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Perspective

Building equitable and nature-positive blue natural capital markets

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SUMMARY

Blue natural capital (BNC) markets have the potential to address global environmental crises such as biodiversity and climate emergencies by contributing to the conservation and restoration of marine ecosystems while providing economic benefits to the owners of these ecosystems and the buyers of their services. Philanthropic and official aid fall short of the funding needed to protect and restore BNC. The resulting finance gap for nature, now approaching USD $1 trillion annually, cannot be closed without mobilizing private capital at scale. However, developing nature markets face significant challenges, including the absence of the visible hand (i.e., policy and regulation) and global coordination, along with issues related to market design, valuation, credibility, governance, and social equity. This paper recognizes and explores the complexities of establishing equitable and nature-positive BNC markets that integrate environmental, social, cultural, and economic dimensions to support market development that is both sustainable and inclusive.

INTRODUCTION

Marine ecosystems play a critical role in climate change mitigation and adaptation, biodiversity conservation, and supporting livelihoods through myriad ecosystem services. These functions and services are most intensely concentrated in coastal habitats, where mangroves, salt marshes, and seagrasses sequester significant amounts of carbon, protect coastal areas from erosion, ensure food security, and sustain biodiversity.[1,2] Coral reefs and open productive waters also generate abundant food, with coral reefs supporting an estimated 25% of marine life despite occupying less than 1% of the ocean floor.

Blue natural capital (BNC) refers to the *stock* of coastal and marine natural assets—including reefs, mangroves, salt marshes, seagrass beds, and other aquatic ecosystems[3]—and the *flows* of services they generate. These services include *provisioning* services—such as food—but also *regulating* services such as climate regulation and coastal protection, as well as other ecological, social, cultural, and biodiversity services.[4] Critically, markets recognize and price provisioning services, while largely ignoring regulating services.

Although the provisioning services of BNC are valued and priced by markets, regulating and other ecosystem services remain unrecognized and, as a result, undervalued by the markets.[5] For example, the market for fisheries is well developed globally,[6] and policies have provided protection, regulation, and even subsidies for this market. In contrast, well-functioning markets for the regulating services provided by mangroves, salt marshes, and seagrasses are, for the most part, nonexistent. Similarly, coral reefs that support fisheries and tourism activities

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while also providing coastline protection are not seen as investable assets.

Collectively, these coastal habitats support more than one third of all marine species and impact the livelihood of billions of people. Although scientists estimate that global ecosystem services provide economic benefits worth at least USD $33 trillion annually, the non-provisioning services of these marine ecosystems remain invisible to markets and to policymaking—leading to the degradation of these systems at an alarming rate.[7]

As the urgency to combat climate change and biodiversity loss becomes increasingly pressing,[8] there is growing recognition that the regulating role of living nature—blue and green, fauna and flora—is pivotal to mitigating these risks.[9–11]

For BNC to be protected and restored at scale, the visible hand of policy and regulation and the invisible hand of private capital must work together. At present, both are insufficient. Funding for nature protection comes largely from philanthropic or official sources and falls far short of what is required. The funding gap for nature is reported to be close to USD $1 trillion annually.[12] For BNC, as further discussed in Section 8, Sustainable Development Goal 14 (SDG14) is one of the most underfunded of the SDGs.[13] The World Economic Forum reports that an additional USD $175 billion per year is needed to close the gap to achieve SDG14 targets by 2030.[14] Here, we argue that private capital is the only sizable source of funding that could bridge the finance gap for nature in general, and for BNC in particular, inviting the important conversation about how to attract private funding into the protection and restoration of the regulating services of BNC.

This paper attempts to answer a central and timely question: how can we design and scale BNC markets that are not only financially viable and investable but also equitable and genuinely nature positive, benefiting local and Indigenous communities? In addressing this question, we identify the vital importance of public sector policy and regulation working alongside private investment and propose a set of integrated solutions rooted in real-world case studies, emerging science, and policy innovation. Although the paper does not present new empirical data, it does provide a perspective that is interdisciplinary and strengthened by experience from existing natural capital projects. The analysis applies a problem-solution-impact lens to identify key challenges and practical pathways to building equitable and scalable nature-positive markets.

In "a brief history of ocean exploitation," we examine the historical forces underlying persistent ambivalence toward the non-provisioning roles of BNC, showing how these legacies continue to shape economic behavior and policy. The section "BNC services and the goods they produce" highlights the hybrid nature of BNC outputs, helping explain the absence or inefficiency of markets for many ecosystem services. Building on this, "the need for the visible hand" argues for targeted policy and regulatory intervention. In "metrics for natural capital: foundations, limitations, and the path forward," we assess the measurement challenges posed by BNC's intertwined ecological, regulating, cultural, and economic functions and outline priorities for decision-relevant metrics. "Case studies of blue carbon actions delivering natural capital" then illustrates the diverse ecosystem benefits generated through BNC protection. Recognizing nature as a form of global infrastructure, "the need for global coordination" underscores the importance of collective action, while "the need for equitable and nature-positive markets" advances a framework that prioritizes equity alongside efficiency. We conclude with "additional policy recommendations" to ensure that emerging nature markets are both socially inclusive and environmentally sustainable.

A BRIEF HISTORY OF OCEAN EXPLOITATION

Historically, the ocean has been viewed through the provisioning prism. Roman law considered the ocean as *res communis*, open to all. This is a result of the lack of private property in the ocean—in contrast to land—and is encoded in the legal systems of Western nations.[15] Later, during the Age of Discovery (15th–17th centuries), the ocean came to be seen, both politically and practically, as claimable, using the same logic as *terra nullius* (nobody's land)—a place to pollute and extract from, without consequence.[16] As a result, the high seas became an unregulated territory full of resources to claim and plunder. When this approach is combined with the view that nature is a boundless source of material wealth for humanity (Francis Bacon's *Novum Organum* 1620),[17] nature, in general, and ocean resources, in particular, are open to being exploited, with no accountability for ensuring sustainability of the bounty or of shared benefits across countries.

In the 20th century, the global community re-affirmed the ocean as *res communis*, part of humanity's shared natural capital and common heritage.[18,19] Indeed, the ocean beyond national jurisdiction—that is, the high seas, which account for 64% of the global ocean—is part of our common cultural and natural heritage as humans and is there for the benefit of all beings. However, the view that humans have access to nature consisting of "infinite commodities" persists, and as a result, the ocean continues to be treated as a resource to exploit with impunity. As such, guardrails for protecting humanity's "shared natural capital and common heritage" have been missing. Recently, following years of negotiations, the global community is at the threshold of ratification of the UN High Seas Treaty, which provides a legal basis for the conservation and sustainable use of marine biodiversity on the high seas and establishes a regulatory framework for nature to prevent unchecked exploitation.[20,21] But to better understand why there are policies and markets for *provisioning* ecosystem services of BNC, and the absence of the same *regulating* ecosystem services for BNC, we need a closer look at the types of goods produced by BNC.

BNC SERVICES AND THE GOODS THEY PRODUCE

BNC produces a mix of private, public, and common-pool goods, often simultaneously and within the same ecosystem. For example, a coastal mangrove privately owned for eco-tourism (private good) also provides climate regulation and storm protection (public goods), as well as a nursery habitat for fisheries (common-pool resource). Private goods are typically excludable and rivalrous, while public goods are non-excludable and non-rivalrous. Common goods are rivalrous but non-excludable.[22,23]

Strictly speaking, the provisioning services of BNC are not inherently private. They *can be* private, but only where

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Table 1. Marine ecosystem goods and services with governance approaches

Marine ecosystems goods and services	Type of ecosystem service	Description	Management/governance approaches
Common-pool goods (non-excludable, rivalrous)			
Wild fish stocks (capture fisheries)	provisioning	food resource available to all but depletable through overfishing.[6,24,25]	fisheries quotas, catch limits, marine protected areas (MPAs), community-based management
Shellfish beds and seaweed for harvest	provisioning	harvestable biological resources that can be overexploited.[26–29]	licensing systems, rotational harvesting, aquaculture zoning
Coral reefs (for tourism and fishing)	cultural/ provisioning	provide livelihood and tourism value but degrade under overuse[30–32]	MPAs, reef restoration projects, sustainable tourism certification
Coastal groundwater linked to marine inflows	regulating	shared regulating function influencing water quality[33–35]	integrated coastal zone management (ICZM), water quality monitoring, watershed protection programs
Private goods (excludable, rivalrous)			
Farmed fish and shellfish (aquaculture)	provisioning	privately produced seafood goods[25,36]	aquaculture permits, environmental standards, eco-certification (e.g., ASC)
Coastal property with ocean views	cultural	privately owned aesthetic and recreational values[37–39]	zoning regulations, coastal setback policies, land-use planning
Marine-derived pharmaceuticals (bioprospecting)	provisioning	commercial products from marine genetic resources[40,41]	patent regulation, access and benefit-sharing agreements (Nagoya Protocol)
Desalinated seawater	provisioning	privately produced and sold freshwater resource[26,33,42,43]	public-private partnerships (PPPs), pricing regulation, environmental impact assessments
Public goods (non-excludable, non-rivalrous)			
Climate regulation by ocean carbon uptake	regulating	oceanic carbon sequestration benefiting the global climate system[44,45]	international climate agreements (e.g., Paris Agreement), ocean carbon monitoring, Blue Carbon Initiatives
Storm protection by mangroves and coral reefs	regulating/ structuring	reduces risk of storm damage for entire coastal communities[46,47]	ecosystem-based adaptation (EbA), mangrove reforestation, coastal protection policies
Biodiversity maintenance	structuring	underpins ecosystem resilience and services[48,49]	biodiversity action plans, MPAs, species conservation frameworks (e.g., CBD targets)
Existence value of marine species (e.g., whales)	cultural	non-use value—valued for their existence[50,51]	international conventions (e.g., IWC), wildlife sanctuaries, non-consumptive tourism regulation
Ocean circulation and nutrient cycling	regulating/ structuring	maintains global biogeochemical balance, supporting life on earth[6,37]	global ocean observation systems, international marine research cooperation, pollution control treaties

boundaries (property rights), technology, or governance (law or collective legitimacy) make exclusion feasible. Otherwise, the ocean's provisioning services act as common-pool resources (rivalrous but hard to exclude) and are easily depleted without cooperation. In contrast, the regulating services of BNC, such as carbon sequestration by mangroves, coastal protection by seagrasses and coral reefs, and water purification by wetlands, are typically considered public goods.

Table 1 summarizes examples of the kinds of common-pool, private, and public goods delivered by marine ecosystem services and the governance approaches used to deal with the challenge of avoiding exploitation or degradation.

Markets for private goods are viewed as efficient (producing the socially optimal level of goods), although they fail that test in the case of common-pool and public goods. For example, some marine provisioning resources have a common-pool characteristic, as in the case of wild tuna in international waters,

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which leads to the "tragedy of the commons," in which overextraction is the natural consequence.[23,52]

Samuelson's famous theorem (1954)[22] clearly points out that, in the case of public goods, markets on their own underdeliver the socially optimal level needed for the good. The regulating services of BNC, such as climate regulation and coastal protection, are public goods, and thus the market alone would tend to underprovide them. For example, a mangrove forest protecting a coastline benefits everyone nearby, but a private company cannot charge all the beneficiaries for protection. Left purely to the markets, there would be too little investment in these regulating services.

THE NEED FOR THE VISIBLE HAND

Given the mixed nature of BNC goods, there is a role for the social planner (state or collective governance) to realign private incentives and social welfare. Efficiency, thus, can be improved through the presence of the visible hand, which can provide incentives to ensure that the needed stock of BNC is restored and maintained. In addition, the visible hand is needed to ensure that benefits accrue to the rightful stewards. For public goods, the visible hand can deploy subsidies and public funding (ecosystem services payments), regulation such as mandates or protections for coastal ecosystems, and collective financing mechanisms such as taxes or levies, trust funds, or international agreements.[53,54] In the case of common goods, there is also a need for regulatory policy, such as cap-and-trade systems or Pigouvian taxes, to internalize externalities. Property rights policy, including community stewardship, co-management, and social norms such as those practiced by Indigenous Peoples and Local Communities (IPLCs), is also essential. Evidence shows that when Indigenous communities hold secure property and territorial rights, they frequently design durable local institutions that solve collective action problems in forests, fisheries, and other common-pool resources[23]—often outperforming centralized or open-access market regimes. Yet Indigenous peoples are still often excluded from equitable governance roles in marine protected areas despite their historical stewardship and contributions to biodiversity conservation.[55]

Overall, indigenous stewardship not only secures extensive areas of biologically rich landscapes but also produces measurable conservation outcomes: slower ecosystem degradation, higher biodiversity intactness, and protection of culturally important species and habitats—underscoring the value of recognizing and supporting Indigenous land rights in global conservation strategies.[56]

Given the historical focus on the provisioning aspect of the ocean, markets did not account for or attach value to the regulating services of the BNC. Therefore, the regulating value of blue natural systems—flora as well as fauna—has been invisible to markets and policymakers. Markets and policy operate on the premise that if something is valuable, it should have a non-zero price. But in the absence of price and market, the regulating services were viewed as possessing no value. The absence of policy action to protect these coastal and marine systems also meant that no regulation or public funding was forthcoming to protect or restore these systems, and with markets viewing the ocean through a purely extractive lens, these living ecosystems have been degraded. For example, according to the UK Centre for Ecology & Hydrology, about 85% of salt-marsh habitat in England has been lost since 1860.[57] Further, according to the National Oceanic and Atmospheric Association (NOAA), the world has lost close to 50% of its coral reefs.[58]

The global focus on fighting the climate crisis and loss of nature and its biodiversity has provided a way to bring visibility to the regulating services provided by nature and, more recently, by BNC coastal systems. This has led to the development of markets for carbon sequestration through a regulated compliance market and the voluntary carbon market (VCM),[59] as well as attempts at creating markets for biodiversity. Not surprisingly, the nascent VCM market has faced many problems. In addition to the typical teething problems of a new market,[60] because regulating services have a public-good aspect, the market alone has not produced the socially optimal level of protection and restoration of these natural systems.

There are ongoing efforts to reform the VCM as well as to develop new markets. For example, efforts are underway to leapfrog the carbon market and to develop the biodiversity market.[61,62] Biodiversity represents the "infrastructure" that supports most, if not all, of the ecosystem services alluded to earlier. In fact, the recent G20 Natural Capital Investment Roadmap 2.0 calls for the recognition of ecosystems and nature as a type of infrastructure that can have economic and service returns if positioned strategically.[63] The Nature Restoration Law, recently passed by the European Commission and ratified by EU countries in March 2024,[64] and the UK Net Nature Gain[65] are examples of the (global) visible hand stepping in to help provide incentives to create the market for biodiversity. These actions price in the value of living nature, allowing the private sector to internalize the cost of its actions on living nature and, thereby, change its behavior.

Although many nature-based mitigation activities have been implemented project by project, there is growing recognition of the need to scale these efforts at national and subnational levels and integrate them into national greenhouse-gas (GHG) inventories and Nationally Determined Contributions (NDCs) accounting. At the same time, the Paris Agreement's Article 6 provisions establish a framework for international cooperation: under Article 6.2, parties may transfer mitigation outcomes, ITMOs, from one country to another, provided robust accounting ("corresponding adjustments") prevents double-counting.[66] This means that a country that achieves "net-negative" emissions (i.e., removal of more GHGs than it emits) could effectively trade its excess mitigation outcomes to other countries or private actors that need them to meet their targets or corporate commitments. Such transactions create a financial incentive, at a sovereign level, for nature conservation and restoration, thereby aligning regulatory (*visible hand*) action to protect ecosystems with market (*invisible hand*) mechanisms for ecosystem services and carbon-removal credits.

In short, the combination of scaled nature-based mitigation and an emerging ITMO market offers a 2-fold opportunity: first, to deploy and scale nature's capacity to remove or avoid carbon emissions, and second, to channel finance and economic value into ecosystem protection and restoration via a sovereign-level

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carbon market infrastructure. The integrity, transparency, and alignment of these nature-based solutions with national mitigation goals are essential for realizing their climate and nature benefits. Moreover, the ITMO market, by using NDCs to create sovereign credits that could be traded, promises to crowd in the visible hand of the state to help create and guide the market for carbon and biodiversity.

Additionally, the ocean provides other important supporting and cultural services. Supporting services include ecological processes such as nutrient recycling, primary production, habitat formation, and soil/sediment formation, among others.[67] Cultural services include the non-material benefits that people derive from nature, such as spiritual and cultural identity, recreation and tourism, artistic and symbolic inspiration, and education and scientific discovery, among others. For most of these services (tourism aside), markets and prices remain absent, and the visible hand is, again, needed to help value and protect them, as well as to safeguard the interests of the stewards of nature such as IPLCs. Concerns regarding procedural, distributive, and inclusion standards must be "baked" into the markets by the visible hand.[68]

It is clear from this discussion that the visible hand is needed to (1) help develop efficient BNC markets for common and public goods, (2) provide incentives to attract the private funding needed to preserve the living ocean and its benefits to society, and (3) ensure the equitable distribution of the benefits from BNC markets.

It is also clear that, given the variety of BNC services, no single metric can capture the full value of these services. Thus, a blend of metrics is needed that would allow policymakers and markets to recognize and value these wide-ranging BNC benefits and thereby support optimal levels of protection and regeneration.

METRICS FOR NATURAL CAPITAL: FOUNDATIONS, LIMITATIONS, AND THE PATH FORWARD

Metrics translate the complex, dynamic functions of ecosystems into standardized values usable in policy, regulation, and investment—enabling monitoring, comparison, and pricing. Without credible metrics, stakeholders lack the means to verify claims or assess whether markets deliver fair, effective outcomes. Metrics are thus foundational to the credibility and legitimacy of natural capital markets, underpinning transactions and governance frameworks.[69,70]

Different metrics shape markets in distinct ways. Stock metrics measure ecosystem extent and condition (e.g., wetland area and water quality), forming the ecological baseline.[71,72] Service flow metrics capture benefits such as pollination or flood protection, linking ecosystem health to human well-being and land-use decisions.[72] Monetary valuation expresses these flows in financial terms to support cost-benefit analyses and economic integration,[73,74] often missing non-market values linked to biodiversity, cultural services, and well-being.[75,76] Biodiversity metrics track ecological integrity (e.g., species richness and habitat connectivity), which is essential for long-term sustainability.[77–80] Governance and equity indicators assess rights, participation, and benefit sharing, ensuring market legitimacy and accountability.[81–83]

Marine conservation benefits should also be evaluated through metrics that consider "physical, emotional, and cultural well-being," given that marine ecosystems fundamentally shape human health, security, and identity in coastal communities. The conservation of reefs, fisheries, and mangroves contributes to physical well-being by enhancing food security, supporting nutrition, improving water quality, and reducing exposure to climate-related hazards. These outcomes can be measured using validated instruments such as the food insecurity experience scale and standardized self-reported health indicators.[84,85] Conservation may also strengthen emotional well-being, including life satisfaction and perceived livelihood security, which are widely assessed using established subjective well-being measures such as the satisfaction with life scale and related life evaluation instruments.[85,86] In addition, marine conservation sustains cultural well-being by protecting access to traditional fishing grounds, reinforcing place attachment, and supporting relational values and intergenerational knowledge systems tied to the sea.[87–89] Integrating these dimensions into conservation evaluation frameworks aligns environmental policy with established social science standards for measuring human well-being and recognizes BNC as foundational to community health, dignity, and cultural continuity.

But metrics are not neutral. What gets measured drives what is prioritized and funded. For instance, carbon metrics incentivize tree planting, often sidelining biodiversity or water regulation.[90,91] Omitting cultural or livelihood values risks marginalizing Indigenous and local communities.[71] Simplified or standardized indicators miss complexity, tipping points, and local contexts—especially in governance and cultural services.[90,92] Data gaps and limited institutional capacity can distort what is seen and valued, often excluding vulnerable ecosystems and regions.[93,94] When metrics appear biased or reductive, they undermine trust and participation.[95]

As a result, no single metric can reflect the full complexity of ecosystems or stakeholder values. Instead, systems of carefully selected complementary metrics may offer a more realistic view—combining stock extent, service flows, monetary valuation, and biodiversity outcomes, along with governance and equity indicators and well-being measures—to ensure both ecological and social integrity.[82,96] Each metric has limits, but together they can offset individual weaknesses by balancing simplicity with accuracy, generality with context dependency, and policy with transparency.

In the next section, we will present case studies of projects that demonstrate the need for complementary metrics. These projects involve protecting and restoring blue natural ecosystems and highlight the services delivered, while also benefiting from carbon revenues.

Case studies of blue carbon actions delivering natural capital

We provide below examples of blue carbon projects across various habitats that provide benefits beyond climate mitigation and should therefore qualify as BNC projects.

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Figure 1. Tahiry Honko project area for mangrove restoration, Madagascar

Virginia South Bay seagrass restoration project

The seagrass *Zostera marina*, dominant in temperate Atlantic waters, experienced an abrupt decline in the 1930s due to widespread "wasting disease."[97] Despite suitable water and sediment conditions, South Bay, Virginia, remained unvegetated for nearly seven decades. In the 1990s, researchers led by Robert J. Orth hypothesized that recovery was limited by insufficient propagule supply, prompting a seed-broadcast restoration effort that was launched in 2001.[98]

The results were unprecedented: seeded areas expanded rapidly, re-establishing extensive eelgrass meadows that restored the full suite of ecosystem functions characteristic of seagrass habitats, including carbon storage, nitrogen sequestration, biodiversity enhancement, and improved water quality.[98]

Projected meadow expansion over 100 years (2015–2115) ranges from 2,190 hectares (ha) to 10,700 ha. The estimated value of ecosystem services—including carbon and nitrogen sequestration, increased fishery habitats, and avoided erosion—totals roughly USD $30.4 million over 30 years, or USD $224 ha^{-1} $year^{-1}$, illustrating how restored seagrass ecosystems function as valuable natural capital.[99]

Mangrove restoration projects

Mangrove ecosystems are exceptional carbon sinks, capable of storing up to ten times more carbon per unit area than terrestrial forests.[100] Their high sequestration capacity makes them central to blue carbon markets, while also supporting biodiversity and enhancing the livelihoods of communities dependent on mangrove ecosystems.

The Global Mangrove Alliance (GMA), established in 2018, has been instrumental in advancing Blue Carbon Initiatives, particularly through the development of carbon credit models that support mangrove conservation and restoration. The GMA aims to increase global mangrove habitat by 20% by 2030.[101] Complementing this goal is the Mangrove Breakthrough, which seeks to safeguard more than 15 million hectares of mangrove ecosystems by 2030. Backed by USD $4 billion in sustainable finance, this program is focused on halting mangrove loss, restoring degraded areas, and ensuring long-term protection through coordinated global action.[101]

To support scaling, the GMA and the Blue Carbon Initiative developed best-practice restoration guidelines, emphasizing the importance of community involvement and ecological integrity. To produce carbon credits, mangrove restoration projects register under an accepted GHG crediting program, each governed by strict standards on project eligibility, accepted activities, and design.

Mangrove restoration projects dominate blue carbon credits thus far: 72 of 81 blue carbon projects[102] reviewed collectively committed to restore 1.93 million hectares—around 10% of the Mangrove Breakthrough goal. These projects are estimated to deliver 20.2 $MtCO_2$equiv per year, representing 99% of annual GHG reductions from blue carbon projects reviewed.[102] Projects that quantify co-benefits such as biodiversity, coastal protection, and livelihoods can attract price premiums.[103]

Successful community-led examples include the Tahiry Honko project (Figure 1) in Madagascar (launched in 2018), the Mikoko Pamoja project in Kenya (launched in 2012 and 2013), and the Sundarbans mangrove project (launched in 2011) in Bangladesh and India. The first two projects generate certified carbon credits used to support community development initiatives, subsidize school fees, and support infrastructure projects aimed at building schools, wells, and health clinics. These cases demonstrate how community governance enhances environmental and socio-economic returns.[104]

The Sundarbans mangrove project, covering 10,000 km^2 across Bangladesh (62%) and India (38%), forms the largest contiguous mangrove forest on earth.[105] It hosts extraordinary biodiversity, including the critically endangered Royal Bengal Tiger, and holds profound cultural significance as the setting for Rudyard Kipling's *Jungle Book*. Declared a UNESCO Marine World Heritage Site in 1997, Sundarbans mangroves provide timber and construction material, fuel, charcoal, honey and wax, fisheries, and shrimp larvae for aquaculture production.[105]

The Sundarbans is responsible for nearly 41% of the total forest revenue in Bangladesh,[103] while also protecting 60 million people, including residents of Kolkata and Dhaka, from flooding and storm surges associated with cyclones and tsunamis.

Historic clearing for agriculture and development reduced the Sundarbans by roughly half between the late 1800s and the 20th century.[105,106] Despite protection of the remaining mangrove areas since the 1970s, primarily to protect the remaining

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Figure 2. Fisherman in Zanzibar

population of Bengal tigers, ecosystem service losses due to forest decline in the Sundarbans Biosphere Reserve between 1975 and 2020 are estimated at USD $3.3 billion.[107]

Today, restoration efforts funded through carbon credits operate in both India and Bangladesh. The Indian Sundarbans Mangrove Restoration Project, registered in the international REDD+ (Reducing Emissions from Deforestation and Forest Degradation) database, works closely with local communities to replant more than 16 million mangroves in degraded areas—sequestering carbon while providing climate adaptation benefits through protection from damaging floods. The mangroves also enhance fisheries, as the restored ecosystems act as a nursery and feeding ground for fish, mollusks, and crustaceans, as well as biodiversity.[108]

These projects frame carbon revenues as a mechanism to restore the broader natural capital that sustains local economies and safeguards lives.

Coral reef protection and community-led markets

Community-led coral reef conservation demonstrates the potential for aligning ecological and social goals, delivering significant economic, social, recreational, and cultural benefits. Coral reefs, which are found in more than 100 countries and territories, support about 32% of named marine species and sustain nearly one billion people directly and indirectly through food security for vulnerable communities, coastal protection, driving tourism revenues, and providing sources for lifesaving medicines.[109] Their global economic contribution is valued at up to USD $2.7 trillion annually.

Nevertheless, corals and reefs are among the most threatened of all marine ecosystems from GHG emissions, land-use change, direct exploitation, pollution, and invasive species.[110] More than half of the world's shallow-water coral reefs are degraded, and scientists warn of functional collapse due to climate change.[111] Efforts to conserve coral reefs as essential natural capital that supports a range of benefits, including the livelihoods of coastal communities, are, therefore, urgently required. Indeed, at the UN Oceans Conference of 2025, the UN released an urgent call to action to conserve and restore coral reefs.[112] In response, the international community has launched coordinated initiatives.

The Coral Breakthrough aims to mobilize at least USD $12 billion to meet the Kunming-Montreal Global Biodiversity Framework targets for tropical corals.[112,113] The estimated long-term economic loss from reef decline exceeds USD $800 billion (net present value over 50 years).[114]

The Global Fund for Coral Reefs (GFCR) is the world's leading financial vehicle to ensure a future for coral reefs and related ecosystems, mobilizing public and private capital to support reef-positive enterprises and innovative financing mechanisms. As coral reefs are weak sources of CO_2 and not eligible for carbon crediting, emerging natural capital or biodiversity credits will be instrumental in financing coral conservation at scale.[111]

The Coral Research & Development Accelerator Platform (CORDAP) was launched in 2020 by the G20 to accelerate research and development solutions aimed at preserving the world's coral reefs. One flagship example is the Mnemba Island (Zanzibar) project (Figure 2), which engages local communities and conservation rangers to restore degraded reefs to a healthier and more functional state, alleviate tourism pressure by creating additional artificial reefs, and assess socio-economic costs and benefits of the Mnemba Island Marine Conservation Area (MIMCA) for local communities.[115] In collaboration with government bodies, academic institutions, and key local stakeholders—including fishers, tourism operators, and traditional leaders—the project strengthens partnerships for long-term success. This initiative is expected to increase coral cover on degraded reefs by 10% within 3 years, reduce tourism-related stress on natural reefs, and enhance biodiversity and habitat quality. It will also foster local stewardship by training rangers and promoting active community involvement, ensuring long-term environmental and economic benefits. Additionally, capacity-building efforts will target fishers, eco-tourism operators, and schools to promote ocean literacy, stewardship, and a deeper understanding of the value of coral reef ecosystems.

In summary, the above case studies highlight projects focused on the protection and restoration of blue natural systems that deliver ecological, social, cultural, biodiversity, provisioning, and regulating services. As such, metrics for measuring the merits or the success of such projects should involve a complementary approach.

Moreover, although revenues are mainly derived from the sale of carbon credits, it is clear that the overall valuation and return on investment (ROI) should also include co-benefits such as the value of coastal protection, fisheries enhancement, eco-tourism, and water quality. Table 2 highlights these characteristics from the case studies, along with other projects that enhance resilience of communities, including educational programs.

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Table 2. BNC projects show multiple benefits and economic returns

Ecosystem/location	Project/program	Key benefits/outcomes/metrics	Estimated ROI/economic value
Seagrass, Virginia, USA (South Bay and Seaside Bays)	Virginia South Bay Seagrass Restoration[99,116] (VIMS/TNC)—Robert J. Orth	World's largest successful seagrass restoration (>6,000 acres restored since 1999); enhances water clarity, fisheries, carbon and nitrogen storage, and habitat recovery; supports bay scallop reintroduction	updated valuation: ≈ USD $224 per ha per year or USD $30.4 million over 30 years; discounted values USD $19.1 M (30 years) and USD $41.5 M (100 years); carbon sequestration is the largest value component
Mangroves, Southwest Madagascar	Tahiry Honko (Plan Vivo; Blue Ventures; GMA)[117]	community-managed mangrove restoration; verified carbon credits; ecosystem resilience; >1,300 tCO_2equiv avoided annually[118]	carbon revenues fund local development: ROI expressed via carbon payments and avoided emissions
Mangroves, Gazi Bay, Kenya	Mikoko Pamoja[119,120]	first community-led mangrove carbon project; 117 ha conserved; revenue funds water, education, and conservation	annual carbon credit revenues reinvested locally; verified under Plan Vivo standard
Mangroves, Sundarbans (Bangladesh and India)	Sundarbans mangrove conservation[34,121–123]	cyclone buffering, carbon storage, fisheries, and cultural services	ecosystem service value ≈ USD$ 2,584 ha^{-1} (maintenance), USD$ 713 ha^{-1} (provisioning), USD$ 152 ha^{-1} (cultural)
Coral reefs, Mnemba Island, Zanzibar	Mnemba Island Reef Restoration (project with CORDAP and Wild Impact)[124–126]	4 ha reef restored; 18 artificial reefs with 4 structures monitored; community training and education programs	tourism and coastal resilience benefits documented but no monetary ROI published
Mangrove restoration, Philippines	Philippine Mangrove Rehabilitation Program[34,127,128]	storm protection, fisheries enhancement, carbon sequestration	$3–5 return per $1 invested
Seagrass Meadows, Kenya and Tanzania	coastal blue carbon projects[45,129,130]	fisheries productivity, carbon storage, improved water quality	≈$10,000 ha^{-1} $year^{-1}$ ecosystem services value
Coral reef protection, Belize	Belize Coastal Zone Management Plan[131–133]	tourism, fisheries, shoreline protection	USD$350 million $year^{-1}$ ecosystem services; ≈5:1 ROI
Mangrove insurance model, Mexico (Quintana Roo)	Coastal Zone Trust/Reef Insurance[134–136]	parametric insurance for reefs and coastal defense; post-storm repairs	>USD $800 k $year^{-1}$ payouts protect ∼$10 B tourism assets
Wetland Restoration, Louisiana (US)	CWPPRA[132,137–140]	flood risk reduction, fisheries, carbon storage	USD $7.72 B avoided losses vs. USD $1.32 B invested (≈5.8:1 ROI)
Oyster Reefs, Chesapeake Bay (USA)	Oyster Recovery Partnership[141–144]	water filtration, habitat creation, fisheries recovery	$1 invested = $4–12 return
Marine protected areas, Seychelles	Debt-for-Nature Swap[145,146]	30% marine protection, biodiversity, fisheries sustainability	USD $21.6 M debt swap created long-term protection benefits

THE NEED FOR GLOBAL COORDINATION

As discussed earlier, markets for public and common goods work well when the visible hand provides the appropriate safeguards, incentives, and regulations. However, natural assets deliver services that benefit local and global communities. Thus, biodiversity may be local, but its impact could very well be regional or global. For example, the Amazon forest is responsible for significant carbon removal and affects global rain patterns beyond the natural borders of the forest.[147,148] Likewise, coastal and marine ecosystems act as blue carbon sinks and biodiversity hotspots, underpinning the health of global fisheries, protecting coastlines, and contributing to global climate stability and food security. Therefore, there is a need for global action to ensure that such ecosystem services are provided at a level that is globally optimal.

A number of factors warrant the need for global cooperation to create the enabling conditions for fair and equitable markets. First, regulatory inconsistencies across jurisdictions could hinder investor confidence by creating uncertainty around legal frameworks, credit eligibility, and compliance standards.[149,150] Second, knowledge and capacity asymmetries—particularly in low-income and coastal countries—prevent the development of bankable projects and limit access to climate finance and biodiversity funding mechanisms.[151,152] Third, free-rider effects reduce national incentives to invest in ecosystem services that provide global public goods—such as climate regulation or

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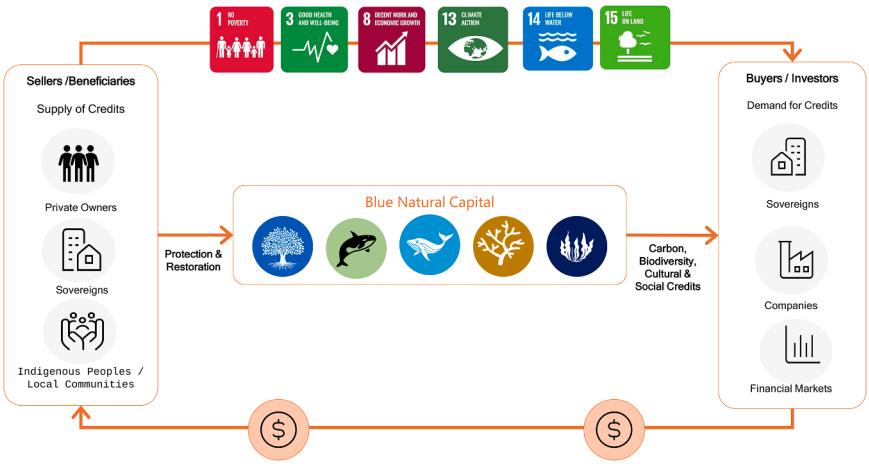

Figure 3. Connecting supply and demand for a BNC market

migratory species protection—leading to chronic underinvestment.[153,154] Finally, market fragmentation results in a proliferation of unlinked and non-fungible credits, which undermines liquidity and scalability, impeding the growth of nature-based markets at a time when speed and coordination are critical.[155] Thus, leaving this global concern to be dealt with by local markets alone is insufficient to capture the global public-good aspect, as evidenced by the continued loss of nature and its biodiversity. The expanded International Union for Conservation of Nature (IUCN) list of threatened species reports continued global decline in ecosystem integrity as well as the increased risk due to delayed action on fighting climate change.[152,156]

Global coordination is needed on a number of issues. Convergence on definitions, measurement standards, environmental safeguards, and policies must be established. There are already efforts underway, such as emerging global accounting and disclosure frameworks. A key player in this effort is the Global Ocean Accounts Partnership (GOAP), a multi-stakeholder partnership established to enable countries and other stakeholders to measure and manage progress toward sustainable ocean development using ocean accounts. It provides an integrated foundation to inform evidence-based decision-making and holistic policy development for the blue economy and sustainable ocean planning and management approaches.[157] Building on the GOAP, better Social Accounts for the Ocean are also being formulated, which could increase the visibility of communities and human-ocean relationships in decisions about ocean policy and management.[158]

Similarly, the System of Environmental Economic Accounting-Ecosystem Accounting (SEEA-EA) provides a structure for incorporating ecosystem service values into national economic planning,[79] while the Taskforce on Nature-related Financial Disclosures (TNFD) enables companies and financial institutions to assess and report their nature-related risks and opportunities.[159] Several countries and regions are piloting natural capital accounting frameworks supported by the World Bank WAVES (Wealth Accounting and the Valuation of Ecosystem Services) partnership and others, translating ecological assets into balance-sheet items. Advances in data (e.g., satellite monitoring of forests, digital monitoring, reporting and verification (MRV), and biodiversity databases) make it more feasible to quantify ecosystem services with scientific rigor.

THE NEED FOR EQUITABLE AND NATURE-POSITIVE MARKETS

Currently, official and philanthropic funding for nature remains woefully inadequate. The most recent Paulson Report (2025)[12] clearly shows that the financing gap for nature has increased to USD $942 billion annually. Although the blue economy shows promising growth,[13] investment directed toward protecting and restoring BNC, including SDG14—which calls for the conservation and sustainable use of the ocean and its marine resources—falls significantly short of what is needed.[160] This lack of investment not only hampers progress toward achieving SDG14 but also undermines broader efforts aimed at ensuring the health and resilience of the ocean. Indeed, SDG14 is one of the most underfunded goals of all.[14] According to the World Economic Forum, about USD $175 billion per year is needed to achieve SDG14 targets by 2030. Yet between 2015 and 2019, just under USD $10 billion was invested in total, highlighting a substantial and widening financial gap. This sizable gap can only be filled by attracting investments from the private sector. But attracting buyers or investors into BNC is not enough; the markets must be built for BNC services and intentionally designed for these markets to be nature positive and equitable.

BNC market structure

Markets, typically, involve buyers and sellers, a product (or products) that is (are) bought/sold, and the resulting exchange of funds. In the case of BNC, our focus is on developing the market for the regulating services of a marine ecosystem, which includes selling carbon sequestration services in the form of carbon credits, along with other benefits such as biodiversity and cultural credits. The seller of BNC credits could be IPLCs, local governments, or sovereigns. The buyer of these credits could be corporates, sovereigns, financial entities aiming to meet voluntary targets—a carbon-zero target as part of a science-based target (SBTI) or part of a nationally determined contribution (NDC) target—or to abide by mandatory requirements (Nature Restoration Law, for example), or an intermediary aiming to make a market in such credits (see Figure 3).

Given the wide range of BNC benefits and the fact that these natural assets are long-lived, three key principles need to be considered when shaping the market.[161] First, the underlying "asset"—such as mangroves or seagrass—is not to be sold. An owner of mangroves, for example, may sell carbon sequestration services, which are the *regulating services* of the mangrove, and not the mangrove itself. This is because the

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mangroves provide other goods and services (provisioning services such as fish and regulating services such as coastal protection, among others) that are not priced or reflected in the carbon price. Thus, although the carbon service can be sold, the mangrove itself should not be sold. Second, these services being sold are produced by living systems, but the amount and quality of services produced (such as carbon sequestered or fish stock, etc.) depend very much on the health of the BNC asset and surrounding ecosystem. The carbon sequestered, for example, is only delivered if (1) actions are taken by the project owner to protect and restore the living asset and (2) there are sufficient and earmarked funds to finance such actions. Thus, funds generated from the sale of the credits should ensure the long-term protection and restoration of the natural asset.

Third, carbon sequestration or other biodiversity services accrue due to actions that are taken by project owners, such as IPLCs whose long-term management of these natural assets ensures their sustainability. Thus, IPLCs should be involved in all aspects of structuring and managing such activities, as well as be positioned as beneficiaries of the funds generated from the sale of these services.[161]

Challenges and solutions facing the development of BNC markets

Beyond the three principles stated earlier, to unlock the potential of the BNC market, certain microstructure issues endemic to all nascent markets must also be resolved.[60,148]

Establishing provenance

This step is paramount for any project to receive private sector funding. Where property rights are not well developed or enforced, investors would be reluctant to advance funds due to a lack of confidence in receiving remuneration or in the ability to litigate in case of disagreements. In this regard, policy reform is needed to ensure that legal and social protections are embedded in BNC markets, including clear delineation of the state and private sector. In the case of blue natural assets, as governments move to realize the financial value of these assets on their balance sheet, they would be incentivized to pass legislation clarifying ownership and benefit sharing for their Exclusive Economic Zone (EEZ) blue carbon assets. Furthermore, with the clarification of Article 6.2 of the Paris Agreement, countries are moving to establish legal frameworks for their blue carbon markets. One example of such an effort is that of the Government of The Bahamas, which enacted the Climate Change and Carbon Market Initiatives Bill, 2022,[162] and the Securities Commission, which enacted the Carbon Credit Trading Act, 2022,[163] to provide the regulatory framework for accrediting and trading blue carbon credits.

Converting an asset into financial capital

Counting the asset on the owner's balance sheet involves legal coding alongside standardized and robust valuation. Valuation approaches drawn from natural capital accounting frameworks such as the SEEA-EA allow for the integration of biodiversity and ecosystem service values into national and corporate accounts.[164] When BNC stocks are recognized on balance sheets, and their ecosystem services are monetized as tradable services, conservation can be transformed from a liability into an investable proposition.[155,164,165]

Measuring and valuing ecosystem services

Market-based valuation of BNC relies on the development of standardized methodologies that enable the quantification, verification, and monetization of ecosystem services. For example, carbon credits are priced based on sequestration potential, using MRV methodologies such as Verified Carbon Standard (VCS), the Gold Standard, and ART-TREES, which assess net carbon sequestration by measuring biomass growth, soil carbon stocks, avoided emissions, and project additionality.[166,167] Significant advancements in technological tools such as satellite remote sensing, LiDAR, UAV imaging, and allometric equations are increasingly used to improve the accuracy and scalability of carbon accounting in coastal blue carbon ecosystems such as mangroves, salt marshes, and seagrasses.[168,169] Advanced methodologies and technologies, including remote sensing, environmental DNA, and AI, can improve the measurement and valuation of natural capital and ecosystem services.[170] These tools support robust MRV systems that are essential for transparency and credit integrity.

Biodiversity credits require more complex valuation frameworks, as they must measure species richness, habitat restoration success, and functional biodiversity indicators. The UK's Biodiversity Metric 3.0 and the Global Biodiversity Framework (GBF) have established methodologies to quantify biodiversity improvements and integrate them into market mechanisms.[160] Biodiversity co-benefits can be bundled alongside carbon sequestration credits to create premium products for off-takers looking to fulfill both their climate and nature commitments. These credits, however, are often non-fungible, meaning that they are tailored to local contexts and cannot be easily substituted or aggregated across regions, which influences both credit pricing and investor expectations.[171,172]

Developing tailored financial instruments

Instruments must satisfy the needs of buyers and sellers. Traditional financial instruments can be used to generate market interest from early investors, such as vanilla blue bonds or more hybrid-type instruments. Blended finance models can help facilitate early project capital, helping to ensure funding is available for projects lacking sufficient funds and that valuations reflect both ecological and social benefits. Instruments such as blue bonds, which channel debt proceeds into ocean conservation, and debt-for-nature swaps, where national debt is restructured in exchange for marine protection commitments, are proven examples of how innovative financing can free up funding for BNC.[173–175]

For example, blue bonds—debt instruments earmarked for marine and coastal projects—have gained traction. The Seychelles pioneered the world's first sovereign blue bond in 2018 (raising USD $15 million for sustainable fisheries), and others have since followed. A landmark case is Belize's Blue Bond debt conversion (2021), a debt-for-nature swap that unlocked more than half a billion dollars in debt relief and funding for marine conservation. In that deal, Belize repurchased a USD $553 million commercial bond (its entire external commercial debt) at a substantial discount, financed by issuing USD $364 million in blue bonds backed by credit guarantees.[176] The arrangement shaved 10% of GDP off Belize's debt burden and committed the country to extending marine protected areas to 30% of its waters, alongside USD $4

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million per year in conservation spending through 2041. This innovative structure shows how natural capital (in this case, healthy reefs and fisheries) can be leveraged to achieve both debt sustainability and ecological gains.

De-risking investments in BNC

With climate impacts growing, innovative insurance mechanisms are critical financial instruments for resilience. These could include public as well as private sector players. In the case of the former, this could include international development banks acting as insurers or guarantors of last resort. Regional risk pools such as the Caribbean Catastrophe Risk Insurance Facility (CCRIF) and the African Risk Capacity (ARC) have been expanded and refined. They use parametric insurance (payouts triggered by event parameters such as storm wind speed or rainfall, rather than assessed losses) to provide quick liquidity to governments after disasters. As of 2024, new insurance products are being extended to nature-based solutions—for instance, insurance that pays for rapid reef restoration after a storm (piloted in Mexico for the Mesoamerican Reef) to ensure that the reef's coastal protection service is quickly restored.[177,178]

Similarly, livelihood insurance schemes for farmers and fishers, often subsidized by governments or NGOs, are scaling up with mobile technology for distribution. These instruments do not directly mobilize substantial new capital, but they protect development gains and budgets, acting as shock absorbers that prevent costly setbacks.[179,180]

Building trust through transparency and accountability

Verification of compliance with commitments made by the project owner can be achieved through independent audits and public disclosure of financial flows, as well as through transparency reporting via independent enterprise systems. Establishing clear and transparent financial mechanisms that trace the allocation of funds is paramount.[181,182] Case studies of successful projects, such as Indonesia's mangrove restoration initiatives, demonstrate how transparency and inclusive governance can build trust among investors and local stakeholders alike. Financial returns from blue carbon projects must contribute to social development, including education, healthcare, and economic empowerment. Successful community-driven projects provide models for equitable implementation. In this case, the traceability of where and how the benefits are distributed would have a positive effect on attracting investors who may be concerned that their funds could be diverted into unintended alternative uses. In this respect, tokenization—and, more generally, the use of digital technology—goes a long way toward providing the transparency needed. These safeguards are now available to be deployed across projects to gain investor confidence.

Ensuring commitment over time

The project owner needs to provide credible mechanisms to ensure that promises made concerning protection and restoration efforts—as well as the funding of community development—are not reversed over time. Independently governed endowments or trust funds can be established as repositories of investment capital directed toward these promised outcomes.[183] These tools can assure investors that funds are being directed toward conserving natural assets and providing long-term support to IPLCs.

Safeguarding equitable and financial inclusion of IPLCs

Although the ownership of BNC may reside with states, local marine stewards play a central role in the success of BNC projects. Indigenous people and local communities have, under international, national, and customary laws, tenure and ownership rights over the resources they steward. BNC projects must ensure that these rights are recognized.[184] International human rights frameworks underscore the importance of secure tenure and governance rights in ocean and coastal contexts. The United Nations Declaration on the Rights of Indigenous Peoples affirms Indigenous peoples' rights to lands, territories, waters, coastal seas, and other resources traditionally owned or otherwise occupied or used, as well as their right to participate in decision-making affecting those resources.[185] Similarly, the United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas recognizes the rights of small-scale food producers—including artisanal fishers—to land, natural resources, and meaningful participation in resource governance.[186] Together, these declarations provide a normative foundation for recognizing marine tenure rights and supporting community-based stewardship in coastal and ocean conservation policy.

Beyond provenance and legal frameworks, including Indigenous rights, developing inclusive, scalable blue carbon and biodiversity markets requires accounting for ecosystem complexity and local contexts. Multi-stakeholder partnerships can integrate community needs, environmental objectives, and private sector investment. Participatory models that incorporate IPLCs in governance and implementation not only improve equity but have also been shown to enhance project effectiveness and legitimacy.[187–189] Flexible, region-specific mechanisms can ensure that diverse ecosystem services are valued and traded effectively.

Long-term protection and regeneration of BNC can only be achieved if the people living in these communities are also supported. Global frameworks such as the Integrity Council for the Voluntary Carbon Market (ICVCM) and the International Advisory Panel on Biodiversity Credits (IAPB) recognize this fundamental element and require active participation, decision-making, stewardship, and benefit sharing for IPLCs, thus creating high-quality standards and guardrails for investors as they conduct due diligence on potential projects. The resolution of such contractual issues must be tailored to the BNC market given the mixed nature of its goods and the diverse incentives of the various stakeholders involved.

Figure 4 identifies a range of stakeholders needed for a fully functioning nature market and highlights their differing functions and incentives. Primary beneficiaries remain IPLCs and nature itself. However, stakeholders needed for the growth of a robust BNC market that delivers successful, long-term, sustainable outcomes must include a mix of market actors alongside scientists, conservationists, and community members.

ADDITIONAL POLICY RECOMMENDATIONS

In this section, we identify additional policies that would help ensure equitable and nature-positive markets and highlight the commensurate actions that would need to be taken to achieve such an objective.

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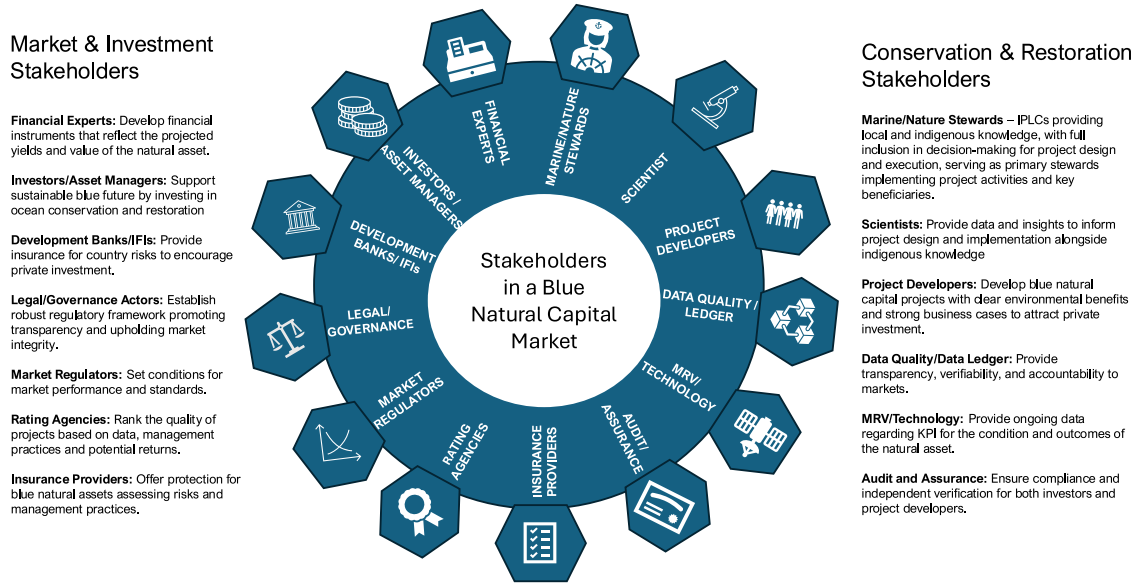

Figure 4. Key stakeholders and their roles in developing a thriving BNC market

Establish robust legal and governance frameworks

Strong governance is the precondition for credible BNC markets.

Recommended actions at the national level include the following:

(1) clarify ownership, tenure, and benefit sharing for coastal and marine ecosystems, especially in EEZs.
(2) Legally recognize and protect the rights of IPLCs to manage, co-govern, and directly benefit from BNC projects.
(3) Ensure that rights and tenure are protected and respected so that benefits flow to IPLCs.
(4) Require an Environmental and Social Safeguards Framework (ESSF) that ensures restoration activities do not undermine community rights, biodiversity, or local knowledge systems.
(5) Ensure that blue carbon nature-based solutions demonstrate alignment with international human rights standards.[185] This would include secure tenure recognition; free, prior, and informed consent (FPIC); equitable benefit sharing; and accessible grievance mechanisms to prevent dispossession and ensure that mitigation outcomes strengthen, rather than undermine, coastal community rights.

Recommended actions at the international level include the following:

(1) countries should adopt enabling legislation for Article 6.2 crediting arrangements, ensuring transparent accounting and avoidance of double-counting.
(2) Multilateral institutions should support legal coding of blue natural assets on sovereign balance sheets to unlock investment and strengthen national stewardship.

Integrate BNC into climate, biodiversity, and economic policy

BNC must become a core pillar of national climate and development strategies.

Recommended actions are as follows:

(1) embed coastal restoration and protection into NDCs and National Adaptation Plans (NAPs).
(2) Include BNC in disaster-risk-reduction planning, recognizing the cost savings associated with natural buffers such as reefs, mangroves, and seagrasses.
(3) Incorporate natural capital into coastal zoning laws, infrastructure planning, and marine spatial planning.

This alignment ensures that market mechanisms reinforce long-term public objectives.

CONCLUSIONS

This paper highlights the challenges of building equitable and nature-positive BNC markets and suggests possible solutions that comprise policy actions at the local as well as global levels. Given that BNC involves some services that have developed markets and others that are non-market services, complementary metrics need to be used to identify and measure the value and success of BNC projects. Goods and services produced by BNC living ecosystems also involve common and public goods requiring an active role by the visible hand of government and regulation to avoid depletion and under-provisioning of these resources. Additionally, given the global nature of the regulating services of BNC ecosystems, global action by the visible hand is warranted.

Given the urgency of mitigating the loss of nature and its biodiversity, our perspective is that policymakers need to partner with markets to accelerate and close the funding gap needed to protect and restore nature. But for the BNC market to work properly, certain conditions are needed. First, establishing legal and governance frameworks is fundamental—especially in countries where property rights, tenure systems, and regulatory oversight are weak. Second, standardization of accounting and valuation methodologies for ecosystem services would enhance market credibility and investor confidence. Third, assurance and insurance mechanisms must be in place to help de-risk investments in BNC ecosystems, especially in countries where governance is deemed weak. Fourth, ensuring data quality and transparency is crucial for enhancing cross-border investor confidence. Finally, the involvement of nature stewards such as IPLCs in the management of these BNC ecosystems, as well as in benefiting from the success of these projects, is paramount to the success of the market for BNC.

When grounded in sound science, strong governance, and social equity, these markets can unlock powerful co-benefits—restoring marine biodiversity, mitigating climate change, supporting livelihoods, and generating sustainable economic growth. The development of BNC markets presents a transformative opportunity to create a regenerative environment and an equitable economy, enabled by robust governance and public sector involvement. This can only happen if nature is protected and restored and its stewards are beneficiaries in perpetuity. By realigning finance with planetary boundaries, ecological resilience, and human well-being, we can move toward a sustainable and regenerative blue economy.

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DECLARATION OF INTERESTS

The authors declare no competing interests.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work, the author(s) used ChatGPT to create Tables 1 and 2. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the published article.

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