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Marine Prosperity Areas: a framework for aligning ecological restoration and human well-being using area-based protections

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Mechanisms for marine ecological protection and recovery, including area-based conservation tools like 'Marine Protected Areas' (MPAs) are necessary tools to reach the Aichi Target or the forthcoming 30x30 target set by the Kunming-Montreal Biodiversity Framework. However, full ecosystem recovery takes years to manifest and the idea that MPA protection alone will foster human well-being is frequently contradicted by socio-economic evidence. Therefore, a new framework for marine area-based conservation and ecosystem restoration that reconciles the discrepancies between ecological recovery and socio-economic growth timelines is needed to effectively meet global biodiversity conservation targets. We introduce the concept of 'Marine Prosperity Areas,' (MPpA) an area-based conservation tool that prioritizes human prosperity as opposed to passively relying on ecosystem recovery to catalyze social change and economic growth. This concept leverages a suite of tried-and-true community-based intervention and investment strategies to strengthen and expand access to environmental science, social goods and services, and the financial perks of the blue economy. This data-driven framework may be of interest to stakeholders who support traditional area-based conservation models, but also to those who have been historically opposed to MPAs or have been excluded from past conservation processes.

KEYWORDS

marine conservation, blue economy, recovery times, narrative and storytelling, community engagement, Gulf of California

1 Introduction

Marine Protected Areas (MPAs) have been shown to provide considerable ecological and socio-economic benefits, thus representing a powerful tool for marine ecosystem recovery (Grorud-Colvert et al., 2021). Marine Protected Areas (MPAs) are also considered as the primary tool for achieving the global conservation targets set by the Kunming-Montreal Global Biodiversity Framework, which include the international commitment to protect 30% of oceans by 2030, known as the "30 by 30" target.

Well-managed MPAs – particularly those fully-protected from extractive and destructive activities – tend indeed to be environmental 'bright spots' that host high numbers of meso- and macro-fauna (Cinner et al., 2016; Saunders et al., 2020); provide refugia for rare, large, and migratory species (Hooker and Gerber, 2004), and can generate greater recovery of socially, culturally, and economically important species or habitats (Grorud-Colvert et al., 2021). They may even sequester higher amounts of carbon dioxide relative to similar non-MPAs, in the form of high above-ground and below-ground biomass (Howard et al., 2017; Jankowska et al., 2022). Fully-protected MPAs can also lead to higher fishery and tourism revenues, improved food security, and better nutritional outcomes for people living in communities nearby (Costello and Ballantine, 2015; Nowakowski et al., 2023).

Area-based conservation (ABC) measures (Maxwell et al., 2020), such as fully protected MPAs, marine reserves, and 'other effective area-based conservation measures' (OECMs) as classified by the Convention on Biological Diversity (e.g. fishing cooperatives, community-managed beaches, and coastal reserves), are particularly important in the context of buffering against the worst effects of climate change (Roberts et al., 2017; Strain et al., 2019; Zentner et al., 2023). They provide small pockets of respite for organisms whose populations are vulnerable to climate stressors such as warming, acidification, and deoxygenation, in addition to defaunation stressors such as overfishing, fishing down food webs, and habitat destruction. Moreover, ABC can bring people together through the shared common goals of ocean stewardship, protection, and revitalization in a time of tremendous cosmopolitan need. These tools are interlinked with the blue economy and can drive the sustainable use of ocean resources for economic growth, improved livelihoods, and job creation while preserving the health of ocean ecosystems (Winther et al., 2020; Bennett et al., 2021; Sumaila et al., 2021).

But, while the benefits of ABCs can be many, marine life and ecosystem recovery is often complicated, costly, and time-intensive (Fung et al., 2013). Full recovery may not be realized in our lifetimes (Lotze et al., 2006; Bekkby et al., 2020; Saunders et al., 2020), and the socio-economic benefits of area-based protections may materialize decades from now. Therein lies one of the central contentions surrounding the establishment of ABCs, as most would likely agree that ABC strategies improve social-ecological outcomes on-net but only with enough time and enforcement to work. For many, the immediate negative effects of area closures today outweigh the social-ecological benefits that may arise months, years, or decades from now (Gill et al., 2019). These high opportunity costs are often magnified by stakeholders' lack of access to financial capital and, in general, near-term monetary constraints which leads to skepticism in the process (Sala et al., 2013; Gill et al., 2017; Bohorquez et al., 2023).

Additionally, inequities in marine conservation frequently arise with ABC, with vulnerable populations such as women, low-income groups, and small-scale fishers disproportionately bearing the costs due to power asymmetries and restricted access to resources (Cinner et al., 2012; Bennett and Dearden, 2014). Conflicts over resource allocation and the disruption of traditional cultural ties to marine resources further exacerbate these challenges (McClanahan et al., 2006), making it increasingly difficult to secure the support of social groups who are disproportionately affected by these inequities (Bennett and Dearden, 2014). Addressing these issues requires inclusive, context-sensitive, and equitable conservation approaches that prioritize collaboration and shared decision-making.

Co-management in marine conservation has emerged as a promising strategy to integrate local communities into resource management. This approach emphasizes equitable benefit-sharing, adaptive governance and collaborative decision-making to balance ecological and socio-economic goals (Butler et al., 2015) to foster prosperity in communities. Equitable access to natural resources is a cornerstone for contributing to all dimensions of prosperity, providing economic stability, strengthening social and cultural ties, improving physical and mental health, and promoting good governance (Ban et al., 2019; Nash et al., 2022; Bennett et al., 2021). In turn, increased prosperity helps steer peoples' personal decisions and policies toward long-term ecological sustainability, which we define as *the point at which natural resource consumption is approximately equal to natural resource production (at similar scales)*. Thus, discussing environmental conservation in the context of human prosperity reframes environmental protection as a conduit to better quality of life, rather than a sacrificial act (Zhang et al., 2022). Acknowledging the dynamic, symbiotic relationship that exists between people and nature helps to ensure that short-term socio-economic activities support ecological recovery in the long-term.

ABC strategies must define ambitious yet realistic goals that not only align with the 30x30 targets, but also address local socio-economic needs and promote long-term resilience. Here, we extend the traditional scope of 'Marine Protected Areas' to encompass a comprehensive suite of human prosperity dimensions. First, we propose to reconcile timeline disparities between ecological recovery and socio-economic growth under the umbrella term we call 'Marine Prosperity Areas' (MPpAs). Second, by acknowledging the recovery times, human efforts and economic resources required to balance conservation and sustainable exploitation of marine resources, MPpAs can redefine success in the context of marine ABC interventions and challenge the conventional model that segregates humans from nature. Third, we distill the central tenets and steps to implement the MPpA concept into one unified 'MPpA Framework.' Finally, we highlight three cases from the Gulf of California (GoC), Mexico, where ABC actions and investments have supported ecological health and human prosperity. We discuss how this framework can be applied elsewhere in the world, fostering greater inclusivity and equity among stakeholders impacted by these measures.

2 Defining 'Marine Prosperity Areas'

We define a Marine Prosperity Area (MPpAs) as an *area in the ocean acted upon by ABC measures that prioritizes social-ecological prosperity*, as opposed to passively relying on ecosystem recovery to catalyze social change and economic growth. MPpAs encompass methods of restoring, protecting and sustainably using marine resources, aiming to simultaneously maximize ecological and socio-economic benefits to generate human prosperity. MPpAs are geographically defined, though boundaries may be loosely delimited, incorporating coastal and marine areas used and supported by stakeholders from various economic sectors and social groups. They are well-managed locally, featuring fully protected and/or effectively managed marine ecosystems which function as nurseries and contribute with spill-over effects that benefit the broader marine environment.

Social-ecological prosperity is a multifaceted concept that can be interpreted and applied to the marine environment in various ways – e.g., the IUCN refers to prosperity in the context of the Regenerative Blue Economy, while the United Nations' Decade of Ocean Science for Sustainable Development refers to 'prosperity' as a key outcome in the context of sustainable economic growth (Solidoro et al., 2024). The term itself originates from the Latin verb 'prosperāre', meaning 'to make happy.' Thus, we interpret prosperity to mean *a desirable outcome or state of social and ecological existence that promotes all facets of human well-being, including the cultural and spiritual dimensions of humanity, alongside the health and protection of natural ecosystems* (Horton and Horton, 2019).

True human prosperity depends on the satisfaction of peoples' basic needs (food, water, shelter, community), education and the proliferation of knowledge that cultivates a strong shared sense of environmental stewardship and symbiosis (Rosadi et al., 2022). Prosperity can be tracked and measured using existing frameworks that include various dimensions of human well-being, defined as economic, health, political, education, social capital, and cultural domains (Biedenweg et al., 2016; Breslow et al., 2016; Mascia et al., 2017; Kaplan-Hallam and Bennett, 2018; Gill et al., 2019). Environmental protection and recovery require fostering healthy human populations to maintain social-ecological balance. Key indicators, such as residents' connection to their region and/or shoreline public accessibility, guide strategies to achieve environmental and community prosperity. Tracking success in a MPpA will depend on sustained collaboration between community members, researchers, and managers, supported by adequate resources and time to monitor ecological restoration, as well as human dimension variables.

Our conceptualization of MPpAs seeks to enhance human prosperity during periods of active ecological restoration (and paused resource exploitation) through targeted socio-economic investments (Figure 1). To effectively address the biodiversity-climate crisis, a new investment logic that embraces a systemic approach to sustainability transitions in the real economy is required (Sumaila et al., 2021). Investors must fund assets that go beyond traditional financial returns to prioritize ecological resilience, social justice, and inclusiveness, while advocates of conservation must acknowledge the 'missed-opportunity costs' of ABC protections (Kittinger et al., 2024). Thus, the MPpAs concept is grounded in systemic investment thinking (Hofstetter, 2020), sustainable impact funding (Pascal et al., 2021), strategic alliances (Jacob et al., 2020) and robust scientific support (Fox et al., 2012). In the future, MPpAs may be differentiated from existing approaches, such as OECMs, based on legal or management frameworks in certain countries. However, we believe that the MPpA concept and narrative have the potential to enhance the social and financial impacts of current MPAs and OECMs on a global scale, without a legal distinction.

2.1 Integrating human and socioeconomic factors in ecosystem recovery timelines

Within well-managed multi-use or fully-protected ABCs, species populations and ecosystems can recover even after years of disruptive and destructive human activities (Roman et al., 2014; Obura et al., 2023). Estimates show that significant global oceanic recovery is possible by 2050 if we effectively mitigate pressures like overfishing (Duarte et al., 2020). This can be achieved by limiting fishing effort (e.g., setting and lowering catch quotas), eliminating illegal, unreported, and unregulated catch, discouraging destructive practices (e.g., trawling), and employing restoration techniques (e.g., artificial and living reefs) (Hutchings, 2000; Costello et al., 2016). While tackling overfishing requires long-term, continuous, strict, and well-enforced measures (Jackson et al., 2001; Boonstra et al., 2018; Iacarella et al., 2021), well-managed local fisheries can help fish stocks recover and become climate resilient (Sumaila and Tai, 2020).

However, fishing is not the only stressor influencing ecosystem health. Other anthropogenic stressors that contribute to the degradation of marine and coastal ecosystems include pollution, nutrient enrichment, sedimentation, coastal development, and the removal of key species (Halpern et al., 2007). Often times, these stressors interact synergistically, exacerbating their individual impacts, which is why effective management and mitigation strategies are crucial to enhance the resilience and recovery of marine ecosystems (Borja et al., 2010; Strain et al., 2014; Gil et al., 2016; Fong et al., 2020).

Ecosystem recovery is influenced by factors such as the degree of ecological degradation, the frequency of disturbances (Guidetti and Claudet, 2010), and the underlying traits of endemic organisms and habitats (Dulvy et al., 2021). Additionally, recovery rates vary based on initial management efforts, are often nonlinear (Palumbi et al., 2008; Fogarty et al., 2016), tending to slow down as they near the ecosystem's carrying capacity (Abesamis et al., 2014). Global stressors, like climate change and pollution, may reduce carrying capacity while slowing or impeding system recovery (Wilson et al., 2020), and climate-exacerbated natural disasters (such as hurricanes, landslides, and fires) have the potential to reverse restoration gains. For example, subtidal environments home to hard corals and sponges may require a century or longer to recover, whereas wetland ecosystems, like salt marshes and mangroves, could recover within a few decades (Lotze et al., 2006; Bekkby

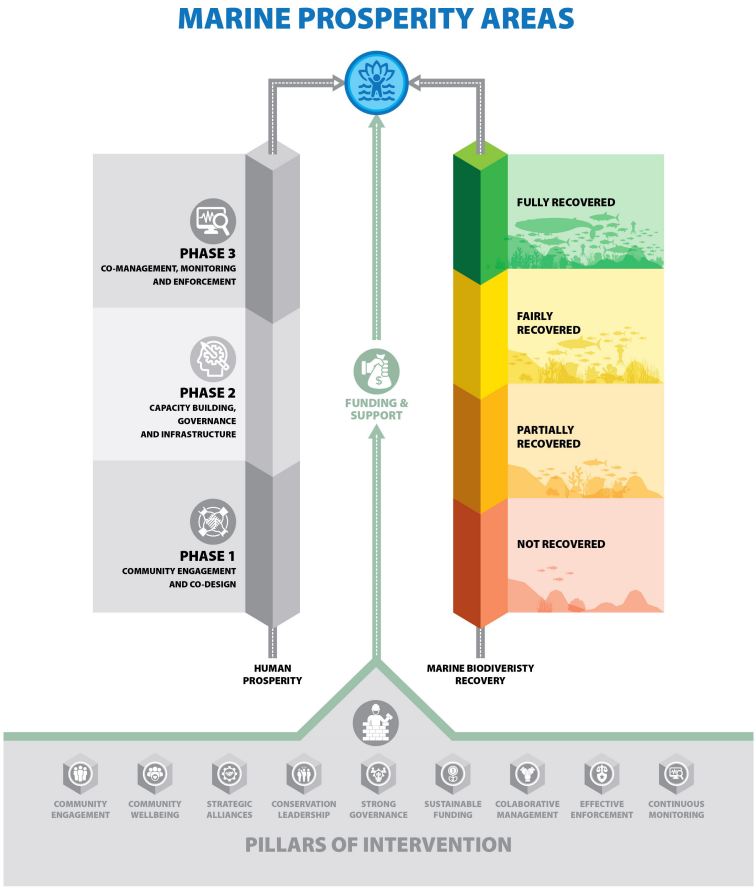

FIGURE 1
(Left) Human Prosperity integrates human dimensions and strategic interventions essential for effective marine conservation. (Right) Marine Life Recovery is achieved through progressive stages, starting with minimal recovery, where species and ecosystems begin to rebound, transitioning from partially to fairly recovered, and eventually achieving full ecological recovery and resiliency. Aligning ecological restoration and human well-being requires a systemic approach that acts on leverage points, or Pillars of Intervention, which are crucial for the long-term sustainability of marine ecosystems and socio-economic prosperity.

et al., 2020; Saunders et al., 2020). K-selected taxa with longer life spans, such as whales, seals, sea turtles, and birds, may require several decades to recover (30–100 years) (Lotze et al., 2011), but some fish and invertebrates can recover as quickly as 5–10 years after being depleted (McLean et al., 2018; Yim et al., 2020). Recognizing that these factors can affect the trajectories of population growth and ecosystem recovery is essential for setting achievable and effective ABC goals in line with the 30x30 target.

The potential socio-economic advantages borne from successful marine restoration projects offer strong and compelling incentives for investment. However, the time an ecosystem requires to recover does not necessarily match the time frame expected for socio-economic growth, which can be tracked by macroeconomic indicators like the Gross Domestic Product, the GINI index, as well as local growth indicators like declines in unemployment, increases in minimum wage, and public satisfaction polls. Additional indicators that assess human well-being across multiple dimensions (Biedenweg et al., 2016; Breslow et al., 2016; Mascia et al., 2017; Kaplan-Hallam and Bennett, 2018; Gill et al., 2019) can also be used to help improve management and restoration projects.

Without a comprehensive approach to implementing ABC protections that invest in both long-term ecological recovery and near-term socio-economic well-being, measures can feel socially 'out-of-touch' and are likely to fail (Lubchenco et al., 2020). Specifically, ABC that lack mechanisms promoting socio-economic stability and equitable access alongside environmental reforms tend to fall short of their biodiversity objectives by overlooking drivers of biodiversity loss, such as social inequality, political instability, unchecked resource consumption, among others (Scoones et al., 2020; Obura et al., 2023). This disconnects between environmental and economic goals has stymied meaningful conservation progress worldwide, as reflected in our inability to meet global conservation targets like the Aichi Target or the forthcoming 30x30 target set by the Kunming-Montreal Biodiversity Framework (Maxwell et al., 2020; Adams et al., 2004).

2.2 Semantic shift for interconnectedness

While MPpA evokes the concept of 'Marine Protected Areas' – which emphasizes safeguarding the marine environment – it shifts the focus to a broader objective: overall community prosperity. This semantic shift highlights the interconnectedness of ecological and socio-economic outcomes and promotes a more inclusive approach that accommodates a wide range of stakeholder interests and needs. Stakeholders include economic sectors reliant on extractive and non-extractive uses, as well as Indigenous peoples, local communities and other underserved groups. Their stewardship of lands and waters, often suppressed for centuries due to colonization, is increasingly recognized as vital for sustainable resource management (Thornton and Scheer, 2012; von der Porten et al., 2019; Winter et al., 2023).

We have carefully selected the term 'Marine Prosperity Areas' to convey a specific narrative, wherein humans and non-humans can thrive. Like others, we recognize the power of *narrative* and *storytelling* as tools for advancing shared, fundamental ideals that shape our perception, decisions, and understanding of the world (Louder and Wyborn, 2020). Narratives connect events, actors, and actions in a temporal and logical sequence, acting as cohesive elements for collaborative governance (Fuhse, 2009; Ingram et al., 2014; Koch et al., 2021). Compelling and meaningful narratives also have the power to motivate action, making them crucial for transformative sustainability (Veland et al., 2018; Chabay et al., 2019; Koch et al., 2023). As such, multiple narratives allow for unprecedented listening, embracing peoples' differences, diversity, and democratic pluralism (Koch et al., 2023) in defining local prosperity and addressing social equity and justice in ocean conservation (Lorimer, 2017; Bennett, 2022), which have been shown to significantly enhance the social outcomes of conservation measures as they foster inclusivity, equity, and collaborative governance (Jupiter et al., 2014; Di Franco et al., 2020; Quintana et al., 2021). Therefore, adopting a multi-narrative and multi-stakeholder perspective, which is at the basis of the MPpA concept, helps explore and define the roles of and interactions between stakeholders, including communities, markets, state entities, and third-sector organizations to ensure the success of ABC projects (Avelino and Wittmayer, 2016).

2.3 A concept for aligning ecological restoration and human well-being in a long-term perspective

The MPpAs concept, depicted in Figure 1, aims to align ecological restoration and human well-being within a long-term perspective required by the ecological recovery time (minimum 10 years). It illustrates recovery times for marine life observed in successful conservation projects and incorporates the human dimension. At its core, the MPpA concept (Figure 1 right) recognizes the importance of well-managed and/or fully protected marine areas for the restoration and long-term sustainability of marine ecosystems. The recovery trajectory (blue line) is a lengthy non-linear journey that requires consistent effort in which socio-economic processes need to be acknowledged to ensure they also improve. When ABCs are established, it usually means that marine biodiversity and ecological functions are in some type of altered states; but as time progresses, some species begin to rebound and signs of recovery start to show (*partially recovered*) (Yim et al., 2020). When ecosystems demonstrate substantial improvements in structure and function (typically after about a decade of protection) (Babcock et al., 2010), they are considered *fairly recovered*. For example, a sandy bottom consistently exhibiting colonizing algae or seagrass with low densities of pioneering species indicate the initial stages of recovery. Ecosystems in this stage are fragile and lack the resiliency needed to bounce back or fight significant environmental stressors (e.g., Díez et al., 2014; Hillebrand and Kunze, 2020). On the other side of the recovery spectrum are the *fully recovered* ecosystems exhibiting robust biodiversity, ecological resilience, and sustainable functioning. A thriving seagrass meadow with a resident population of herbivores to keep it in check, mollusks and worms burrowing in the sand helping to create microhabitat for smaller species, and predators visiting the meadow to rest, feed or reproduce while it helps minimize the impact of a storm's surge, all signal a fully functioning ecosystem. Long timescales required for the ecological recovery of marine ecosystems are supported by Indigenous ecological knowledge (Taylor et al., 2011; Eckert et al., 2018; Ramadani et al., 2023).

The MPpA concept articulates three interlinked phases, each addressing progressive stages of socio-economic change that facilitate the adaptation to the long-term scale of ecological recovery (Figure 1 left). To ensure effectiveness, MPpAs are structured around nine foundational elements, which, according to a literature review (Supplemental Material) and to the success factors identified in three case studies of effective ABC conservation in the Gulf of California, represent the key leverage points for facilitating a socio-economic shift that aligns with the ecological outcomes of restoration and conservation measures. These leverage points, referred to as 'Pillars of Intervention,' underpin the three phases that characterize the establishment of an MPpA:

1. Community Engagement and Co-design: The primary focus is to mobilize the community and actively engage all relevant stakeholders in collaboratively defining prosperity and envisioning pathways to achieve it. This phase prioritizes the co-design of strategies for sustainable marine resource utilization, serving as a critical foundation for subsequent phases. By aligning the framework with the local context and people's aspirations, this step ensures that the approach is both context-sensitive, locally relevant and inclusive.
2. Capacity Building, Governance, and Infrastructure: The goal for this stage is to establish the essential building blocks for the MPpA. This includes investing in the capacities of community members to design and implement the MPpA, developing a governance system with legal and statutory frameworks to oversee the MppA, integrating conflict resolution mechanisms, and creating the physical infrastructure necessary for effective enforcement.

3. Monitoring, Enforcement, and Co-management: This stage forms the basis for the effective implementation of a collaborative and adaptive management framework. Effective enforcement and monitoring activities are integral, providing necessary scientific data to continuously inform management decisions, and allowing stakeholders to enhance all dimensions of prosperity.

3 A unified framework to establish Marine Prosperity Areas

We propose a unified 'MPpA Framework' that drives the operational implementation of the MPpA concept. This framework represents a participatory and transformative model that utilizes standardized methodologies, processes and activities to drive a positive change to enhance resource protection, creating prosperity within socio-economic systems. Centered around building a committed and empowered community, the MPpA framework enables the necessary conditions for incremental transformation that ensures social, economic and cultural benefits at local and regional levels. This strategic model also facilitates the transition towards a sustainable, equitable blue economy. The ideas underpinning the framework stem from a literature review (*Supplemental Material*) and our work with communities in the GoC, where certain ABCs have experienced full ecosystem recovery.

In 2021, some coauthors of this paper began visiting different communities along the Gulf of California and began sharing these ideas and concepts with members of those communities. Preliminary findings were presented during the "Foro Mar de Cortés" (see acknowledgment section) in November 2022, after which we received feedback from academics, NGO representatives and regional government representatives. In February 2024, a diverse group of stakeholders convened at Scripps Institution of Oceanography (San Diego, USA) to discuss how to enhance marine biodiversity and biomass recovery in the GoC. Participants included experts from: (1) research and academia, including experts in marine ecosystems and systems thinking; (2) representatives from NGOs and local community organizations, who shared their experiences in community empowerment and sustainable resource practices, along with lessons learned regarding grassroots-level challenges and opportunities; and (3) members of the private and finance sectors, who contributed with market-oriented perspectives and resources. Guided by a facilitator and governed by an agreement of mutual respect, participation and consensus, ideas and feedback gathered from the communities were integrated into the body of knowledge summarized here.

3.1 An adaptive, interconnected, participatory framework

To operationalize the 'Marine Prosperity Areas' concept, we defined an adaptive and participatory 'MPpA Framework' that allows incremental social, economic, and cultural benefits for people to occur through enhanced marine protection. In doing so, the framework achieves two things: (1) paves the way for a transition towards a sustainable blue economy that can be scaled to broader geographic scales, and (2) helps build interconnectedness between MPpAs at a regional scale, facilitating transboundary management. Figure 2 is a graphic representation of the notion that prosperity embraces the idea that "people value, and have reason to value, nature in line with the common good" (Macqueen et al., 2020), and highlights the need for businesses to contribute to local prosperity through community-oriented practices, democratic governance, and financial security (Avelino and Wittmayer, 2016; Bó et al., 2022; Zhu et al., 2023), and how the steps of the framework are interconnected among them. Each phase in the framework is reinforced with Key Actions paired with rigorous environmental and socio-economic monitoring (Table 1), through which data is collected and evaluated to track the MPpA's progress and impacts (Gill et al., 2024).

When implementing the MPpA Framework, the process begins with 'Community Engagement and Co-design,' when diverse groups are convened to coalesce around shared socio-economic, ecological and cultural goals (Figure 2). This approach enables vision-driven planning that promotes both human prosperity and marine conservation, while proactively addressing diverse perspectives and needs to minimize potential conflicts. During the second stage, 'Capacity-building, Governance, and Infrastructure,' special attention is given to capacity-building, developing robust governance structures and securing infrastructure necessary for effective management. The third phase, 'Co-management, Enforcement, and Monitoring,' aims to address operational activities, including enforcement and monitoring. This creates a dynamic management system that involves setting, assessing, respecting and improving shared goals to ensure sustainable outcomes. The framework is highly sensitive to the local context, allowing it to be tailored to the specific aspirations of each community involved.

While the three phases described above refer to on-the-groundwork, it is important to have an overarching strategy to secure the necessary funding and investments for each individual MPpA and the network. This involves engaging stakeholders focusing on financing and investments that can unlock synergistic effects and help identify leverage points, feedback loops and drivers of self-organization (Hofstetter, 2020) within the MPpAs framework. These interactions are necessary while economic transitions take place in the community and can also help determine how risks and rewards are shared. Investors can use the pillars of intervention and key actions to assess progress and establish accountability in terms of impact on ecosystem resilience and socio-economic inclusiveness (Clarkin and Cangioni, 2016).

3.2 Benefits and challenges of the framework

MPpAs offer opportunities for systemic change via long-term strategic planning, monitoring and diverse financial investments. The framework described above employs a multi-scalar and multi-level approach and integrates insights from natural sciences, conservation, social sciences, economics, and fields such as leadership and negotiation, all viewed through the lens of

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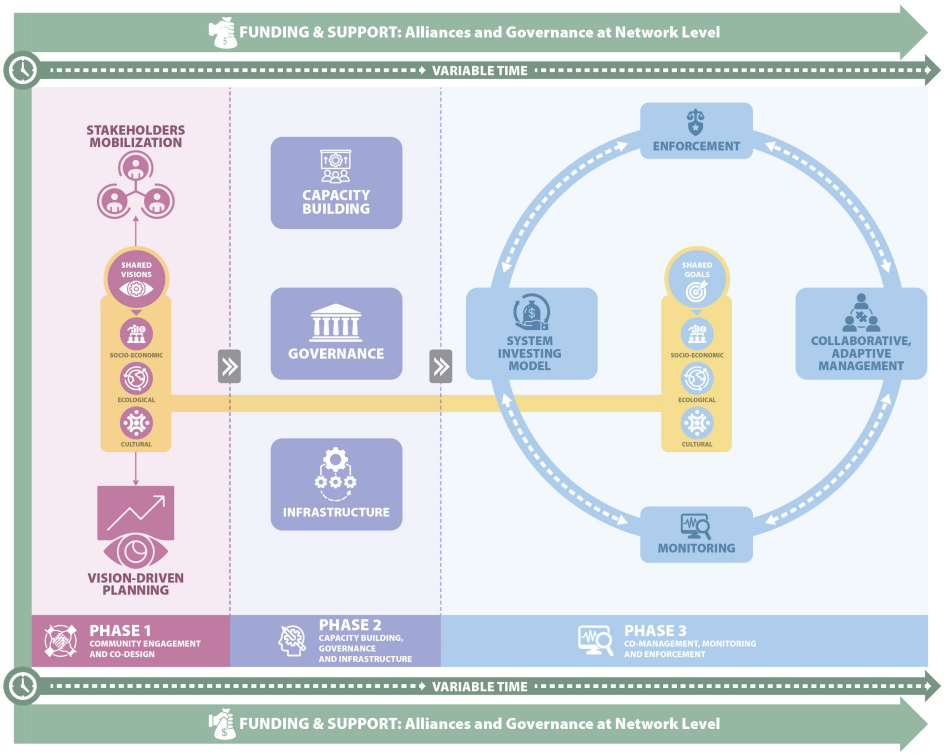

FIGURE 2
Interconnectedness and multisectoriality of the steps of the Marine Prosperity Area Framework. It integrates natural and social sciences, conservation and economics through systems thinking; emphasizes community-defined visions of prosperity and adaptable management methodologies. This approach enhances ecological outcomes and community capacities by incorporating stakeholder mobilization, capacity building, governance, enforcement, monitoring and sustainable funding.

'systems thinking' to drive transformation (Jacob et al., 2020). It purposely targets governance and technological changes to steer complex systems toward normative goals, bolstering human organization and potential for collective action.

This approach is designed to be participative and adaptable to a community's unique needs and ambitions, providing a scalable and standardized methodology in which communities define their vision for *prosperity* and play a central role in the management and implementation of any MPpA. Stakeholders collaboratively define conservation goals, design strategies, and create action plans. This helps builds trust, promotes equity by including marginalized groups, and balances competing interests through early dialogue, reducing potential conflicts during implementation (Chuenpagdee et al., 2013; Koch et al., 2023).

By connecting local actions to a broader network of MPpAs, the framework aims to amplify ecological outcomes and strengthen community capacities, enhancing their political influence over regional issues and threats. The regional scope of the network also addresses transboundary management challenges and facilitates collaborative governance and conservation of natural resources beyond political or geographical boundaries, as seen at the state, federal, and municipal levels in the Gulf of California. Its inherent flexibility in defining shared visions and goals across socio-economic, cultural, and ecological dimensions allows an MPpA to make use of a portfolio of interventions aimed at protecting marine ecosystems and fostering prosperity in local communities.

Strong and effective governance is essential for resolving conflicts in marine resource management (Parlee and Wiber, 2018) as it requires cross-sectoral coordination, active engagement of local communities, transboundary collaboration, and adherence to key governance principles (Bellanger et al., 2020). These elements are central to the framework's design, ensuring that governance structures are inclusive, adaptable, and capable of addressing complex challenges. Like any other framework where outcomes require long periods of time to materialize, perhaps the biggest challenge is securing necessary funding throughout the implementation process. During the implementation, each phase should be well-financed and supported by strong partnerships to ensure that interventions can be implemented. This becomes especially important as the community's social network, its economy and even its governance systems begin to shift and transform, giving way to new needs. This constant transitioning between states and the framework's stages will involve deploying capital to generate societal outcomes that are aligned with marine ecosystem recovery.

4 Inspiration and evidence from the Gulf of California

Two decades ago, when large-scale ocean protection was not being emphasized, Sala et al. proposed a model for a network of marine reserves and argued that neither conservation nor social well-being could be ignored (Sala et al., 2002). This model used social-ecological

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TABLE 1 Key actions of the framework.

Key Action	Phase (Figure 2)	Year	Name	Description
1	Phase 1	Y1-Y2	*Stakeholders' Mapping*	Systematically identify, engage, and establish connections with all relevant stakeholders involved inor affected by the use of marine resources within the community.
2	Phase 1	Y1-Y2	*Building Trust, Commitment and Increasing Social Cohesion*	Implement methodologies that enhance trust, commitment and social cohesion within the community.
3	Phase 1	Y1-Y2	*Co-designing Communal Spaces and Engaging Stakeholder Groups*	Encourage stakeholders to self-organize and collaboratively design communal spaces for them to meet and engage in activities.
4	Phase 1	Y2	*Setting a Common Vision*	Convene stakeholders in an exercise to create a common vision for their MPpA, one that encompasses ecological, socio-economic and cultural dimensions.
5	Phase 1	Y2	*Vision-driven, Participatory Planning of the MPpA Framework and testing prototypes for alternative livelihoods and income generation*	Develop a sustainable management and conservation model for the MPpA, identifying and testing prototypes for alternative livelihoods and short-term income generation.
6	Phase 2	Y2-Y3	*Conservation Leadership Training*	Provide training to key stakeholders within the community to enhance their conservation leadership skills, enabling effective management and advocacy for MPpAs.
7	Phase 2	Y2-Y3	*Capacity Building through Knowledge Exchange*	Facilitate knowledge exchange among stakeholders and communities to enhance alternative livelihoods development, as well as conservation and management efforts.
8	Phase 2	Y3-Y4	*Establishing Local Governance Structure*	Support communities in collectively designing a MPpA governance structure that includes decision-making processes and conflict-resolution mechanisms, in addition to mechanisms that help connecting MPpAs in a network.
9	Phase 2	Y3-Y4	*Establishing Communal Infrastructure*	Develop communal infrastructures based on each MPpA's development model where stakeholders can meet to work, socialize and learn to foster collaboration and that facilitates the deployment of the prototypes.
10	Phase 3	Y5-Y7-Y9Y10	*Setting MPpA Goals in a Local Management Plan*	Define ecological, socio-economic and cultural goals (and indicators) that align with the shared vision within a comprehensive management plan for the MPpA.
11	Phase 3	Y5-Y10	*Implementing Collaborative and Adaptive Management*	Identify and implement specific actions that help the community advance towards their established goals through an adaptive management approach informed by continuous monitoring and collaborative governance.
12	Phase 3	Y5-Y10	*Ensuring Effective Enforcement of the Management Plan*	Design a rigorous enforcement plan that includes surveillance and environmental education for MPpA users to ensure that the management plan is respected.
13	Phase 3	Y5-Y10	*Monitoring and Assessment*	Monitor ecological, socio-economic, and cultural indicators to help assess progress towards long-term outcomes and short-term goals, while providing data to enable adaptive management.
14	Cross-cutting: Funding	Y2-Y10	*Strategic Partnerships for Communities*	Connect and empower communities through partnerships with other MPpAs and external stakeholders (NGOs, research centers, public and private institutions) who can support activities that contribute to the collective vision.
15	Cross-cutting: Funding	Y2-Y10	*Regional Governance and coordination of the MPpA Network*	Establish the Network's governance system to facilitate coordination between MPpAs. The system requires representatives from each MPpA, as well as a basic legal framework for operations.
16	Cross-cutting: Funding	Y2-Y10	*Supporting alternative livelihoods*	Test intervention models for financial sustainability and support alternative livelihoods in line with the proposed ABC, through different types of capital, particularly during the prototype phase.

(Continued)

TABLE 1 Continued

Key Action	Phase (Figure 2)	Year	Name	Description
17	Cross-cutting: Funding	Y2-Y10	*Designing a System Investment Model and Attracting Additional Investments*	Develop a systemic investment model to secure long-term funding aligned with the vision and goals of individual MPpAs but allows for changes as projects evolve and the local economy grows.

Each phase of the Framework is articulated through specific Key Actions aimed at establishing Marine Prosperity Areas (MPpAs) over a 10-year timeline. These Key Actions are designed to operationalize the nine Pillars of Intervention, as depicted in Figures 1, 2. Each Key Action is strategically timed to occur at a specific stage in the Framework's maturation process.

optimization algorithms to strategically designate 15 no-take marine reserves to maximize biodiversity protection while minimizing social conflict, advocated for the protection of 40% of rocky habitats along the GoC and suggested area-based conservation tools for different regions. By integrating multiple data layers – including biodiversity, ecological processes, and socio-economic factors – Sala's model provided a comprehensive view of conservation needs that ensured connectivity between reserves, which is critical for sustaining marine populations (Kinlan and Gaines, 2003).

Since its publication, this model has been applied in and beyond the GoC, including Micronesia, Madagascar, Colombia, the Mediterranean Sea, and California in the United States (Gleason et al., 2010; Giakoumi et al., 2011; Allnutt et al., 2012; Alonso et al., 2016; Harborne et al., 2018). However, while the model provides a roadmap to designing and establishing MPAs, implementation has proven to be challenging as inadequate enforcement (Rife et al., 2012), insufficient no-take zones, weak governance structures, and limited community engagement have rendered some of these MPAs as nothing more than 'paper parks' (Rife et al., 2013). Inspired by our collective experience in three MPAs in the GoC, we set out to identify and describe the socio-economic factors that have facilitated their success (Figure 3). Despite the differences in community size, environmental problems and socio-economic context, these three MPAs have proven effective on their ecological and socio-economic outcomes.

The three analyzed case studies serve as foundational components of the framework, as its pillars encompass the success factors that define them (we have included each pillar achieved in parenthesis). Consequently, these case studies could be further strengthened by implementing the remaining pillars of the MPpAs framework, thereby benefiting from its more holistic and integrated approach to overcome their remaining challenges.

4.1 Cabo Pulmo National Park

The ABC was implemented 29 years ago (1995), following a community-driven initiative to address the overfishing that had depleted local fish stocks, when residents sought federal support to

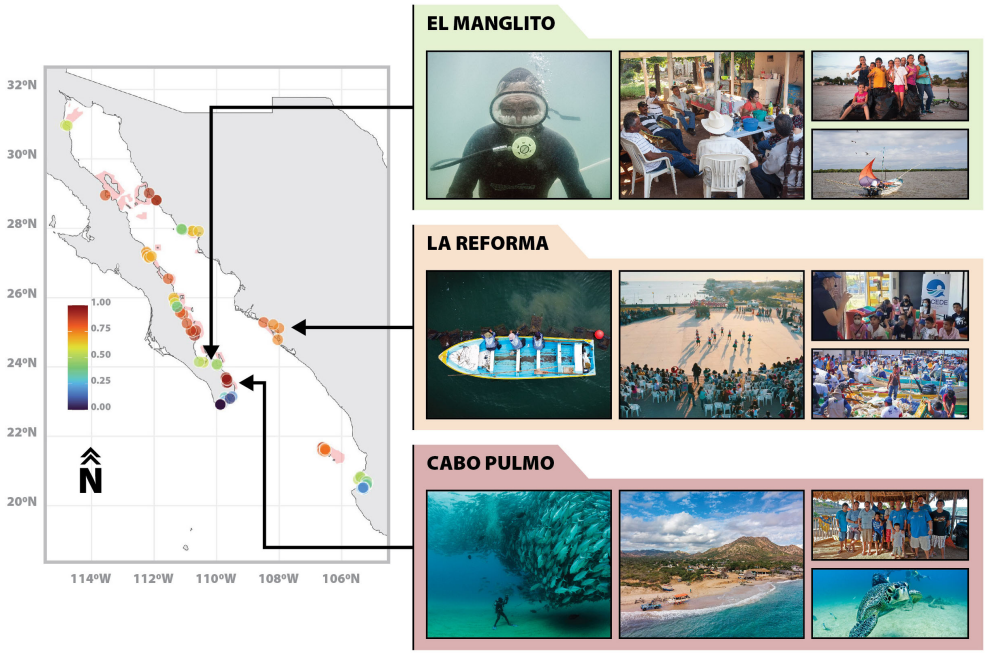

FIGURE 3
Examples of ABCs that have followed the MPpAs concept in the Gulf of California with different time scales of implementation: El Manglito (11 years), La Reforma (6 years) and Cabo Pulmo (29 years). Pink areas are high-biodiversity areas studied and identified in the last decades (Alvarez-Romero et al.). Colored dots are communities of less than 1,000 persons in a buffer of 10 kilometers from pink areas and with similar socio-economic characteristics to Cabo Pulmo (*Supplemental Information*).

protect their marine resources through the creation of a National Park. Located on the southeast of the Baja California Peninsula, the community of Cabo Pulmo (CPNP) has met at least six of the nine pillars of intervention of the MPpA framework. Two characteristics that have positioned this MPA as an example are its local leadership (Pillar: Conservation Leadership) and the community's active participation (Pillar: Community Engagement) throughout the planning, design and implementation phases. The community's diverse network of collaborators and supporters (Pillar: Strategic Alliances) have been instrumental in socio-political mobilization which has been crucial to counter coastal developments that threaten to modify coastal ecosystems surrounding CPNP. Without losing sight of their definition of well-being (Pillar: Community Well-being), Cabo Pulmo has successfully linked local issues with broader policy concerns, thus influencing and sustaining an adaptive environmental governance (Pillar: Strong Governance) that contributes to CPNP's ecological and social resilience.

After 10 years (1999–2009), fish biomass increased 463% increase (Aburto-Oropeza et al., 2011), which has sustained the local economic transition from fishing to tourism (Leslie et al., 2013). Today, CPNP is among the most popular diving destinations worldwide, generating $8 Million USD a year and supports regional economic activities that benefits from this small reserve's spillover (CONANP-GIZ, 2017). In almost 30 years, CPNP has become a benchmark for global conservation efforts, so scientists work with the community and the Park's authorities to consistently monitor marine environments within and around the park's boundaries (Pillar: Effective Enforcement) (Langle-Flores et al., 2017).

Despite the conservation success achieved, CPNP still faces significant social challenges, including demographic shifts with rising tourism, tensions between locals and expatriates, increased real estate speculation, and governance issues such as underfunding and limited enforcement (Anderson, 2019). While economic support for marine issues and research has been secured through public and private programs, long-term funding to strengthen the community's governance structure, public infrastructure, capacity building and diversifying the local economy have been scarce. These investments are essential to foster a strong and resilient community capable of addressing emerging threats and needs, but require consistent collaboration with public authorities which can be difficult to sustain without a stable governance system.

4.2 El Manglito

In 2011, in a small community in La Paz, Baja California Sur, a group of fishermen set out to build a collaborative relationship with authorities to design and implement fisheries regulations and management strategies that could revive their once thriving fisheries. Fourteen years after the first meeting, El Manglito, one of the last-standing fishing neighborhoods in La Paz, has gone through at least five pillars of intervention. Fishers began by self-organizing and reached a collective agreement to restore the bay (Pillars: Community Engagement and Conservation Leadership) to provide a healthy ecosystem for species to repopulate. Supported by researchers and the local NGO Noroeste Sustentable (Pillar: Strategic Alliances), funding was secured for the first activities which focused on recovering pen shell (*Atrina maura*) and *Catarina* clam populations through comprehensive evaluations (Corpuz et al., 2014; Palacios-Abrantes et al., 2018), beach and seabed clean-up campaigns, (Pillar: Strong Governance) and participatory surveillance activities (Pillar: Effective Enforcement).

Encouraged by the scallop's population recovery, the community decided to form the SPR Fishermen's Organization Rescuing the Ensenada (OPRE for its initials in Spanish) to secure fishing property rights within the bay, access public and private funding to support their organization, as well as improve their income through other fishery related products. By July 2017, OPRE had secured a 2,048-hectare fishing concession for 11 bivalve species, and scallop fishing resumed with specific management rules like size restrictions and bank-specific catch quotas. However, given the current environmental and socio-economic context in which this small fishing community lives, fishing cannot fully meet their economic needs and new revenue-generating options have been identified. Today, OPRE has ventured into oyster aquaculture, mussel fishing and nature tourism and are consistently assessing and optimizing their productive processes to ensure profitability without compromising economic and environmental sustainability (Pillar: Community Well-being).

Unfortunately, in 2019, an invasive tunicate (*Distaplia stylifera*) invaded the bay killing thousands of scallops compromising the health of the population and therefore OPRE's income (Moreno-Dávila, 2022). Environmental stressors like these are hard to predict and, depending on the issue at hand, reversing negative impacts can be time consuming with high costs usually associated. Nevertheless, El Manglito continues to strengthen their network of collaborators and search for opportunities to invest in their community and business ventures. If OPRE can secure long-term funding, their efforts to restore healthy environmental conditions and diversify their community's income will undoubtedly bring them one step closer to their goals for a thriving community.

4.3 La Reforma, Santa María Bay

The ABC was implemented six years ago (2018) and has been through four MPpA's pillars of intervention. Located in Sinaloa, on Santa María Bay, La Reforma is home to about 6,600 residents whose livelihoods primarily depend on fishing. Their process began when the community self-organized as a collaborative network driven by the need to recover the overfished resources on which they depend (Pillar: Community Well-being). The intervention strategy is anchored on economic enhancement, communal cohesion and environmental sustainability, all aiming to empower individuals as agents of prosperity and change (Pillar: Conservation Leadership). Particularly, it placed a strong emphasis on education and leadership training, as well as empowering women and enhancing their economic independence.

The emphasis on capacity building has yielded positive results that have impacted the community's governance and well-being (Pillar:

Community Well-being). Most notably, the first women's oyster-farming cooperative was established in 2023 and produced over 3 million oyster seeds, and two cohorts of 40 men and women (80 total) have completed training in leadership and environmental stewardship. Additionally, approximately 1,800 have participated in environmental education and entrepreneurship workshops. Collectively, these grassroots efforts are contributing to strengthening the community's resiliency and governance structure (Pilar: Strong Governance) and they are proud of the positive changes and steps they have taken to improve their livelihoods and well-being, but they still face stark inequalities and persistent social challenges common in Mexico's fishing and aquaculture sectors for which long-term financing is needed to guarantee efforts are not abandoned.

5 Foundational narrative that resonates with a broad spectrum of stakeholders

The framework proposes the establishment of MPpAs using a collaborative process that begins with inclusive and representative structures supported by a unifying vision, which are all the basis for co-management and collaborative conservation approaches (Bryson et al., 2006; Ansell and Gash, 2008). A co-created vision, or narrative, (Figure 4) can foster empathy and a shared understanding of needs, challenges and opportunities (Chabay et al., 2019) and guide governance processes that define the path towards success (Lorimer, 2017). The concept of Marine Prosperity Areas can resonate with stakeholders who were previously disengaged from, opposed conservation efforts due to perceived conflicts with their livelihoods, or have experienced significant challenges or failures in the past. The MPpA model has the potential to create spaces where inclusivity and diversity of stakeholders is valued as it recognizes that, as a community evolves, its economic and social structures will transform to give way to new livelihoods, which in turn will attract other stakeholders and perspectives (Mascia and Claus, 2009).

Several narratives have emerged regarding ocean conservation and biodiversity protection over time. The 'doom and gloom' scenarios dominated environmental literature since the 1960s (Borja et al., 2022), although a notable shift towards focusing on actionable solutions has been taking place in that past 15 years. For instance, Lubchenco and Gaines (Lubchenco and Gaines, 2019) propose a compelling new ocean narrative, writing, "the ocean is not too big to fail, nor is it too big to fix, but it is too big and important to ignore". This perspective highlights the importance of addressing ocean health as it recognizes its vast potential for recovery while allowing for hope to help build a sense of urgency. Optimism is increasingly recognized as a crucial element in addressing complex environmental, social, and economic challenges (Knowlton, 2020; Park et al., 2020), acting as a catalyst for proactive measures driven by an empowered society (Dean and Wilson, 2023;

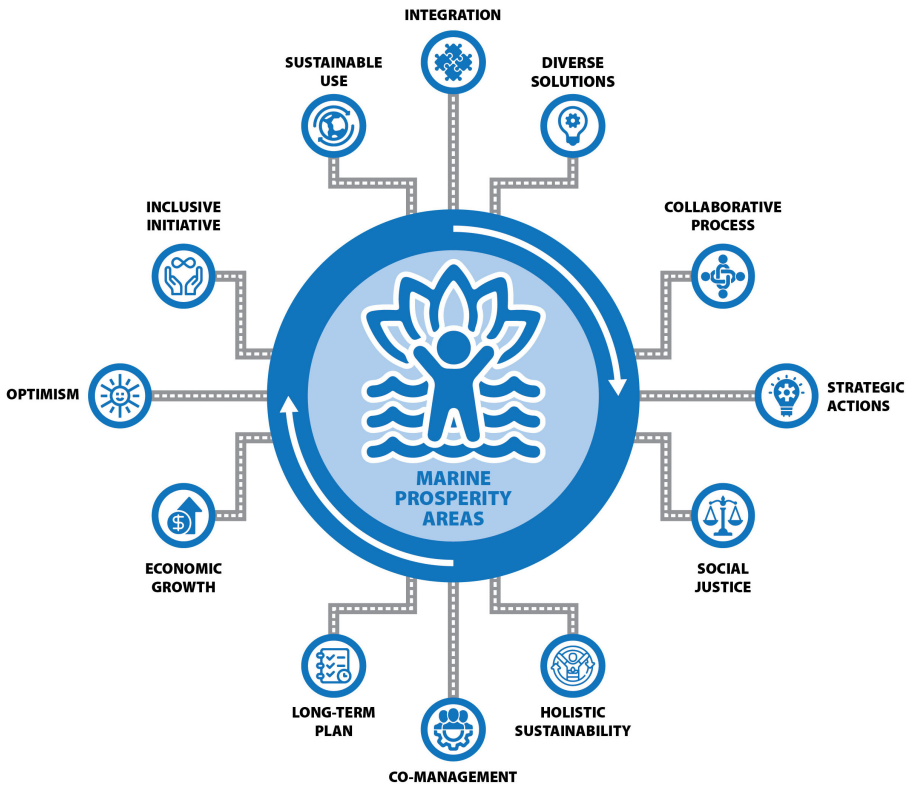

FIGURE 4
The overarching concept of 'Marine Prosperity Areas' transcends traditional conservation methods, integrating diverse solutions for the sustainable use and protection of marine resources. This concept was deliberately chosen to establish a foundational narrative that resonates with a broad spectrum of stakeholders, many of whom have historically been marginalized in discussions about conservation and ocean protection. The aim is not to standardize or assimilate diverse viewpoints, but to provide an inclusive platform for self-determination that allows a variety of perspectives on prosperity to be included. Rather than homogenizing viewpoints, it aims to provide a space for self-determination by including diverse perspectives.

Dealy et al., 2024). The concept of Marine Prosperity Areas aligns with this optimistic approach, fostering not only hope but also inspiration in the pursuit of both ocean health and human well-being.

5.1 A long-term prosperity vision adaptable to the local context

The MPpAs concept creates a space where hopeful and inclusive engagement occurs, prioritizes marginalized voices and offers flexibility to adapt to local contexts. The three examples discussed above share the same origin: faced with an environmental crisis, each process was catalyzed by a collective willingness to redefine prosperity in the context of a healthy environment. However, the paths taken have been significantly different because of their individual reality, history and opportunities. While all have strong ties to fishing, Cabo Pulmo's reefs and clear water undoubtedly created opportunities for the community to venture into tourism that are simply not possible for La Reforma and El Manglito. However, unlike Cabo Pulmo, these communities have been able to keep their fishing traditions by diversifying their activities and integrating ecosystem management tools to recover lost biodiversity while sustaining income. The strategy designed by each community reflects their needs, priorities and opportunities and despite these differences, they are moving towards the same goal.

The pillars of intervention described represent milestones that allow an MPpA to assess progress. Aside from Pillar I, Community Engagement, there is no predefined order in which a community must achieve them, they do they expire, nor are they mutually exclusive. For example, we recognize that strong governance can facilitate progress and allow for leadership, alliances and collaborative management to stand out. However, each pillar operates in different time scales. Convening meetings, setting up monitoring or enforcement programs and even finding seed funding can happen in a time scale of weeks or months; but building a governance system where leaderships are established, strategic alliances are built requires a longer timeline. Because each of the analyzed MPpA case studies began under very different contexts, their paths not only exemplify the flexibility of the model but provide a snapshot of community transformations over time. Building on the pillars already achieved, addressing the remaining ones would further enhance the effectiveness and resilience of the analyzed case studies, providing additional benefits to their ongoing community transformations.

How each Pillar of Intervention is specifically defined will also vary depending on the MPpA. While we provide general definitions or concepts, the MPpA model allows for individual and specific definitions to be defined by participating stakeholders. The model also allows for modifications as we acknowledge an MPpA's right to change their view, goals and priorities. The Community Well-being pillar is perhaps the best example of something that will be consistently changing as goals are met and milestones reached. How we define something depends on the current context and on the source of any source of urgency. When fishers from El Manglito first came together, they were unable to envision anything beyond a modest recovery of the bay's ecosystems. Expectations for improvements in community well-being were probably low, but as the benefits of their hard work began to materialize, they saw themselves needing to revisit their initial definitions and goals. Success empowers people and allows them not only to be more daring, but to push goals farther into the future, thus creating a sense of long-term commitment.

How often stakeholders need to adapt and adjust during or after interventions is not a sign of how fast they will achieve their goals. The MPpA model does not dictate pace, but rather advocates for dialogue, transparency and consistent self-evaluation to provide necessary feedback that ensure basic needs are met and rights are guaranteed while progress is maintained. Reframing priorities will help build trust among stakeholders and the model provides the necessary structure to avoid losing sight of goals. La Reforma presents a good example of this by showing how, although fishing is the main source of income, they are prioritizing education and training and see this as a necessary investment that will help set the foundation for a new attitude towards fisheries management and ecosystem conservation.

But regardless of individual timelines, the one pillar of intervention that seems to be the most challenging is the one related to sustainable funding. All three MPpA case studies discussed benefitted from initial seed money or funding through small grants aimed at implementing short-term projects. However, the MPpA framework requires a shift from reactive to strategic portfolio paradigms and recognizes the interconnectedness and complexity of socio-technical systems. Businesses within MPpAs should operate under principles that empower local families and communities to make decisions about the management and use of marine and coastal ecosystems, securing tenure rights, ocean concessions, and access to markets and technology that bolster environmental sustainability. In this way, the framework facilitates the deliberate composition and governance of investments to unlock transformational effects, ultimately contributing to long-term wealth preservation and holistic sustainability.

Visions including long-term prosperity plans could make large-scale investments and new forms of finance more accessible, bridging the funding gap for marine conservation, especially in developing countries (Pascal et al., 2021). Examples of such investments include infrastructure projects, technology start-ups, and public subsidy schemes. Blended finance, leveraging public or philanthropic capital, and collaborative design with policymakers can further attract climate finance and support sustainable economic activities (Ganbat et al., 2016). Having strategic portfolios will allow investors to consider asset synergies and leverage positive correlations to drive change while generating financial returns (Hofstetter, 2020). Innovation in financial solutions and policy adjustments is essential to support sustainable practices within MPpAs and the broader blue economy. The long-term plan is not only to safeguard ecosystem health but to also ensure the prosperity of human systems.

6 Conclusion

Over time, ecosystem restoration through ABCs can provide substantial socio-economic benefits for various stakeholders, including Indigenous peoples, fishers, tourism operators, and other coastal residents (Grorud-Colvert et al., 2021; Gurney et al., 2023), help preserve cultural heritage and empower communities by strengthening cultural institutions and common property regimes (Bennett and

Dearden, 2014; Obura et al., 2023). As ecosystems and populations recover, MPAs and OECMs boost local economies through commercial and recreational fishing and tourism (Roberts et al., 2001; Wood et al., 2013; Narayan et al., 2016; Ban et al., 2019; Potts et al., 2022) and can enhance access to health services and community well-being (Bennett and Dearden, 2014; Ban et al., 2019). While socio-economic outcomes vary and can sometimes be negative due to increased costs and conflicts (Gill et al., 2019), positive impacts can be maximized (Kaplan et al., 2019).

Fostering a balance between environmental and socio-economic well-being through a network of 'Marine Prosperity Areas' can yield substantive positive changes. However, to reap the socio-economic benefits associated with ecosystem recovery, a long-term commitment to restoration is necessary. We have proposed a framework through which stakeholders can effectively engage to buoy socio-economic stability while ecosystems recover in the form of MPpAs.

The proposed MPpA framework provides a scalable solution by connecting local actions to a broader network of conservation efforts. By integrating considerations of ecological, economic, and social well-being, it ensures prosperity that is rooted in sustainability. MPpAs can act as a global model for marine conservation, offering a flexible framework that incorporates diverse socio-ecological contexts, supports local communities, and fosters cross-sectoral cooperation. These features make the MPpA framework highly adaptable for global application.

Future research could help shed light on how to structure the sustained financial and policy support required for MPpAs and how to maximize synergies with alternative management approaches beyond MPAs.

The MPpA framework acts as a reconciliatory force, capable of promoting a more just environmental ethic by integrating diverse visions and providing a common narrative that inspires conservation action, ultimately enhancing existing marine-conservation endeavors. It offers a hopeful vision where thriving ecosystems and prosperous communities coexist. This vision is not only achievable but essential for our collective well-being in the face of growing environmental and social challenges. To realize this vision, governments, NGOs, and local stakeholders are called upon to champion MPpAs as a cornerstone of global conservation efforts, committing to the investments and partnerships necessary to build a sustainable future. Let this be the moment where collective action transforms marine conservation from isolated efforts into a unified, global movement for prosperity and resilience.

Ethics statement

Written informed consent was obtained from the individual(s) for the publication of any identifiable images or data included in this article.

Author contributions

OA-O: Conceptualization, Formal analysis, Investigation, Methodology, Resources, Supervision, Visualization, Writing – original draft. VP: Conceptualization, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft. EF: Formal analysis, Investigation, Methodology, Visualization, Writing – original draft. CL-S: Conceptualization, Formal analysis, Methodology, Visualization, Writing – original draft. RAM: Conceptualization, Resources, Writing – review & editing. AAG: Conceptualization, Resources, Writing – review & editing. FF: Conceptualization, Methodology, Writing – review & editing. AG-N: Conceptualization, Writing – review & editing. IMC: Conceptualization, Validation, Writing – review & editing. CNS: Conceptualization, Resources, Writing – review & editing. MPC: Conceptualization, Validation, Writing – review & editing. AR: Conceptualization, Investigation, Validation, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fmars.2024.1491483/full#supplementary-material

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