burden on local communities and help identify viable transitional paths towards more sustainable livelihoods.



2. **The value of externalities is not properly accounted for in the MSP process.** Negative externalities, especially those generated by land-based decisions (e.g., plastics pollution or pesticide run-off), are not explicitly included in MSP, despite their implications for the welfare of vulnerable groups of society, such as small-scale fishers and tourism entrepreneurs. In addition, positive externalities are typically undervalued, leading to underinvestment in ocean natural capital. There is growing recognition of the need to include land-sea interactions (LSI) in MSP, given the direct interface between terrestrial and marine environments, as well as for promoting coherence across policies, plans, and decisions (Shipman et al. 2018, Bocci and Ramieri 2018, and Kidd et al. 2019). However, the two-way interactions

that arise from LSI should be addressed more explicitly using an economic lens. Marine ecosystems are subject to a wide array of pressures, ranging from exogenous ones (e.g., changing climate patterns) to endogenous ones (e.g., overfishing). Negative externalities add a new layer to the current unsustainable trajectory of oceans health. Unfortunately, knowledge-based policy making to correct these market failures often lacks evidence on the effectiveness of alternative policy tools (e.g., taxes, subsidies, and innovative behavioral approaches) suitable for different countries (Alpízar et al. 2020). In addition, there is limited information on the welfare implications of such externalities on vulnerable groups of society, such as small-scale fishers or tourism entrepreneurs.

Similarly, MSP investments and interventions are intended to generate positive externalities, for example, increased provision of ecosystem services, for the benefit of global and local populations. In this case, the economic assessment of costs and benefits of proposed interventions would need to consider non-market values associated with better protection of key marine ecosystems. Positive externalities might also result from improved business opportunities or reduced conflict between activities in the marine space. For example, damage to fishing gear might decline as a result of improved access routes to a harbor. This positive effect can be valued using market values. Unfortunately, these critical inputs are typically absent from the preparation and approval of MSP plans, thereby weakening the business case for MSP.

3. **Long-term consequences, uncertainty, and dynamic adjustments are intrinsic components of MSP design and implementation, yet scenario analysis and risk assessment are insufficient.** MSP plans will typically have consequences long into the future, but most of these consequences may be highly uncertain. This uncertainty challenges decision makers' capacity to design and implement sound MSP regulations and investments. Moreover, most MSP processes do not assess risks properly when analyzing the expected flow of cost and benefits arising from alternative interventions, or when

using robust decision making, scenario analysis or adaptive management approaches.

Emerging marine industries, such as offshore wind, tidal, and wave energy and mineral extraction in ultra-deep waters, operate in exceptionally harsh environments, which climate change and variability are likely to alter in unpredictable ways. These characteristics make investments highly risky and potentially unattractive to investors. Developing the full potential of these maritime activities under MSP requires the effective management of such risks. It is important to note that the initial conditions supporting an MSP might change over time, as stakeholders adjust to the implementation of the plan and changes in underlying resource conditions. Any economic analysis of MSP should account for the dynamic marine context and should identify critical monitoring points in the implementation of MSP.

4. **MSP implementation typically has inadequate monitoring and evaluation.** Probably due to the field's incipient nature, evaluations of MSP effectiveness are relatively scarce (Jay 2017). Nevertheless, an evidence-based analysis of the social, economic, and environmental impacts of MSP is critical to gaining political support, increasing the engagement of stakeholders, and making the necessary adjustments to reach the desired goals. Reliable, accessible, and comparable data are key to decision making in MSP. However, ocean data is often disorganized, spread across multiple governmental agencies, or not available at all (Fenichel et al. 2020b). Furthermore, ocean-relevant data that we do have are commonly found in broad aggregated categories, which merges marine and land-based activities. Recent studies highlight the challenge of isolating ocean activities from others in traditional national accounting (Jolliffe et al. 2021).

Evaluating progress towards MSP goals involves going beyond the implementation of traditional monitoring-reporting-verification (MRV) tools. It requires a good understanding of the starting conditions and how to construct a suitable counterfactual situation. This is true

irrespective of the method used to assess the impact of a particular MSP. For example, claiming a reduction in unemployment in fishing villages covered by MSP requires a good understanding of the initial and final levels of unemployment in those villages, and in other villages outside the MSP that are then used as benchmarks. In addition, the evaluation process should be particularly attentive to the effects of proposed regulations of underrepresented populations on their access to coastal and marine resources.

5. **MSP designers often lack behavioral insights to understand perverse incentives and ways in which people affected by the program will—or will not—comply with MSP regulations.** Two central components of an MSP plan are (1) the definition of the management measures or spatial regulations necessary to achieve the desired goals, and (2) the incentives needed for the successful implementation of these interventions (Ehler and Douvere 2009). Once these regulations and incentives are in place, actors in the marine space will react to them, sometimes obeying them, but frequently ignoring them or manipulating them in their favor.

   Generally speaking, MSP processes have done a poor job at keeping track of the effect of regulations (e.g. spatial closures, zoning) on the behavior of relevant stakeholders. In most cases, behavioral responses will be aligned with expectations, but in other cases, well intended interventions might lead to perverse incentives or unintended side effects. If expected behavior fails to match reality, the effectiveness of MSP policies might be reduced, leading to lower overall support for MSP as a tool to develop the Blue Economy. As in terrestrial protected areas, the impact of MPAs on both conservation and socioeconomic outcomes depends on how the behavior of relevant actors changes in response to regulations on access and use (Albers et al. 2017 and Albers et al. 2020). Understanding these potential reactions in advance can help inform policy decisions, for instance, about where and how to expand MPAs to maximize ecological and economic outcomes (Madrigal

et al. 2017). Equally important, a better comprehension of the behavioral responses of other major corporate stakeholders in sectors such as shipping and energy is critical to improve effectiveness and acceptance.

6. **There is insufficient development of innovative financial mechanisms that would encourage transformation of traditional sectors and emergence of new ones.** MSP and ocean-specific regulations such as MPAs have been funded mostly by governmental budgets, donations, and user fees. However, these funds are typically insufficient for the broad, ambitious goals foreseen in most MSP processes. On the other hand, private funds are readily available to finance activities such as fossil energy extraction and unsustainable fishing. Perverse subsidies in the current marine economy, meanwhile, distort markets in areas as diverse as non-green shipping, extraction of fossil fuels, and fishing and aquaculture (Sumaila et al. 2020)[1].

   Clearly, business as usual is not an option when it comes to financing MSP. It is imperative to create enabling conditions for ocean finance, develop new financial models, and redirect private finance business opportunities. An equally important goal is to reprogram governmental budgets to help transform traditional sectors, such as maritime transportation, into sustainable paths of growth and to consolidate new sectors, such as wave and tidal energy, as viable alternatives for building the Blue Economy.

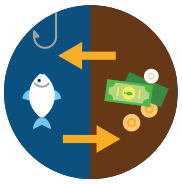
The next two sections describe economic tools and approaches to close the gaps identified above (Section 4), and the application of those tools in different phases of MSP (Section 5).

1 Subsidies in the fishing sector provide a salient example of this problem: In many countries, resource rents from fisheries are negative, as revenues do not fully cover the costs of fishing (Lange et al. 2018). Subsidies provided to distant-water fishing fleets typically constitute a large proportion of their total landed value of catch, in some cases as much as 50 percent of that value. (Skerrit and Sumaila 2021). Subsidies are not only supporting the costs of fishing – and artificially increasing profits-- but are also boosting massive overfishing by fostering overcapacity.

4 Economic Tools for MSP

This section provides an overview of economic tools appropriate for MSP design and implementation. The tools can bridge the main gaps on the economics of MSP identified in the preceding section. Wider use of these tools will help justify investing in MSP, provide more robust insights for the design and compliance with MSP regulations, and ultimately, increase the contribution of MSP to more sustainable use of the ocean. Wherever possible, examples illustrate the use of the proposed tools in the marine context, although not all were developed under MSP processes.

TOOLS TO BRIDGE
GAP 1.



Trade-offs between competing uses are seldomly subjected to an economic analysis as part of MSP design, and the distributive impacts on key stakeholders are not properly accounted for.

Given scarce marine resources and multiple potential uses, the MSP processes should allocate those resources to activities that generate the highest well-being. In practice, the allocation of scarce resources frequently entails a trade-off: "If a portion of marine space is allocated to an activity – say a wind farm – it follows that, in principle, that same portion cannot be allocated to other uses – say oil extraction" (European Commission, 2020, p. 34). Economists argue that a "policy can be considered desirable from the social point of view, only if overall benefits (regardless of who reaps them) outweigh costs (regardless of who bears them)" (European Commission, 2020, p. 34). Once all available resources are put to good use, trade-offs should be analyzed using suitable tools to compare benefits and costs (see Box 1).

Box 1:

Social Cost Benefit Analysis, Intertemporal Decision Making, and Distributional Concerns

To produce the best allocation of marine resources, a MSP process should in principle rely on social cost-benefit analysis (SCBA).

A SCBA is intended to inform decisions from a public policy perspective, what economist call a social planner perspective. This type of analysis differs from a more standard and simpler private cost-benefit analysis, of the kind a firm undertakes to judge whether to invest or not. Given the complexity of marine ecosystems, the large number of actors, their many interactions within the marine socio-ecological system, and the long-term planning horizon, many costs and benefits are hard to identify. In many cases, in fact, the complexity is so large that quantification and monetization of some benefits and costs will be too costly or not possible at all.

Still, a cost-benefit framework is a powerful tool to identify circumstances and judge whether the true benefits are likely higher or under-estimated. SCBA varies in complexity depending on how ambitious the analysis is.

Three rules of thumb typically apply in SCBA:

- All parties directly or indirectly affected by the MSP agreement should be considered, either as enjoying benefits or enduring costs.
- The estimation of costs and benefits should reflect the full implications of MSP actions, including intrinsic and non-market values. In practice, this implies the quantification and monetization of effects for which there is no market (for example, marine pollution) or where the market fails to capture the true value to society of a given outcome. In economics, this is called shadow value or accounting price to be estimated using a valuation technique (Johnston, et al., 2017).
- The relevant discount rate in SCBA is the social discount rate, that is, the rate at which representatives of the current generation discount the welfare of future generations (Drupp et al. 2018 and Arrow et al. 2013). In practice, the social discount rate is typically much lower than the market interest rate, and as a result the well-being of future generations acquires a more prominent role in a SCBA.

In principle, a SCBA is agnostic with respect to distributional impacts.

The basic argument is that if the SCBA renders a positive result, then the winners should be able to compensate the losers and still be better off. In reality, though, distributional impacts matter a lot and need to be factored into the analysis. In some cases, this requires the use of equity weights. For more details, see Adler 2016.

A good example of economic tradeoff analysis focusing on alternative uses of the ocean is the study by White et al. (2012) for the United States. It assessed potential conflicts among the offshore wind energy, commercial fishing, and whale-watching sectors. It showed that using MSP over conventional planning could prevent more than US$1 million in losses to the incumbent fishery and whale-watching sectors and generate more than US$10 billion in extra value to the energy sector.

Spatial tools, such as the InVEST and ARIES software packages, can provide powerful insights into the trade-offs resulting from alternative MSP scenarios. Development of the Integrated Coastal Zone Management Plan for Belize (See Box 2) provided a clear demonstration of this utility. A team of experts proposed three scenarios—conservation, informed management, and development—and then valued future returns in monetary terms for each of the scenarios and for key activities: lobster fisheries, tourism, and coastal protection. This exercise helped inform decision making as the Central American country charted how to best protect its marine resources.

Box 2

The Integrated Coastal Zone Management Plan for Belize

Belize has rich coastal resources, including the Belize Barrier Reef, declared a World Heritage Site by UNESCO in 1996. The Belizean coast, which runs for approximately 400 kilometres, is home to 35 percent of the country's people, many of whom rely on fishing and marine tourism for their livelihoods. An innovative joint effort between stakeholders and policymakers led to coordinated actions across sectors to define zones of human use, reduce risk to ecosystems, and enhance the delivery of multiple ecosystem services (Arkema et al. 2015).

In 2016, Belize approved its first Integrated Coastal Zone Management (ICZM) plan to ensure the sustainable use of coastal resources while balancing the country's economic and social needs (Coastal Zone Management Authority and Institute2016). The team in charge of producing the ICZM used the Integrated Valuation of Environmental Services and Trade-offs (InVEST) software package to examine how different development and conservation scenarios would affect ecosystem services, and human well-being (Rosenthal, et al., 2015).

The scenarios analysed were (1) conservation, (2) development, and (3) informed management. Expected changes in functional habitat (mangroves, seagrass, coral) area were calculated for each of these scenarios. This showed a more than 20 percent increase in functional habitat for the conservation and informed management scenarios, while for the development scenario mangrove areas decreased 50 percent, and seagrass and corals declined to 10 percent of current levels (Arkema et al. 2015). Based on these changes, future returns of ecosystem services were estimated for lobster fisheries, tourism, and coastal protection. Trade-offs for each scenario were valued in monetary terms to facilitate visualization of the impact of human activities on the future returns of ecosystem services.

The results were used by the CZMAI as evidence that the informed management scenario best achieved the ICZM goals of maximizing economic returns while minimizing environmental damage, even enhancing ecological health (though there was some loss of lobster revenue compared to the conservation approach). The informed management scenario became the final zoning scheme that was included in the ICZM plan years later (Arkema et al. 2014 and Rosenthal 2015).

Changes in habitat and ecosystem services economic returns under different scenarios

	Current Scenario (2010)	Conservation (2025)	Informed Management (2025)	Development (2025)
Functional Habitat (km^2)	130 Corals 310 Mangroves 1,460 Seagrasses	180 Corals 410 Mangroves 2,230 Seagrasses	160 Corals 380 Mangroves 1,830 Seagrasses	17 Corals 170 Mangroves 160 Seagrasses
Lobster fisheries (Revenue in BZ$ million)	16	24	21	3
Tourism (Expenditures in BZ$ million)	230	320	710	320
Coastal Protection (Avoided damages in BZ$ million)	5	6	8	5

Source: Authors' own calculations based on Arkema et al. 2015.

In some circumstances, it will simply not be possible to identify and value the impacts of proposed new uses in a marine spatial plan. Frequently, the estimation of the benefits is much harder than the estimation of the costs associated with it. The elimination of negative externalities, however, should be included as a benefit. In the absence of information on the benefits of MSP, and given limited resources, cost-effectiveness analysis should provide insights on alternative MSP designs.

A carefully executed and well-balanced qualitative assessment (positive, negative, or neutral) can in some situations be a complementing, valid option of analysis. The MSP process developed in the Pacific Coast of Washington State (Taylor et al. 2015) provides insights into how economic modeling and qualitative analysis of the impact of future scenarios have helped achieve an appropriate balance between present and future uses of the ocean space (see Box 3). The contribution of existing marine activities to the economy of coastal regions and to Washington State was analyzed using economic modeling applications that were specifically designed to measure the effect of policy changes on economic outcomes and human well-being. However, such models do struggle to incorporate new activities for which data are scarce or non-existent. As a complement, these new activities were analyzed qualitatively. Potential conflicts among users were identified, and ways to solve those trade-offs were analyzed.

Box 3

Economic Analysis to Support MSP in Washington State

To estimate the economic contribution of Washington State's marine sectors, the Washington Coastal Marine Advisory Council oversaw development of input-output economic models based on IMPLAN (https://implan.com/) modelling systems. These models also simulated the impact of alternative scenarios on the economy, both of the coastal region and Washington State as a whole.

As a complement, a qualitative analysis generated important inputs for decision making. This was done because quantification was difficult due to the broad scope of the proposed changes, and because changes were not location- or project-specific. The qualitative analysis provided useful information to anticipate potential conflicts and suggested strategies to deal with them.

The MSP process identified six potential new use categories: (1) marine product extraction (e.g. seafood), (2) offshore aquaculture, (3) dredge disposal, (4) mining of gas hydrates, (5) mining of marine sand and gravel, and (6) marine renewable energy, such as offshore wind, wave, or tidal.

The potential impact of these new uses on existing uses (commercial fishing and aquaculture, recreational fishing, recreation and tourism, and commercial shipping) was explored qualitatively to determine synergies and conflicts. The impacts on "recreation and tourism" are summarized below as an example. Recreation and tourism activities important to the Washington coast include beach-going, sightseeing, camping, hiking, and photography. Trip-related recreation spending within the coastal region totalled an estimated US$481 million in 2014. The potential impacts are presented in the table below (Taylor et al. 2015, p. 348).

Table 11-4. Summary of Potential Impacts of New Uses on Recreation and Tourism

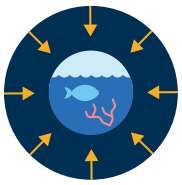
Potential Impacts	Marine Product Extraction	Offshore Aquaculture	New Dredge Disposal Locations	Mining of Gas Hydrates	Mining of Sand and Gravel	Marine Renewable Energy	Notes
Access to Locations for Recreation and Tourism Activities	⊖	⊖	⊖	⊖	↑	⊖	Recreation sites near sand and gravel mining could be closed temporarily, but access would be much improved in the longer term.
Disruption or Displacement of Recreation Activities	⊖	↓	↓	↓	↓	↓	Disruption of cruise, sightseeing, or pleasure boaters from increased vessel traffic or access limits by offshore facilities.
Quality of Experience at Nearby Recreation Sites	⊖	↓	↕	↓	↑	↕	Vessel traffic and congestion, noise, visual impairment, and disturbed habitat areas important to wildlife viewers are the primary concerns. Habitat near marine renewable energy sites could enhance some activities.
Rate or Quantity of Tourist Participation	⊖	↓	⊖	↓	↑	↕	Offshore facilities can create unwanted views, vessel traffic conflicts with boater tourists. Marine renewable energy could be an attraction or distraction for tourists. Beach conditions would improve with sand and gravel mining.

⊖ Neutral impact | ↓ Negative impact | ↑ Positive impact | ↕ Positive and negative impacts

Economic goals should be measured not just by profits or money streams, but should cover ethical concerns and intrinsic values as well. For example, in certain locations, stakeholders might define social concerns or equity considerations as an MSP priority. In other settings, conservation might be the main rationale. Finally, MSP can be designed to address historical gender gaps. Recognizing women as actors in the marine space and including them in MSP policy discussions is a first step to ensure that no additional costs are imposed on them. It is a way to provide women with access to resources that would otherwise not be available to them (Turpie et al. 2021).

Most importantly, the economic analysis should identify who benefits and who bears the cost under alternative scenarios and at different stages of the MSP implementation. It should also suggest alternative instruments to increase the fairness and inclusiveness of the proposed MSP. Doing this will raise the chances for successful implementation (see more details on the importance of inclusive processes for MSP in Alder and Castaño-Isaza 2022). The MSP process in Washington (Box 3) also highlights the importance of considering the differentiated impact on local communities, indigenous groups, and businesses, to cite a few. Including these considerations in MSP could increase buy-in, reduce conflicts, and ease the negotiation processes, among other benefits. The distributive impact of alternative MSP designs is obviously context-dependent given the widely differing social actors (tourists, small-scale fishers, oil companies, and coastal inhabitants, for example) that are embedded in MSP. Moreover, given the marine system's interconnections with other key systems (energy, food, and trade), it is likely that stakeholders far from the actual marine space will also want a say in how the MSP process ultimately allocates resources (Friends of Ocean Action 2020).

TOOLS TO BRIDGE
GAP 2.



"The value of externalities is not properly accounted for in the MSP context."

The closer the interaction among the relevant stakeholders in a marine socio-ecological system, the more likely it is that the stakeholders' consumption and production decisions have consequences that transcend their individual spheres. This fact has implications for the well-being of other groups or individuals, or the profits of other firms. In economics, an externality "is said to occur when the production or consumption decision of one agent has an impact on the utility or profit of another agent in an unintended way, and when no compensation/payment is made by the generator of the impact to the affected party" (Perman et al. 2011, p. 121). The MSP process lies at the core of the solution to externalities: A project's community participation system should be designed to identify and value externalities and to make actors in the marine space assume, directly or indirectly, the full responsibility for their consumption or production decisions.

A socio-ecological approach to MSP makes it easier to account for interactions between the marine environment, associated systems (e.g., instance land, air) and human activities. This allows those in charge of MSP design to better predict the capacity of the marine environment to produce human well-being. Negative externalities across the land-sea systems, for example, when agricultural runoff harms coral reefs with unwelcome consequences for inshore fisher people and tour operators, will not be solved with actions in the marine environment alone. Although an MSP process typically focuses on coordinated actions in the marine space, a more systemic perspective would allow stakeholders from the marine and terrestrial spheres to coordinate to minimize negative externalities that originated on land.

The construction of an impact pathway is an important conceptual tool for identifying what generates negative externalities that hold back achievement of MSP goals. An impact pathway starts with an understanding of the entry or baseline conditions in the relevant marine system, say, the underlying drivers of overfishing. It then identifies the mechanisms by which those features of the marine sphere generate intermediate outcomes and ultimately affect the MSP goals. A key element of an impact pathway is an understanding of how some

of the mechanisms can be turned off or on. Armed with such a conceptualization of the marine system, spatial planners can identify leverage points (i.e. policy entry points) and interventions, such as policies and norms, that can move the system towards the desired goals. Alpízar et al. 2020 describe such an exercise: an impact pathway is used to identify the critical policy entry points for a decision-maker who wants to reduce the flow of plastic waste or agrochemicals into the sea, and then suggests alternative policy instruments, such as direct regulations, market-based instruments, and behavioral approaches.

Assigning a valuable to externalities is one of the key economic tools to account for negative and positive externalities. Say, for example, that the use of antibiotics in an aquaculture plant is causing damage to surrounding flora and fauna. From the perspective of the aquaculture plant, the market value of the purchased antibiotics reflects their full cost, but this fails to capture the negative externality imposed on others due to damage to species in the area. From the perspective of a marine spatial planner, however, who is taking a social perspective, those damages need to be factored in to ensure that the final allocation of resources truly maximizes well-being. From a social perspective, the true cost will include the antibiotics' purchase value plus the value of damage to surrounding life, which is estimated using a suitable valuation technique (Johnston et al. 2017). It is important to note that externalities can also have unaccounted positive effects, for example, when reduced overfishing leads to better whale watching experiences and increased tourist activity. Positive externalities should also be valued and taken into consideration in MSP.

Box 4 presents three case studies from developing countries in Southeast Asia, and the Caribbean. They show the application of economic valuation methods to estimate non-market values and to build business cases for public and private investments in ocean natural capital. Although these cases are not associated with MSP processes per-se, the lessons learned from them highlight the importance of using economic tools to estimate the financial and economic (intrinsic and indirect) benefits of Nature-based Solutions (NbS) in coastal and marine settings, and to understand how results can improve policy design processes.

Box 4

Using Economic Valuation in MSP Design: Case Studies from the Philippines, Barbados, and Indonesia

Valuing the protection services of mangroves and coral reefs: The Philippines.

The Philippines is highly vulnerable to coastal storms and has the third-highest number of recorded landfalls of tropical cyclones (Losada, et al., 2017). Menéndez et al. (2018) conducted a nationwide evaluation of how effective mangrove habitats are as natural defenses in the Philippines, using a rigorous and novel multi-step probabilistic approach that blended ecological and economic approaches.

The results show that mangroves significantly reduce damage from tropical cyclone surges and routine flooding from large waves, providing approximately US$1 billion per year in annual savings and protection to more than 600,000 people annually. Moreover, if mangroves were to be restored to the levels of 1950, annual savings could increase by more than US$453 million, and about 267,000 more people could be protected from flooding.

These estimates can provide clear guidance to policymakers when accounting wealth that natural resources provide and integrating this information during national accounting and decision-making regarding coastal protection investments.

Analysis of spatial variations in flood damage reduction can also pinpoint areas with the greatest returns on investment for restoration and protection, either as stand-alone strategies or as part of hybrid approaches of grey and green infrastructure. These results can inform the country's insurance sector and bond markets, with risk models influencing insurance premiums and bonds (such as catastrophic hazard, resilience, and blue bonds), and sparking development of innovative finance mechanisms for mangrove conservation as a way to reduce risks.

Combining green and gray infrastructure to enhance coastal resilience: Barbados.

Between 2002 and 2010 the Government of Barbados implemented a Coastal Infrastructure Program (CIP) with the support of the Inter-American Development Bank (IDB). It invested US$24.2 million to improve shoreline stability, coastal resilience, and amenity values of popular beaches in the south coast. The program included green and gray infrastructure such as landscaped headlands, boardwalks, revetments, steps, beach sand recharging, and breakwaters (Banerjee, et al., 2018).

An assessment of these interventions, using contingent valuation, found that they improved cultural and aesthetic values for both residents and tourists: 23-30 percent of tourists and more than 60 percent of residents visited the beaches due to the improved conditions. Tourists valued the improvements at US$25.52 per visit to Barbados while for residents the figure was US$28.22 per year (Banerjee et al. 2018). Another assessment of the ex-post economic growth impact of the program, conducted by Corral and Schling (2016), used remotely sensed nightlight density as a proxy to capture human activity at nighttime and correlated this data to GDP measures. The study suggested that after three years the CIP raised local GDP by about 11.7 percent.

Mangrove restoration: Indonesia.

Coastal and marine resources are central to prosperity in Indonesia. Its fishing sector is the second largest in the world, providing 7 million jobs and more than half the animal-based protein needs of the country. Likewise, these ecosystems are key for the country's tourism sector (World Bank, 2021d). Mangroves and seagrasses support the feeding and breeding cycles of many fish species and serve as natural filtration systems, removing pollutants from runoff and pathogens that could poison surrounding coral reefs. In Indonesia, coral reefs support tourist activities valued at US$3.1 billion annually and contribute to fishery revenues of an estimated US$2.9 billion by providing fish habitat. Moreover, reefs offer flood damage protection estimated at US$600 million (World Bank, 2021d). Recognizing the importance of marine ecosystems, the Government of Indonesia has steadily increased the MPAs' areas to more than 23 million hectares, reaching and going beyond the Aichi Target, and setting an ambitious goal of restoring 600,000 hectares of mangroves by 2025 (World Bank, 2021d).

TOOLS TO BRIDGE
GAP 3.

Long-term consequences, uncertainty, and dynamic adjustments are intrinsic components of MSP design and implementation, yet scenario analysis and risk assessment are insufficient.

Due to the ocean's size, physical environment, and comparative lack of ownership and responsibility, ocean economic sectors have long operated under more unpredictable conditions than terrestrial ones (Sumaila et al. 2020). Ocean-related uncertainty undermines investor confidence in Blue Economy projects. Innovative and smart strategies to "de-risk" projects can raise private-sector confidence and bring its participation. Below is a brief description of five potential tools to mitigate risk and uncertainty: insurance, blended finance, probabilistic risk assessment, scenario analysis, and adaptive management.

Accessible and efficient ***insurance*** systems can help mitigate the risks of financial loss resulting from damage, malpractice, or other unexpected changes in projects. Alternatives such as parametric insurance (an insurance product that offers pre-specified payouts based upon a trigger event defined numerically by an index), combined with advances in data availability and risk modelling, could enable non-traditional insurance products that will address the complex variety of risks associated with nature-based investments, such as restoration of reefs, mangroves, and seagrass meadows. Box 5 presents an example of the use of parametric insurance to protect the fisheries sector.

Box 5

Caribbean Ocean and Aquaculture Sustainability Facility (COAST)

TARGET	FINANCIAL INSTRUMENT	REGIONS OF INTEREST	DEVELOPERS
Fisheries sector	Parametric insurance product	Caribbean and Central American governments	U.S. State Department, World Bank, and CCRIF SPC

WHAT IS THE PROJECT ABOUT?	COAST was designed to drive sustainable finance for Caribbean fisheries, with an emphasis on providing access to insurance for vulnerable fishing communities. It is a parametric product that provides coverage for fisheries losses caused by adverse weather. It is innovative in incorporating a livelihood protection component, which is tied to sea conditions and heavy rainfall. It also has a tropical cyclone component, which assesses direct damage by tropical cyclones. COAST advocates for policy reforms for enhancing climate-smart fisheries practices.
KEY OUTCOMES	Improving resilience in the fisheries sector through sustainable management of the ecosystems and incentivizing policy reforms for the uptake of climate-smart fisheries practices and increasing coastal resilience.
SOURCES	CCRIF SPC (n.d.) Caribbean Ocean and Aquaculture Sustainability Facility. Special projects. Available at: https://www.ccrif.org/projects/coast/caribbean-ocean-and-aquaculture-sustainability-facility
	CCRIF SPC (2019) The Caribbean Oceans and Aquaculture Sustainability Facility. The World Bank.

Developing the full potential of emerging industries that operate in extremely rough natural environments requires, to start with, an effective management of risks through better science and technology and innovative insurance products. Even then, private investors might be reluctant to get in, particularly when marine resources under national jurisdiction are at stake. In such cases, use of ***blended finance*** can make investments more attractive for the private sector. Blended finance is the use of official development finance combined with supplemental private finance to a project.

Furthermore, given the long term horizons associated with MSP investments and the inevitable effects of climate change and other unpredictable non-climatic drivers of change, the expected outcomes from MSP processes could vary significantly. This uncertainty involves explicit or implicit probability judgments

of cost and benefits under a standard cost-benefit analysis (Belli et al. 2001). There are various tools for ***probabilistic risk assessment***, an approach that can develop cost-benefit analysis under uncertain MSP scenarios, such as sensitivity analysis, switching values, and/or simulation techniques.[2]

Other complementary methods that can support good decision-making under uncertainty could be easily adapted to MSP design. Some of these involve direct work with stakeholders, thereby securing a better understanding of uncertainty and increased buy-in. The application of these methods has already shown positive results for MSP design. One of them is ***scenario analysis***, a powerful tool for decision making under uncertainty. Good scenario development is not straightforward and requires a combination of expert dialogue and evidence (Sayers et al. 2021). In the Netherlands, stakeholders developed three alternative spatial-use and sea-level rise scenarios when establishing visions for MSP (Frazao-Santos et al. 2020). This included projecting climate change impacts on alternative scenarios (optimistic vs. catastrophic). Analysis of the scenarios helped anticipate conflicts and opportunities, facilitating informed planning and decision-making (Frazao-Santos et al. 2020).

Adaptive management is another tool that has been used productively in MSP. By its nature, marine planning is continually iterative and adaptive (Frazao-Santos et al. 2020). This tool helps planners monitor, then adjust actions and strategies according to uncertain future conditions (Frazao-Santos et al. 2020). Seven countries (Australia, Belgium, China, Germany, the Netherlands, Norway, and the United States) that have implemented MSP have undertaken adaptive management approaches successfully (Frazao-Santos et al. 2020). The key to successful adaptive

2 Sensitivity analysis identifies the variables that most influence the flow of cost and benefits and quantifies the effect of these changes on viability decision criteria such as IRR or NPV. Switching values refers to the value of a variable at which the cost-benefit indicators of a project's worth reach a turning point for decision (NPV equal to zero or the IRR equals the discount rate). See Belli et al. 2002 for details. The tools mentioned earlier still have limitations because they do not consider the probabilities of occurrence of the events, nor the correlation between the components of the flow of cost and benefits, among other aspects. In these cases, the use of simulation techniques such as Monte Carlo Simulations could improve the estimation of the underlying probability of the distribution of the cost benefit outcomes.

management is establishing mechanisms to constantly secure the data necessary to judge whether a change in the course of action is needed.

TOOLS TO BRIDGE
GAP 4.

"MSP implementation typically has inadequate monitoring and evaluation adjusted for relevant scale."

Assessing the degree to which changes in outcomes result from policy interventions rather than other confounding factors is critical to evaluating the effectiveness of the interventions. Otherwise, building evidence to support use of MSP becomes an ever more difficult task. Greater effort is needed to identify opportunities to apply evaluation approaches that fit the scale and complexity of the particular MSP. Below three tools are identified to evaluate the effects of MSP on stated goals, with different degrees of precision:

1. **Benchmarked MRV tools.** As mentioned before, establishing a link between the implementation of a MSP and its stated goals goes far beyond simple monitoring of compliance with the plan and the proposed activities, as done in a traditional MRV. Instead, progress towards *goals*, not activities, should be measured regularly, for both the stakeholders benefiting from MSP and a relevant comparison group. This counterfactual group should be chosen to have relevant characteristics that are as similar as possible to the MSP stakeholders under study. This choice can be based on simple expert advice or sophisticated matching techniques, as the focus of this kind of MRV tool is making sure that measurement of progress is always benchmarked.

2. **Impact evaluation tools.** These advance the effort to accurately establish a causal link between MSP and selected outcomes (Ferraro 2019). Although this kind of study might be challenging for complex MSP plans, it is especially applicable at local scales, and for clearly defined interventions within MSP processes. To move towards a more robust evaluation process, managers need information on the impact of MSP on concise and

measurable outcome indicators, collected at the baseline and during project implementation for both the area under MSP and for similar areas with no implementation. Furthermore, it is of uttermost importance monitoring and evaluating all outcomes of MSP, particularly those that concern the most disadvantageous economic agents (see more details o n Alder and Castaño-Isaza 2022). MSP could affect primary dimensions of poverty, such as food security, livelihoods, wealth generation, and access to diverse resources for coastal communities (Turpie et al. 2021). Although MSP could not address all dimensions of poverty, it should be attentive at least to avoid further exacerbating existing inequities in societies.

Interestingly, MSP evaluation can learn from the experience of evaluating marine protected areas (MPAs). These evaluations have often shown an economic case for greater public investments in protected areas to improve biodiversity outcomes and economic development. Most studies that seek to evaluate the impact of MPAs have focused mainly on fishery resources and marine biodiversity (Russ and Alcala 2011, Halpern et al. 2010, and Fraser et al. 2019). Some have studied effects on poverty, livelihoods, household food security, and the ability of fishers to govern their resources (Mascia et al. 2010). These have demonstrated the importance of expanding MPA impact evaluation to evaluate socio-economic outcomes. For MSP, this is key given that MSP is a policy tool that can help with societal goals such as diminishing poverty and gender gaps (Turpie et al. 2021), along with conservation outcomes. Box 6 summarizes a few interesting results on MPA evaluation around the world.

Box 6

Impact Evaluation Studies on MPAs.

Gill et al. (2017) constructed a global database of management data from 433 MPAs and ecological data from 218 MPAs, to document and examine the links between MPA management processes and conservation outcomes. The dataset includes MPAs from every tropical and temperate ocean basin, with variations in terms of size as well as political and biophysical contexts. The database found that 71 percent of MPAs positively influenced fish populations (fish biomass was 1.6 times higher in MPAs than in matched non-MPA areas), although these conservation impacts varied by habitat type, continental regions, and the level of MPA protection.

Even accounting for environmental conditions (such as ocean characteristics) and MPA characteristics (size and age), the staffing and budgetary capacity of MPAs were the strongest predictors of conservation impact: MPAs with adequate staffing capacity had 2.9 times greater ecological effects than MPAs with inadequate capacity. The study showed that continued global expansion of MPAs without adequate investment in human and financial capacity to support monitoring, enforcement, administration, community engagement, and sustainable tourism activities, among other activities, can lead to poor conservation outcomes.

In eight villages in Indonesia, Gurney et al. (2014) evaluated the impacts on poverty associated with implementation of MPAs that were specifically designed to achieve both conservation and poverty alleviation in three specific dimensions: security, opportunity, and empowerment. The causal effects (i.e. longitudinal data for MPAs and control sites) were evaluated in relation to short, medium, and long-term impacts of MPAs using social data for villages with and without integrated MPAs from pre-, mid-, and post-the five-year implementation period of the MPAs. The MPAs analyzed were active from 1997 to 2002, with the other four villages used to estimate counterfactual outcomes.

The study found that MPAs contribute to security, opportunity, and empowerment, but the magnitude of these effects and timescales over which they become evident were mixed. The results show that fisheries dependence was reduced by MPAs. Households in MPA villages were 80 percent more likely to undertake an activity other than fishing as their primary livelihood in 2002, compared to 1997, while control villages showed little change. Also, perception of present well-being was positively affected by MPAs: households in MPA villages were 39 percent more likely to rate their well-being in a higher category in 2000 than in 1997. However, a 2012 data analysis showed that these improvements diminished after the program ended in 2002, suggesting that achievement of development and conservation outcomes is difficult to maintain after the termination of a project´s external support.

3. An ocean accounting framework. The examples above focus on the impact of MPAs on a specific set of outcomes. Sometimes, though, decision makers need indicators of the contribution of a particular sector (wind energy, for example) or a given resource (the marine space) to the economy as a whole or to a specific macroeconomic indicator. In these cases, an ocean accounting framework provides a way to organize and standardize information and to measure MSP outcomes over time (Gacutan, 2020). The resulting statistics from natural capital accounting can help inform immediate national problems, as well as long-term development strategies and solutions to structural problems. Ocean accounting is a tool that reveals the true contribution of oceans to economies.

But ocean accounting needs ways to guide decision makers and illuminate the inherent trade-offs in MSP development. Digital dashboards are one method to deliver ocean accounting data in a comprehensible way to decision makers and everyone who has interest in these topics. The dashboards are flexible, and capable of responding to a specific user's needs. The user can go beyond the single point of view of static data as traditionally presented. A digital dashboard "enables users to rapidly adjust connections so that they can evaluate the state of the ocean and ocean economy from different perspectives" (Fenichel, et al., 2020a, p. 893). The Norwegian Ocean Economy Dashboard, for example, has a friendly interface that enables users to interact with data from ocean economic activities in many ways. Interaction tools can be accessed at Environmental Data Science Organizations || Yale School of the Environment

TOOLS TO BRIDGE
GAP 5.

MSP designers often lack behavioral insights to understand perverse incentives and ways in which people affected by the program will—or won't—comply with MSP regulations.

MSP operates through measures that allocate rights to some users and limit the rights of others. Table 2 presents a series of examples of traditional measures or policy interventions. For instance, creating an MPA entails restricting the right of access to some actors for the sake of conserving nature. Once the restriction is in place, the next step is enforcement and monitoring by the authorities. Similarly, allocating a patch of marine area to aquaculture will only attract private investors if the property rights to that allocation can be enforced.

Table 2: Examples of Marine Management Measures

Input measures	• Limitations on fishing activity and capacity, such as number of vessels allowed to fish • Limitations on shipping vessel size or horsepower • Limitations on the amount of chemicals applied to aquaculture or agricultural lands
Process measures	• Specification of fishing gear type, mesh size • Specification of "best available technology" or "best environmental practice" • Specification of the level of waste treatment technology or CO_2 emissions
Output measures	• Limitations of the number of pollutants discharged to a marine area or the atmosphere • Limitations on allowable catch and/or by-catch • Tonnage limitations on sand, gravel extraction, and deep-sea minerals
Spatial and temporal measures	• Specification of areas closed to fishing or other human activities • Designation of precautionary areas or security zones, including risk prevention • Seasonal closures for biodiversity and fisheries reproduction activities • Designation of marine protected areas • Zoning of areas for specific uses, such as wind farms, military operations, sand and gravel mining, waste disposal, marine transportation, offshore aquaculture • Zoning of areas by objective, such as development, conservation, multiple use

Source: Adapted from Ehler and Douviere 2009, p. 23.

Bio-economic modelling tools and behavioral economics approaches are viable alternatives to analyze how relevant stakeholders respond to MSP regulations. Lack of understanding of responses to regulations depicted in Table 2 could limit the effectiveness of MSP policies as expected behavior diverges from reality. This would curtail overall support for MSP. But anticipating these reactions could generate multiple benefits, such as better use of limited enforcement budgets (for example, by helping patrols target the time and place of illegal activities), closer engagement with stakeholders who see that regulations are being fairly implemented, and fine-tuning of specific rules to increase compliance in diverse settings. Albers et al. (2020) developed a spatial bio-economic model in which a manager chooses the optimal location, size, and enforcement level of a marine protected area (MPA). Relevant to lower-income countries, the model incorporates limited enforcement budgets, costs of traveling to fishing sites, and labor allocation to onshore wage opportunities. The optimal MPA resulting from the model varies markedly across alternative management goals (such as fishery and conservation outcomes) and budget sizes and demonstrates how the response of villagers influences the optimal choice of the MPA.

TOOLS TO BRIDGE
GAP 6.

There is insufficient development of innovative financial mechanisms that would encourage transformation of traditional sectors and emergence of new ones.

MSP is in essence a participatory construction of institutions to govern exclusion and rivalry. By allocating a series of blocks of an EEZ to, say, wind farming or aquaculture, it is giving that sector the right to exclude others and solely enjoy the fruits of their efforts. The creation of different forms of property rights is a prerequisite for private involvement in the management of marine resources. It is also the basis from which private finance will flow to one or another alternative sector.

Table 3 demonstrates how finance flows are ultimately determined by the type of property rights allocated to the marine space (see Table 1 for a typology of goods and services). At one extreme, public goods will be funded by

governments, official development assistance, philanthropy, or NGOs. At the other extreme, private goods, or any good for which exclusion is possible, will be financed by profit-seeking firms (Friends of Ocean Action, 2020). Yet the reality typically falls between these two extremes. Despite efforts to make governmental funding more attuned to Blue Economy and MSP goals, it will probably be insufficient for the broad objectives envisioned (Sumaila et al. 2021). Strong participation of the private sector will often be fundamental to bridge this gap.

Table 3. Finance Flows Determined by Property Rights

Typology of G&S	Capital source	Classification
Public goods **Common pool resources**	**Governments**	Domestic government
		Official Development Assistance (ODA) agencies
		Sovereign wealth funds
	Non-profit groups	Foundations
		NGOs
	International financial cooperation	Multilateral development banks (MDBs)
		Development finance institutions (DFIs)
		Other multilateral agencies
Private goods and services and club goods	**Private finance**	1. Equity investors
		1. Impact investors
		2. Venture capitalists
		3. Commercial banks
		4. Pension funds
		5. Crowd funding
All	**Blended finance/capital**	

Investable projects in new and established sectors need to better align the scale, risk, and returns of the project to different types of private investors (Friends of Ocean Action, 2020). In particular, established sectors need to direct existing and new capital towards the implementation of sustainability standards, particularly in the fishing and shipping industries, while emerging sectors need to find innovative ways to finance natural capital-focused projects (Figure 2). Large-scale private investments in a sustainable ocean economy have been low in number due to high up-front costs, shortage of good projects and innovative financial instruments, and lack of enabling regulatory and policy environments (Friends of Ocean Action 2020 and Sumaila et al. 2021).

Figure 2. Main Established and Emerging Sectors in the Blue Economy.

Source: Authors' own elaborations based on Sumalia et al. 2021 and European Commission 2021.

In many countries, particularly SIDS and LDCs, government and local communities will remain the prime driver in important marine investments and need to begin close study of how to best use scarce resources. Table 3 shows that regardless of private actors' involvement of MSP design and implication, public financing will remain important. In these cases, authorities typically lack the necessary funds to enforce regulations and maintain the governance structure needed to support MSP. It is crucial, then, to make the best use of scarce funds available. A good start is to diagnose in detail the governmental resources, adequacy of expenditures, and key aspects of financial accountability, equity, and redistribution. This can be achieved through a Public Expenditure Review (PER), providing a broader picture to mobilize other funding for MSP and the Blue Economy approach (PROBLUE 2019).[3]

In-kind contributions of local communities should not be overlooked. Although they might be only a small share of total financial resources needed for MSP implementation, they lead to increased ownership and long-term sustainability of the interventions. This is particularly true for ones aimed at improving the livelihoods of vulnerable communities.

3 A Blue PER guidance could help determine if there are (1) insufficient public expenditures to achieve a Blue Economy, or to prevent negative effects resulting from poor enforcement of marine regulations and unsustainable terrestrial activities impacting the ocean, (2) excessive public expenditures that create perverse subsidies promoting unsustainable fishing practices, the use of fossil fuels, or the excessive use of agrochemicals, and (3) missed opportunities to generate public revenues or to correct negative externalities via fees or taxes. An environmental fiscal reform that raises revenues while obtaining environmental goals provides an opportunity to adjust public and private interests in the Blue Economy (PROBLUE 2019).

5 Linking the Economic Tools to Specific Stages of MSP

The economic tools and approaches described in previous sections will need to be adjusted to the specific reality of the marine system in question, and to the MSP process's own level of ambition. For example, there should be a balance between desired technical precision and the costs of achieving that precision and the specific needs of relevant stakeholders. Yet lack of data should not be a reason for rejecting a particular economic tool. For instance, MSP developers may proceed even if they lack data with the precise granularity that are required for a cost-benefit analysis that justifies the case for the MSP. Neither should imperfect data rule out the use of the *principles* behind a cost-benefit analysis, such as the mapping of cost and benefits and identification of all relevant stakeholders (see Box 1). In an adaptive management approach, parties in charge of MSP design should build the case with the best information available. They might draw, for instance, on global datasets and secondary information. At the same time, they should make decisive commitments to gather the data they need to develop a robust cost-benefit analysis in a reasonable time.

Under some circumstances, alternative economic appraisals that require less-intensive data inputs could serve to build a case or guide decisions on planning using an economic lens. For instance, a cost-effectiveness analysis (CEA) could be useful in selecting the lowest-cost option to achieve a single specific goal, such as meeting a particular conservation goal in the marine space. The CEA would need the costs of the alternative interventions, but not the monetary value of the benefits generated by these interventions.

Table 4 summarizes the potential contribution of economic tools and concepts to the four stages of an MSP process describe in Figure 1. As mentioned before, these are (1) entry points and making the case, (2) enabling conditions, (3) planning, and (4) implementation. For each stage, the table includes examples of relevant economic questions, the most suitable economic tools and concepts, the purpose of using those tools, and the minimum data they need. The last column of Table 4 describes the gaps discussed in the previous sections.

The reader should see the table as a general guide to the relevant tools and concepts and refer to other sections and relevant literature for more in-depth description of each of the methods. Furthermore, for obvious reasons, the table should be seen as a non-exhaustive enumeration of economic questions, concepts, and tools. Space also limits the description of the methodological requirements of these methods. Still, it provides an interesting insight into the economic toolbox available to marine spatial planners. The list of data requirements does not necessarily mean a minimum data requirement. Rather It covers a broad spectrum of possibilities, starting from data-scarce scenarios where the only available option is global datasets, and extending to situations where the collection of primary data can meet a demand for a high level of technical precision.

Table 4: Linking the Four Stages of MSP Design to Economic Tools and Concepts

MSP Phase

Entry Points

Establishing a dialogue with the client to raise awareness and show how MSP can be a tool to realize the ocean´s sustainable development

Key economic question(s)

- What is the current value of different marine sectors?
- How is it distributed among different stakeholders?
- Is there growth potential?
- Is the business-as-usual relationship with the ocean sustainable?
- What is the potential for the MSP to improve climate change mitigation and adaptation outcomes?
- What is the potential to improve biodiversity and ecosystem services' outcomes?

Economic tools & concepts (see GAPs and tools for details)

- Identify externalities using a systemic approach to MSP, with particular focus on land-sea interactions. **(GAP 2)**
- Create an impact pathway to identify mechanism affecting the achievement of MSP goals, and leverage points and associated interventions that can move the system towards those goals. **(GAP 2)**
- dentify key economic actors and competing temporal and spatial uses for ocean space using a socio-ecological system approach. **(GAP 2)**

Potential sources of data

- Highlight the importance of the ocean as an engine of economic growth and development: contribution to GDP, social outcomes, livelihoods, and poverty reduction.
- IEmphasize that oceans are more than fish stocks: untapped wealth and multiple ecosystem services.
- Show the importance of traditional sectors and business opportunities for emerging sectors.
- Identify land-sea interactions.

Purpose/What it tells you

- Standard system of national accounts (SNA).
- Disaggregated data by sector, provided by ministries and decentralized agencies.
- Economic reports/studies for the area of intervention.
- Global datasets on social, ecological, and economic indicators.

MSP Phase

Making the Case

Making compelling arguments to inform the client on the benefits to government – including international obligations, society, and the private sector.

Key economic question(s)

- Do the proposed MSP investments offer benefits that exceed the implementation costs?
- Who will be the winners and losers?
- What is the cost of inaction?
- What are the most important trade-offs in economic terms?
- What are the business opportunities offered by MSP?
- What are the economic benefits for government and society from MSP investments?

Economic tools & concepts (see GAPs and tools for details)

- Identify potential win-win situations and inevitable trade-offs and analyze them using cost-benefit analysis from a social perspective: (1) for all stakeholders, (2) using prices that reflect both private and external costs, and (3) discounting future costs and benefits using a social discount rate. **(GAP 1)**
- Account for all sources of value, including indirect values, intrinsic values, and social goals that go beyond pure efficiency concerns. **(GAP 1)**
- Analyze the distributive impact of alternative MSP designs to identify who benefits and who bears the cost under alternative scenarios and at different stages of the MSP implementation. **(GAP 1)**
- Complement with qualitative insights and participatory assessments. **(GAP 1)**
- Conduct cost-effectiveness analysis. **(GAP 1)**

Purpose/What it tells you

- Determine the societal and private desirability of intended investments and regulations.
- Build business cases to booster MSP finance.
- Provide information on the best spatial and temporal allocation of resources with attention to the existing economic tradeoffs, as well as environmental and social goals.
- Increase engagement of stakeholders through transparent decision-making based on robust economic data.
- Identify vulnerable groups affected negatively by planning scenarios and propose options to mitigate these impacts.

Potential sources of data

- Costs of proposed interventions (e.g. budget for enforcing MPAs, monitoring systems to deter illegal fishing).
- Ecological and social data to estimate baseline scenarios.
- Characterization of beneficiaries (e.g. economic activities), and avoided costs on potentially damaged civil infrastructure.
- LSMS and similar surveys.
- Primary data from economic valuation studies.

MSP Phase

Enabling Conditions

Determining what is in place already and what needs to be put in place either before or during planning to ensure MSP is a worthwhile investment.

Key economic question(s)

- What type of property rights need to be created and/or enforced?
- What is the cost of enforcing property rights?
- How can investors´ confidence in Blue Economy projects be increased?
- Are there perverse subsidies promoting unsustainable practices?
- Is public expenditure insufficient to achieve MSP goals?
- Do opportunities to generate public revenues or to correct negative externalities via fees or taxes exist?

Economic tools & concepts (see GAPs and tools for details)

- Make accessible and efficient insurance products part of the MSP design itself, whenever risk cannot be addressed by other means at a viable cost. **(GAP 3)**
- Deploy blended capital alternatives if they can make investments in high-risk emerging industries more attractive for the private sector. **(GAP 6)**
- Use existing tools (e.g. a Public Expenditure Review) to diagnose and increase the efficiency of governmental expenditures. **(GAP 6)**

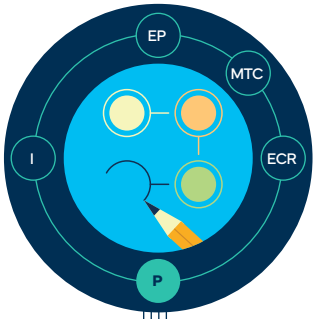
Potential sources of data

- Public and private sources of funding for marine activities.
- Institutional arrangements and technical and human capacity.
- Regulatory information on public services.

Purpose/What it tells you

- Provide information on the transaction costs for implementing MSP.
- Create enabling conditions redirecting governmental funding and attracting private investors to sustain the transformation of traditional sectors and the emergence of new ones. Traditional governmental sources of funding are likely insufficient for implementing all ambitious activities embedded in most MSP processes.

MSP Phase



Planning

Stakeholders using various tools to find the balance between uses as well as meeting conservation and climate change objectives.

Key economic question(s)

- What are the best economic approaches to further understand the economic feasibility of investments identified during the initial stages?
- Where and how can protected areas be expanded to maximize ecological, social, and economic outcomes?
- What are the likely distributive impacts (e.g. income, gender, migration) of alternative MSP designs, and how can marginalized peoples be engaged and benefit?
- How can land-sea interactions be addressed?
- How can climate change events be predicted, mitigated, and adapt to?
- What are the most likely reactions of actors in the marine space to the new regulations?

Economic tools & concepts (see GAPs and tools for details)

- Economic valuation of externalities constitutes one of the key tools to design policies that internalize negative or positive externalities. **(GAP 2)**
- Probabilistic risk assessment can aid cost-benefit analysis, including sensitivity analysis, switching values, and simulation techniques. **(GAP 3)**
- Participatory scenario analysis allows a better understanding of uncertainty by stakeholders in an MSP process. **(GAP 3)**
- Cost-effectiveness.
- Impact evaluation analysis. **(GAP 4)**
- Scenario analysis, using InVEST, ARIES, or similar spatial tools. **(GAP 3)**
- Behavioral economics methods to anticipate perverse incentives. **(GAP 5)**
- Bio-economic models to capture the interrelation between productive and extractive sectors and the condition of the resource. **(GAP 5)**

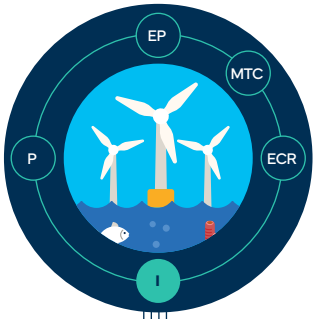
Potential sources of data

- Various sources, based on the industries included in the planning process. For instance, for the tourism industry: yearly number of tourists, tourism contribution to gross regional domestic product (GRDP), jobs linked to tourism disaggregated by age and gender, expenditure on food and lodging, pollutant discharge from tourists.
- In addition, social and ecological data relevant to the tourism trade.

Purpose/What it tells you

- Determine the ypes of incentives needed for motivating higher compliance with regulations.
- Provide feasible strategies to deal with negative externalities such as plastic pollution and contamination by agrochemicals (e.g. direct regulation, market-based). Include the welfare implications on vulnerable groups, such as small-scale fishers and tourism entrepreneurs.

MSP Phase



Implementation

Establishing action plans and activities (e.g. a public investment in improving a port), and working with the private sector to invest in implementation actions (e.g. moving forward with a feasibility study for offshore renewable energy).

Implementing an effective monitoring & evaluation program.

Key economic question(s)

- What economic indicators should be used in monitoring and how will they best be measured?
- What are the measurable impacts attributable to MSP on ecological, social, and economic outcomes?
- What is the evidence on improving economic outcomes for women and other marginalized groups?

Economic tools & concepts (see GAPs and tools for details)

- Ocean accounting and digital boards. **(GAP 4)**
- Impact evaluation methods (ex-post) to establish causal links. **(GAP 4)**
- Behavioral economics tools to anticipate perverse incentives. **(GAP 5)**
- Bio-economic models to capture the interrelation between productive and extractive sectors and the condition of the resource. **(GAP 5)**
- Implementation of sustainability standards in existing sectors to attract new capital. **(GAP 6)**
- Production of packages of investable projects with scale, risk, and returns adjusted to different types of investors. **(GAP 6)**
- Adaptive management allowing marine spatial planners to learn by doing, adjust actions as information becomes available, and adapt to uncertain future conditions. **(GAP 3)**

Potential sources of data

- To gain political support, increase the engagement of relevant stakeholders and make adjustments to improve the achievement of desired goals through science-based evidence of impact on a multidimensional basis.
- Use proper ocean accounts to help MSP move towards its full potential Both tools (ocean accounting and MSP) must be brought together as a guide for the sustainable development of oceans.

Purpose/What it tells you

- Data of baseline information, as well as consistency in the definition and collection of outcome indicators.
- For impact evaluation: catch (e.g., catch per unit effort); economic impacts (e.g., income growth); perceptions of ecological and socio-economic change; wages and employment. To build ocean accounts: natural assets; flows of goods and services from the ocean; waste to the ocean environment; ocean economy satellite accounts.

6 Recommendations

Entry points and making the case

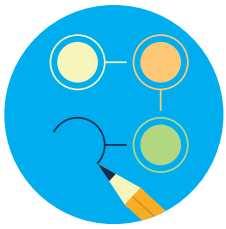
- ✓ Highlight the potential of MSP to improve biodiversity and ecosystem services outcomes for advancing the climatic and sustainable development agendas.
- ✓ Build the economic case for MSP. Utilize the best data available to argue that the cost of inaction is much higher than investing in MSP. Motivate the early engagement of the private sector by featuring business opportunities.
- ✓ Evaluate trade-offs between current and future competing uses of ocean space in monetary terms, showcasing win-win situations and suggesting ways to solve potential conflicts.
- ✓ Identify all sources of economic value derived from MSP interventions but also account for social goals that go beyond purely efficiency concerns.
- ✓ Develop an impact pathway that helps to identify how MSP contributes to goals of the Blue Economy, and the leverage points and interventions that will help bring on a sustainable use of the ocean space.

Enabling conditions

- ✓ Develop frameworks and financial products to lower the risk of ocean investments and foster investors' confidence in Blue Economy projects.
- ✓ Invest in relevant data collection to build a baseline and track progress towards making MSP a reality. Accurate data will help evaluate impacts on social, economic, and

ecological outcomes and allow skillful fine-tuning of plans towards compliance and the achievement of goals.

- ✓ Bring greater discussion of land-sea interactions into MSP processes, especially for the benefit of coastal communities harmed by contamination that originates inland.
- ✓ Identify and eliminate perverse subsidies in the context of MSP and the Blue Economy approach.



Planning

- ✓ Develop participatory scenario analysis and risk assessment to understand the long-term consequences of MSP interventions. This should get particular attention in the development of emerging industries under the Blue Economy, along with innovative financial and insurance products, science, and technology.
- ✓ Explore the potential use of economic incentives such as taxes and subsidies to foster compliance with MSP regulations and to fully integrate positive and negative externalities into MSP.
- ✓ Pay close attention to the distributive impacts on vulnerable communities and devise mechanisms to engage and benefit marginalized groups

Implementation

- ✓ Embrace a nimble, adaptive planning approach, especially in data-scarce and uncertain situations.
- ✓ Allocate sufficient resources to monitor compliance with and to enforce MSP regulations and incentives. This is key to building trust and transparency for better governance and commitment of relevant stakeholders.
- ✓ Promote a rigorous evaluation of the impacts of MSP. Although this might be challenging in complex plans, greater effort is needed to identify opportunities at local scales and specific interventions within MSP processes.
- ✓ Involve communities in small-scale finance and in-kind contributions to increase buy-in.

7 Conclusion

Despite increasing interest in MSP worldwide, gaps in the application of economic tools and methodologies are preventing the approach from achieving its full potential. The crux of MSP is identifying a sustainable allocation of marine resources that maximizes the well-being derived from human enterprise in the marine space. Clearly, MSP can benefit from economic tools that have been designed precisely for that purpose. This report identifies six specific gaps and proposes tools and approaches that can close them.

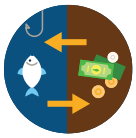
Table 5 provides a summary of the gaps and tools. Ultimately, use of the tools should give a better understanding of the trade-offs involved in MSP. An ambitious MSP process should end with an analysis that clearly identifies winner and losers, and the mechanisms through which the process impacts consumers, producers, and the environment. The importance of such economic insights goes far beyond simply establishing what makes sense from a planner's perspective. By identifying the potential trade-offs and distributive implications, an MSP can allow greater—and much needed—attention to issues such as inclusiveness, fairness, and political opposition. Simple tweaks to the MSP design, for example, stepping up use of blended finance and insurance, could dramatically change the participation of the private sector and hence open the door to very different outcomes. Similarly, embedding procedures from the start for regular monitoring of impact can enable the early detection of unintended effects or undesirable behavioral responses. With this information in hand, adaptive managers can act to ensure that the MSP is not derailed beyond repair, which in turn will increase the political support of central governments.

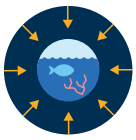
Economic tools are particularly important in securing and motivating different actors to financially support an MSP. The tools will make governmental authorities better able to show

positive social outcomes. Private investors should be attracted if they see clearly established property rights and business packages that vary in size, duration, and risk to suit different types of investors.

The World Bank has a clear competitive advantage to deploy these economic tools to support MSP in client countries. Most of the tools described in this report are already part of the Bank's day-to-day operations. Putting them to use in the context of MSP, for example, by measuring costs and benefits in monetary terms, should increase the attractiveness of MSP within the Bank's operations. The Bank could also take a leading role in the design of more complex tools, such as blended finance and targeted-investment sub-projects. Having the technical backstopping of the World Bank in the design of such endeavors should increase the potential for the private sector to join in the sustainable management and conservation of the world's marine resources.

Table 5. Gaps and Tools in the Economics of MSP

Identified gap		Economic tools to close the gap
GAP 1 	Trade-offs between competing uses are seldomly subjected to an economic analysis as part of MSP design. The distributive impacts on key stakeholders (e.g. income, gender, and and indigenous groups and migrants,) are not properly accounted for.	→ Identify potential win-win situations and inevitable trade-offs and analyze them using cost-benefit analysis from a social perspective: (1) for all stakeholders, (2) using prices that reflect both private and external costs, and (3) discounting future costs and benefits using a social discount rate. → Make sure to account for all sources of value, including indirect values, intrinsic values, and social goals that go beyond purely efficiency concerns. → Conduct an analysis of the distributive impact of alternative MSP designs to identify who benefits and who bears the cost under alternative scenarios and at different stages of the MSP implementation. → Complement with qualitative insights and participatory assessments. → Use spatial tools (e.g. InVEST, ARIES) that can provide powerful insights into alternative scenarios. → Use cost-effectiveness when information on benefits is non-existent or too costly.

Identified gap		Economic tools to close the gap
GAP 2 	The value of externalities is not properly accounted in the MSP process. Negative externalities, especially those generated in land-based decisions, are not explicitly included in MSP, meaning that welfare implications on vulnerable groups of society may not be understood. In addition, positive externalities are typically undervalued, leading to underinvestment in ocean natural capital.	Identify externalities using a systemic approach to MSP, with a particular focus on land-sea interactions. Create an impact pathway to identify mechanisms affecting the achievement of MSP goals, and leverage points and associated interventions that can move the system towards those goals. Consider using economic valuation of externalities constitutes as a key tool to design policies that internalize negative and positive externalities.
GAP 3 	Long-term consequences, uncertainty, and dynamic adjustments are intrinsic components of MSP design and implementation, yet there is insufficient scenario analysis and risk assessment.	Make accessible and efficient insurance products part of MSP design itself, whenever risk cannot be addressed by other means at a viable cost. Use blended capital alternatives to make investments in high-risk emerging industries more attractive for the private sector. Employ tools for probabilistic risk assessment as part of cost-benefit analysis, including sensitivity analysis, switching values, and/or simulation techniques. Use participatory scenario analysis for a better understanding of uncertainty by stakeholders in a MSP process. Consider adaptive management to allow marine spatial planners to learn by doing, adjust actions as information becomes available, and adapt to uncertain future conditions.
GAP 4 	Monitoring and evaluation are inadequate, adjusted for relevant scale.	Use a benchmarked MRV tool to measure progress towards goals, not activities, regularly, both for stakeholders benefiting from MSP and a relevant comparison group. Employ impact evaluation tools to accurately establish a causal link between MSP and selected outcomes. These are especially applicable at local scales and for clearly defined interventions within MSP processes. Use an ocean accounting framework to provide a standardized, systematic method to measure MSP outcomes over time. Digital dashboards facilitate access to information.
GAP 5 	A lack of behavioral insights hinders understanding of compliance with MSP regulations and perverse incentives.	Anticipate perverse incentives and avoid unintended consequences by exploring the behavioral consequences of measures that restrict or allocate rights to marine resources. Adopt bioeconomic modeling to capture the interrelation between productive and extractive sectors and the evolving state of the resource.
GAP 6 	GAP 6: There is a need to develop innovative financial mechanisms to encourage the transformation of traditional sectors and the emergence of new ones.	Differentiate between types of property rights to identify suitable financing strategies for MSP. Implement sustainability standards in existing sectors to attract new capital. Produce packages of investable projects with scale, risk, and returns adjusted to different types of investors. Use existing tools (e.g. a Public Expenditure Review) to diagnose and increase the efficiency of governmental expenditures.

At its core, economics is the study of how people make choices under conditions of scarcity, and of the consequences of those choices for society. MSP focuses precisely on those choices, so it is obvious it can benefit from the concepts and tools of the economic profession. These tools should be there to help, not block MSP practice. The degree of sophistication of economic analysis for MSP will vary according to the objectives and scenarios proposed, the data available from different sources, the required precision and reliability of outputs, the timeline, and the budget available, among other considerations (Taylor et al. 2015). Among managers, a certain level of pragmatism and intuition will aid in judging how much analysis is needed to make a socially desirable decision.

This report presented a series of economic methods and approaches that can aid the different stages of MSP, but this by no means implies that all these tools are needed for a successful MSP. Ultimately, the tools in the box should be carefully selected to help marine spatial planners maximize their chances of success.

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