WORLD ECONOMIC FORUM

# Turning the Tide:
## A Financier's Guide to Investing in Blue Carbon Ecosystems

WHITE PAPER

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# Foreword

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Coastal and marine ecosystems are among the world's most powerful yet under-recognized climate solutions. Mangroves, seagrasses and tidal wetlands protect communities from storms, anchor local economies, and store carbon at extraordinary densities. And yet these ecosystems continue to decline, constrained by a lack of connection between political priorities, community will and clear pathways for investment. As this report makes clear, the challenge before us is not whether blue carbon ecosystems offer value, but how quickly global and domestic financial systems can mobilize the capital required to safeguard and restore them.

This work is central to building resilient, equitable and sustainable ocean economies. Through our Blue Carbon Action Partnership, and in deep collaboration with the governments of Indonesia, the Philippines and Viet Nam, we have seen first hand the appetite for high-integrity investment models that channel finance to communities and enterprises on the front lines of climate and nature loss. Insights from in-country consultations and technical dialogues with financiers, practitioners and experts that informed this report demonstrate both the urgency and the opportunity: with clear enabling conditions, blended capital and risk-sensitive financial structures, blue carbon ecosystems can become a viable institutional investment theme capable of delivering climate, nature and development outcomes at scale.

This report offers a practical and catalytic path forward. Its recommendations reflect the realities shared by practitioners across South-East Asia and the growing recognition that nature-based investments are not peripheral. Rather, they are central to economic stability and long-term prosperity. We hope the guidance and examples presented here equip financial institutions, in partnership with governments, corporations and communities, with the clarity needed to act decisively.

With coordinated leadership and strategic finance, South-East Asia can demonstrate a global model where natural capital is valued, communities thrive and the resilience of the region becomes a foundation for shared prosperity. I invite you to join us in turning this opportunity into lasting impact.

# Executive summary

Mangroves, tidal salt marshes and seagrass meadows – together called blue carbon ecosystems – span over 51 million hectares of land and water.[1] Blue carbon ecosystems can store up to five times more carbon per acre than tropical rainforests,[2] support biodiversity, underpin coastal communities' livelihoods and protect climate-exposed coastal communities from floods and storms.[3] It is estimated that these ecosystems provide services valued at $190 billion annually to the global economy.[4] Yet, despite this strong economic contribution, blue carbon ecosystems are currently significantly underfunded. It is estimated that coastal nature-based solutions receive less than 1% of international climate finance.[5] Unfortunately, without adequate financing, these habitats decline – approximately 30% of mangroves around the world have been lost over the last 45 years[6] and 7% of seagrass is being lost every year.[7]

Efforts are afoot from governments, public institutions, corporates, philanthropy and some private financial institutions to direct finance into addressing this trajectory of decline, and to leverage the significant financial opportunity presented by innovations in the blue economy. As demonstrated by the World Economic Forum's publication "Investing in Mangroves: The Corporate Playbook", investment in mangrove ecosystems can offer compelling commercial and reputational benefits to companies.[8]

Nevertheless, private finance is not currently moving at the pace and scale required to support the conservation and restoration of these highly valuable ecosystems. The team behind this paper identified five common barriers for private finance flows, including (i) a long development timeline; (ii) regulatory complexity; (iii) high transaction costs; (iv) demand uncertainties; and (v) lack of scale.

Across these financing avenues, financial institutions can make eight key interventions to allocate or unlock private finance flows into the projects and enterprises that support the conservation and restoration of blue carbon ecosystems.

1. Through blended finance structures, participate alongside concessional or philanthropic capital providers to fund early-stage project/enterprise development and strengthen the pipeline for later-stage investment.

2. Establish relationships with commercial, concessional and philanthropic capital providers to coordinate financing and ensure funding availability across project and enterprise life cycles.

3. Partner with buyers' clubs or other alliances to aggregate demand and create stable revenue streams for blue carbon credits and other sustainable products derived from blue carbon ecosystems.

4. Develop structured finance products or platforms to aggregate small-scale projects and enterprises, diversify risk and deliver finance at scale.

5. Utilize blended finance structures to improve the risk-return profile of blue carbon ecosystem transactions and catalyse greater private participation.

6. Create insurance and risk-sharing products to de-risk projects from market and political exposure.

7. Integrate blue carbon ecosystem risks and benefits into investment strategies, credit risk assessment and asset valuation models.

8. Deploy established financial instruments with conservative assumptions on emerging revenue streams, and refine models as markets mature and data availability improves.

Importantly, underpinning these recommendations is an acute awareness that coastal communities rely heavily on blue carbon ecosystems but have limited access to finance, social services and healthcare, as well as alternative non-extractive income sources. The recommendations and interventions outlined in this paper have been developed with a fundamental understanding that projects and enterprises will only deliver durable conservation and restoration outcomes for blue carbon ecosystems when designed to also improve the livelihoods of blue carbon communities.

This paper presents immediate opportunities for financiers to source deals and structure investments in blue carbon ecosystems, so that the projects and enterprises that support the conservation and restoration of blue carbon ecosystems become a bankable and scalable institutional investment theme. By engaging with these opportunities, financiers stand to access new growth markets and generate returns, while delivering significant impact for coastal communities and economies that rely on these important ecosystems.

# 1 Introduction

This paper provides practical guidance for financial institutions on how to support blue carbon ecosystem conservation and restoration. It outlines strategic entry points into financing projects and enterprises, clarifies the roles different institutions can play, and highlights the enabling interventions needed to unlock private finance.

The paper was developed through extensive expert engagement and a series of multistakeholder regional and global consultations convened by the Forum. While it is hoped that this paper will be useful to readers globally, its insights and recommendations are grounded in the South-East Asian context – a region with globally significant blue carbon ecosystems, and the central locus of the Forum's Blue Carbon Action Partnership programme. South-East Asia has almost 50,000 $km^2$ of mangrove cover, equating to one-third of all mangroves globally. Indonesia alone has 21% of the world's mangroves.[9]

To ensure that they reflect ground realities, insights on the four financing avenues, key barriers and recommended interventions have been drawn from in-country workshops in Indonesia and the Philippines, and targeted discussions with project developers, financial institutions, insurers, corporates, experts and intermediaries active in blue carbon value chains.

Both countries are pioneering national blue carbon ecosystem conservation and restoration frameworks under their National Blue Carbon Action Partnerships and embedding these systems in national priorities, including through their Nationally Determined Contributions (NDCs). They are thereby providing opportunities for engagement in credit markets, and creating linkages to support coastal community well-being and livelihoods. Lessons from the region can inform a global model for mobilizing capital towards high-integrity blue economy investments.

## 1.1 Growing momentum for financing blue carbon ecosystems

The momentum to scale financing for blue carbon ecosystems is accelerating across coalitions, philanthropy, corporates, governments and private investors. Cross-sector platforms such as the Mangrove Breakthrough have mobilized global endorsement to channel billions towards large-scale mangrove protection and restoration by 2030, bringing together governments, financial institutions and community implementers around shared targets.[10] Similarly, the Ocean Resilience and Climate Alliance, launched at the 2023 climate conference COP28 with substantial initial commitments to advance ocean-based climate solutions – including blue carbon restoration – has rapidly expanded its funding base.[11]

Non-governmental and philanthropic organizations continue to play a catalytic role in project development, technical assistance and early-stage risk reduction. Organizations including Rare,[12] The Nature Conservancy,[13] Wetlands International,[14] World Wildlife Fund[15] and Conservation International[16] are advancing field-level implementation and pipeline development. Philanthropic actors such as the UBS Optimus Foundation's UBS Climate Collective[17] and the Moore Foundation[18] are supporting targeted initiatives that strengthen data, traceability and sustainable aquaculture practices linked to blue carbon ecosystems.

Corporate participation is also strengthening demand signals and capital deployment. Salesforce has committed commercial capital to purchase significant volumes of blue carbon credits,[19] while the Symbiosis Coalition is pooling corporate capital to create predictable demand for high-quality nature-based carbon removal projects.[20] These commitments help reduce early-stage risk and improve project bankability.

Governments and multilateral institutions are expanding dedicated facilities and blended finance platforms. Initiatives such as the Blue Natural Capital Financing Facility, the Blue Carbon Accelerator Fund, the United Kingdom's COAST Facility,[21] and the Blue Action Fund[22] are channelling public and concessional capital towards marine conservation, climate adaptation and sustainable coastal livelihoods, often in partnership with development finance institutions and implementing agencies.

Private investors are increasingly structuring vehicles that link conservation outcomes with commercial returns. The Global Fund for Coral Reefs[23] combines a grant fund and an investment fund to reduce stressors on coastal habitats, while Oceans Finance Company has demonstrated innovative structuring through sovereign debt-for-nature swaps that finance long-term marine protection.[24] The Outrigger Impact Fund further illustrates growing appetite for debt and equity investments in blue economy projects, particularly in Small Island Developing States, supported by development finance partners.[25]

However, finance is not currently flowing at either the pace or the scale that is required to both protect standing blue carbon ecosystems from the myriad threats they face and to restore the blue carbon ecosystems that have already been lost. Further, while public, concessional and philanthropic finance remain critical for creating the enabling conditions for investment and de-risking transactions – particularly early in the project life cycle – commercial finance is critical to investments in blue carbon ecosystem conservation and to making restoration a scalable investment theme.

## 1.2 Avenues for scaling private finance and the cross-cutting role for financial institutions

Through a series of regional and global consultations with over 40 experts, the Forum has identified four financing avenues that show significant potential to unlock large-scale private investment into projects and enterprises that support the conservation and restoration of blue carbon ecosystems: credit markets, supply chains, infrastructure and insurance. These present clear opportunities for private participation and offer pathways to integrate blue carbon ecosystems into existing financial products, portfolios and risk management frameworks.

Across these four financing avenues, there are three inter-related but distinct roles that financiers can play in scaling private finance flows.

TABLE 1 **Four financing avenues**

| Credit markets | Supply chains | Infrastructure | Insurance |
|---|---|---|---|
| Credit markets are currently the most advanced financing avenue, with established carbon accounting methodologies and a growing set of projects generating revenue through the sale of blue carbon credits. | Supply chain finance is emerging as a promising but fragmented channel for sustainability-linked instruments, particularly in sectors that directly interface with blue carbon ecosystems. | There is significant potential for coastal infrastructure to integrate blue nature-based solutions, given their strong resilience and risk-reduction properties – but this practice has not yet been largely explored. | Insurance mechanisms, though still nascent, are advancing rapidly as insurers continue to explore nature-linked insurance products and leverage the resilience benefits offered by blue carbon ecosystems. |

TABLE 2 **Financiers' roles in scaling private finance**

| | |
|---|---|
| **Deploying direct finance** | Direct finance involves the deployment of capital into projects or enterprises that deliver measurable blue carbon ecosystem outcomes alongside financial returns. This includes instruments such as project-level loans, equity, revenue-based financing and forward offtake agreements where performance is linked to verified blue carbon or sustainability outcomes. Direct finance transactions sit closest to the underlying assets and activities on the ground, providing the highest level of control and influence over project execution, and the most direct exposure to both risks and returns.<br><br>**Illustrative channels for engagement:** Project finance teams within commercial banks, impact funds, private equity investors, corporate balance-sheet investors and specialized natural capital funds. |
| **Structured finance** | Structured finance refers to the role that financial institutions play in designing, underwriting, aggregating and distributing financial vehicles that channel capital towards blue carbon ecosystems. This includes thematic or sustainability-linked bonds, blended finance facilities, pooled project vehicles, guarantees and other mechanisms that connect concessional, public and private investors and incorporate blue carbon objectives in investments. In this role, financial institutions act as intermediaries – streamlining transaction execution, standardizing structures and packaging smaller transactions into investable products. Structured finance is essential for building investor confidence and translating small, fragmented or early-stage opportunities into channels that institutional investors can access.<br><br>**Illustrative channels for engagement:** Investment banks, impact funds, development finance institutions, multilateral development banks and insurance-linked securities teams. |
| **Enabling finance** | Enabling finance encompasses both the deployment of catalytic capital and market-building actions to create the conditions for investment in blue carbon ecosystems. While building the enabling environment often relies on concessional and philanthropic funding, private financial institutions can support by providing financing for data, measurement and verification systems; supporting market infrastructure; and funding early-stage project development. Equally important are market-enabling activities, including advisory and capacity-building support to governments and developers, participation in standard-setting initiatives, and advocacy for integration of blue carbon ecosystems into sustainable finance taxonomies, ESG disclosure frameworks and credit risk models. By bridging policy, technical and financing gaps, enabling finance reduces risk, expands the investable pipeline and strengthens the market confidence needed for commercial capital to scale.<br><br>**Illustrative channels for engagement:** Philanthropic arms of financial institutions, corporate sustainability teams, development finance institutions, foundations, family offices and early-stage catalytic capital funds. |

## The role of small and medium-sized enterprises (SMEs)

In the ASEAN region, SMEs represent more than 99% of firms and drive employment and economic growth. Although blue economy data remains limited, coastal SMEs in fisheries, aquaculture, tourism and agriculture interface directly with blue carbon ecosystems.

While SMEs rarely access institutional capital directly, they are essential to the success of blue carbon financing. In particular, they are often the primary counterparties for practice change in supply chains and an increasingly important delivery partner in credit markets. Channelling finance to and through SMEs is critical to enabling durable conservation and restoration.

For private financial institutions, enabling SME participation offers scale through aggregation. In practice, this means: (i) deploying direct finance that reaches SMEs through fit-for-purpose working capital and transition finance; (ii) structuring finance that aggregates SMEs into platforms, funds or other vehicles, and use guarantees or first-loss capital to de-risk cash flows; and (iii) providing enabling finance.

Enabling finance funds feasibility, tenure and permitting, certification readiness, and technologies to enhance monitoring, verification and reporting – so SMEs can then qualify for more mainstream financial products. Building SME-ready transaction structures increases investability, reduces delivery risk and ensures benefits flow to the local communities most directly connected to blue carbon ecosystems.

# 2 Financing avenues

## 2.1 Credit markets

Credit markets are one of the most mature and recognizable pathways for channelling private investment into blue carbon ecosystems.[26] Credit markets serve to unitize, verify and monetize particular ecosystem services provided by blue carbon ecosystems. Given the nascency of biodiversity credit markets, and particularly marine biodiversity credits,[27] this summary will primarily focus on financing avenues for blue carbon ecosystems through carbon credit markets, but many of its insights will equally apply in the context of biodiversity credits.

TABLE 3 **Financing through carbon credit markets**

| Dimension | Summary | Classification |
|---|---|---|
| **Market maturity** | Carbon credit markets are among the most established blue carbon finance pathways (though market maturity varies significantly by jurisdiction). Standardized methodologies exist for mangrove conservation and restoration under major standards (e.g. Verra, Plan Vivo), though pipeline and liquidity remain limited. | High |
| **Risk exposure** | Early-stage projects often face regulatory, delivery and verification risks, but potential returns are attractive when credit prices are strong and permanence assured. | High |
| **Return potential** | Premium pricing for blue carbon credits reflects strong demand for high-integrity, nature-based removals with significant core benefits to communities beyond carbon removal. | High |
| **Dependence on concessional finance** | Early-stage concessional capital remains critical to absorbing project preparation costs and de-risking initial investments before credit issuance. | Medium-High |
| **Typical ticket size** | Individual projects typically require $5-20 million; larger portfolios or funds can exceed $50 million. Costs required to implement blue carbon projects often also involve elements of funding local SMEs and community-scale activities, beyond restoration costs. To attract private capital, smaller-scale projects need aggregation to reach the required scale. | Low-Medium |

### The opportunity and role for private finance

For investors seeking both impact and financial returns, blue carbon projects represent an emerging investment theme with strong growth potential. When carefully structured and rigorously executed, these projects can generate risk-adjusted returns supported by high-quality blue carbon credits – particularly where credible MRV frameworks and long-term offtake arrangements are in place.

As concessional and philanthropic capital continue to play an important catalytic role in blue carbon credit markets, the most commercially viable opportunities for private finance in the near term lie in blended finance structures that combine private investments with results-based payments or pre-purchase agreements from corporates seeking high-quality carbon credits offsets.

Table 4 outlines the barriers preventing private finance flows into blue carbon ecosystems, and Table 5 suggests ways to overcome these.

CASE STUDY 1

## Yayasan Gajah Sumatra (Yagasu): Layering carbon finance to scale blue carbon restoration in Indonesia

Since 2001, Yagasu, an Indonesian NGO, has led community-based initiatives advancing biodiversity conservation, climate resilience and sustainable livelihoods across coastal Sumatra, Java and Sulawesi. With project partners, Yagasu has developed a number of mangrove carbon projects that have registered, or are seeking registration, with carbon standards to issue carbon credits. This includes an 8,750-hectare mangrove restoration project in Aceh and North Sumatra with Livelihoods Fund,[28] an 8,000-hectare mangrove restoration and conservation project with the Global Mangrove Trust,[29] and a mangrove project with Apolownia that Yagasu expects to list with Verra.[30]

Yagasu's model demonstrates how multilayered financing can de-risk investment and sustain project viability over decades. The initiative stacks multiple capital sources, including carbon finance alongside philanthropic capital and technical assistance grants. These diversified capital sources support a resilient revenue stream, which, in turn, enables investors across the risk-return spectrum to participate via:

- Technical assistance grants that fund adaptation and women's empowerment programmes.
- Carbon credit revenues structured to provide financing and long-term offtake agreements that generate a 30-year revenue base linked to verified climate outcomes. This creates stable cash flows that are more aligned with private capital providers' expectations.
- Supplementary income generated from mangrove and coastal by-products, including seafood production (crabs, fish, shrimp, oysters), as well as honey, handicrafts and eco-tourism ventures.

Yagasu's model demonstrates the power and financial durability gained by integrating carbon markets with tangible local benefits – empowering women, improving livelihoods and facilitating trade in new sustainable products.

TABLE 4 | **Barriers to private finance flows**

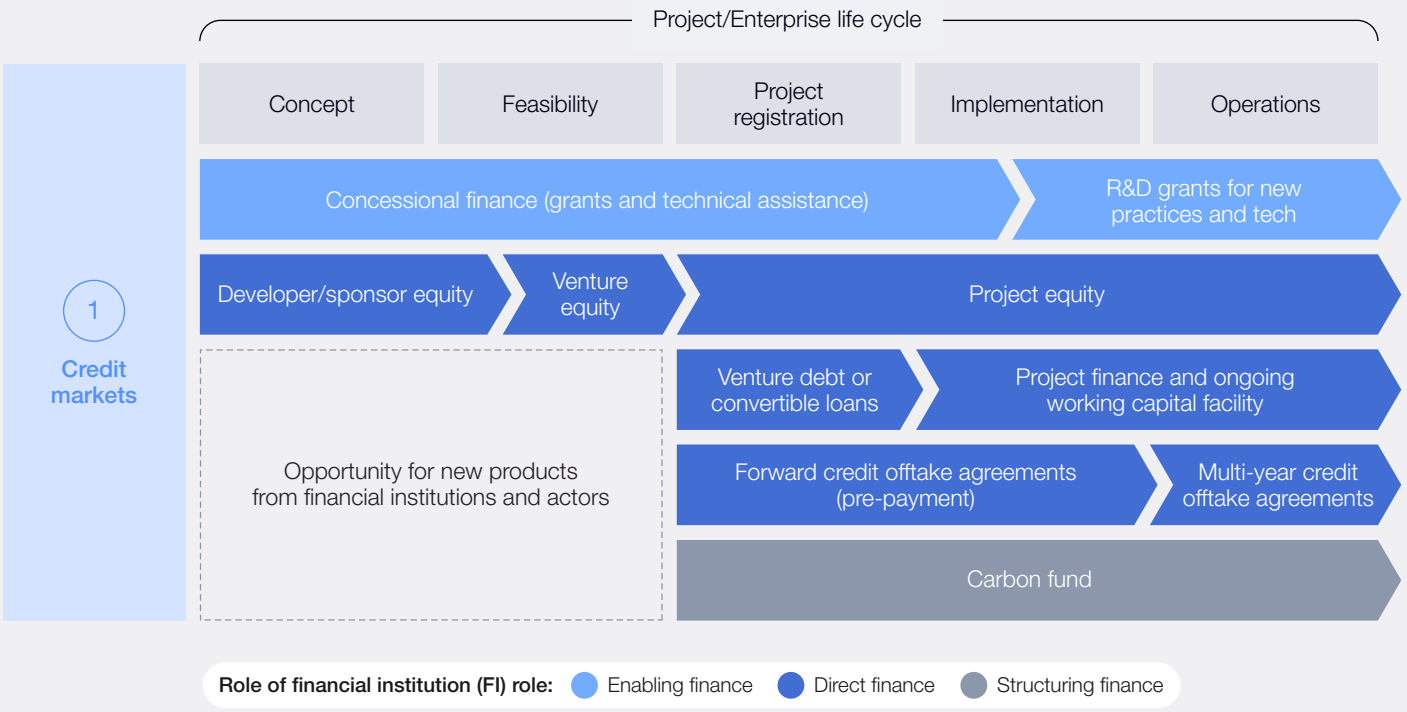
| | |
|---|---|
| **Project delivery risks** | Blue carbon projects are complex and require project developers to navigate a suite of project delivery risks. Though many of these risks can be mitigated through effective management, they collectively pose a barrier to private finance flows. These risks include:<br><br>Risks associated with the host country's regulatory framework including unclear land tenure regimes, complex permitting requirements with overlapping and/or siloed jurisdiction between different levels of government and/or between government agencies, and carbon markets policy uncertainty.<br><br>The technical project implementation challenges inherent to blue carbon ecosystems include site access and vulnerabilities to climate risks.<br><br>Stakeholder engagement and support are essential, given that blue carbon projects are often located where ongoing access and use of resources is required from adjacent communities. Close involvement, or ideally, leadership, from local communities in project design and implementation, as well as financial and other benefits flowing to communities, are critical to managing these risks. |
| **Project costs, revenue generation potential and return timeframes** | The financial profile of carbon projects can present barriers for securing investment from private financiers seeking near-term, commercial-grade returns:<br><br>Significant upfront capital expenditure (capex) is required to undertake pre-feasibility and feasibility assessments, develop project design documentation aligned with carbon credit standards, undertake on-ground interventions, and, importantly, build the community trust, buy-in and capability that is vital for projects to be durable.<br><br>Particularly for restoration project types, there can be a significant lag between pre-feasibility expenditure and revenue generation from credit sales. This process can take 5-10 years.<br><br>Carbon credit prices are highly dynamic and determined by project profile and jurisdictional factors outside developers' control. In some instances, revenue solely from blue carbon credit sales may not be sufficient to cover project costs. |
| **Misaligned project finance needs and minimum ticket sizes** | The project finance needs of many blue carbon projects are often below private financiers' minimum ticket sizes, particularly where activities are implemented by multiple SMEs or community-based organizations and are not aggregated into a streamlined operation. Some blue carbon project developers report falling into the "missing-middle" between philanthropic and commercial finance. |
| **Challenges in meeting debt financing requirements** | Debt financing for blue carbon projects remains particularly challenging, as most developers – especially those yet to reach first credit issuance – cannot offer the kind of security package lenders typically require. As project developers often do not own project sites, they cannot pledge them as collateral. Securing debt requires long term (7-10 years) forward commitments from offtakers, which can be challenging to secure, particularly for SME- or community-led projects with limited collateral and credit history. |
| **Shortage of skilled professionals** | Blue carbon projects and enterprises require inputs from skilled professionals across blue finance, project development and implementation, project design, monitoring and reporting, as well as sales and marketing. Shortages of these skilled professionals within countries can restrict project pipeline development and scaling. |

TABLE 5 | **Recommended solutions**

| | |
|---|---|
| **Direct finance** | Offer credit offtake commitments once projects have completed foundational development milestones and are on a clear timeline to credit issuance.<br><br>Make equity investments to gain control and influence project development decisions.<br><br>Provide project-level loans structured, where possible, to accommodate project finance challenges.<br><br>Design project funding instruments for blue carbon projects where SMEs or community groups are project proponents – similar to the concept of social forestry – tied to verified project milestones but without taking on unsustainable balance sheet risk. |
| **Structured finance** | Establish carbon funds and platforms to aggregate project finance needs and coordinate finance at a platform level to meet minimum ticket sizes and diversify risk across multiple projects, including portfolios of SME- and community-led interventions. |
| **Enabling finance** | Offer concessional and philanthropic finance to support and de-risk early project stages to unlock other capital sources (e.g. guarantees from development finance institutions can unlock bank lending). |

These interventions are likely to be sequenced across the life cycle of a project. Not all forms of finance will necessarily be required for projects to be commercially viable and the appropriateness of each will be dictated by a project's commercial and operating context.

FIGURE 1 **Types of capital that can advance credit market projects at different stages of project life cycle**




**Source:** Pollination Group

## 2.2 Supply chains

Supply chains represent a powerful pathway for mobilizing private finance into blue carbon ecosystems. Credit markets monetize discrete ecosystem services such as carbon sequestration and the various provisioning ecosystem services provided through the maintenance of biodiversity.

In contrast, supply chain financing can integrate blue ecosystem conservation and restoration within the business models and supply chains of fisheries, aquaculture, agriculture and coastal industries that significantly depend on them.

TABLE 6 **Mobilizing private finance through supply chains**

| Dimension | Summary | Classification |
|---|---|---|
| **Market maturity** | Supply chain financing linked to sustainable aquaculture practices in blue carbon ecosystems is at an emerging stage. Early commercial pilots demonstrate viable models that integrate restoration into production, but investment flows remain fragmented across networks of smallholder producers and coastal SMEs, and most deals are still at pilot or proof-of-concept stage. | Medium-low |
| **Risk exposure** | Blue carbon-linked supply chains face high physical and market risks due to climate shocks, disease outbreaks and ecosystem degradation. Fragmented and small-scale producer networks increase vulnerability, but integrating ecosystem restoration and risk-sharing mechanisms (e.g. guarantee facilities, buyer-backed sourcing contracts) can significantly reduce risk exposure. | High |
| **Return potential** | Financial returns come from improved productivity (e.g. restored mangroves enhancing shrimp yields), lower maintenance costs and access to premium markets that reward verified sustainability and biodiversity outcomes. Upside potential may increase as ecosystem performance data becomes more standardized and buyers commit to long-term, sustainable sourcing. | Medium |
| **Dependence on concessional finance** | Projects/enterprises rely on concessional and philanthropic capital to fund early pilots, de-risk SME lending, and build data and certification systems. Dependence should decrease over time as the market matures. | High |
| **Typical ticket size** | Transactions typically range from $0.5-10 million for working capital, sustainability-linked lending depending on size of order book or blended trade finance facilities supporting small- and mid-scale producers. Aggregated regional platforms or export-oriented funds have more potential to scale and can reach $20-50 million. | Low-medium |

### The opportunity and role for private finance

In many coastal sectors, supply chains are built on thousands of SMEs, rather than a few large, vertically integrated firms. This SME base is both a constraint and an opportunity. On one hand, it increases fragmentation and perceived credit risk of supply chain investments in the blue economy. On the other, it offers an opportunity to aggregate and deploy financing in ways that promote sustainable practices at scale.

Beyond risk mitigation, investment in improving sustainable practices in blue supply chains can present a significant commercial opportunity to access premium product markets. There is also evidence that the introduction of sustainable practices can directly improve yields, lower maintenance costs and increase resilience to production disruptions such as diseases (see case study 2).

CASE STUDY 2

## From shrimp to stewardship: How Blueyou is turning restoration into an investable supply chain model

Blueyou is developing commercially viable aquaculture models that integrate mangrove restoration into seafood supply chains across a number of South-East Asian countries, including Indonesia, Viet Nam and the Philippines. The company operates through both an impact arm, which designs and implements sustainable fisheries and aquaculture systems, and a commercial arm, which brings those products to international markets.

Its flagship Selva Shrimp programme in North Kalimantan, Indonesia, has a demonstrated track record in restoring mangroves in aquaculture ponds while increasing shrimp productivity by 70-100 per cent without additional inputs or costs. A parallel initiative in the Philippines works with small-scale tuna producers to improve traceability, certification and market access. Together, these initiatives demonstrate that ecological restoration and commercial performance are mutually reinforcing. Blueyou's model is impact-focused with a clear link to an addressable market, achieving economic self-sufficiency quickly through revenues generated by product sales and avoiding long-term reliance on philanthropic funds.

Blueyou provides enabling finance and technical assistance to help farmers increase their incomes, formalize land tenure and prepare for certification; structuring finance through group certification schemes and blended finance partnerships that de-risk smallholder lending; and direct finance by establishing long-term, non-extractive sourcing agreements with seafood buyers. Blueyou is supporting farmer cooperatives in the Selva Shrimp Indonesia Programme to achieve Aquaculture Stewardship Council (ASC) group certification by 2026, adapting standards to the realities of smallholders, and aligning local production with export-market requirements. By embedding restoration directly in established seafood markets, Blueyou's model illustrates a credible pathway for financiers to back bankable, regenerative production systems that deliver both natural-capital gains and durable returns.

Despite growing momentum, several structural and market barriers continue to limit the flow of private finance into blue carbon ecosystems through supply chains. These constraints affect both the incentives for supply chain investment and the investment readiness of coastal producers and enterprises.

**Image credit:** BlueYou

TABLE 7 | **Barriers to private finance through supply chains**

| | |
|---|---|
| **Lack of compelling business case for investment and practice change** | In many sectors, the commercial rationale for transitioning to sustainable production remains underdeveloped. SMEs and small-scale producers often operate on thin margins, and while sustainable practices can improve long-term resilience, they may entail higher short-term costs and uncertain market premiums. Without consistent market demand or sufficient risk-sharing mechanisms, there are limited incentives for producers and upstream purchasers to adopt and finance sustainable practice change. |
| **Industry certification standards not suitable for smallholder producers and SMEs** | Most industry certification systems were designed for medium to large enterprises, making them difficult to access or costly for small and micro-scale producers. This creates barriers for financiers who rely on certification to assess eligibility for disbursing financing, increasing transaction costs and excluding smallholders – which form much of the supply base – from access to capital. Fragmented supply chains also make monitoring, reporting and verification (MRV) of environmental and social outcomes difficult. |
| **Ambiguous tenure and informal business structures** | A lack of formal land tenure, operating licences and legal business status remains a fundamental barrier in many coastal regions as proof of legality and business permits are prerequisites for most certification and financing processes. While government programmes to assist smallholders to formalize land ownership exist, they are often administratively burdensome for smallholders. |
| **Infrastructure and market access deficits** | Many blue ecosystem commodities rely on cold-chain logistics and efficient transport. Gaps in storage, processing and transport infrastructure limit access to higher-value markets that reward sustainable practices, thereby compromising the business case for financing improvements in sustainable practices. |

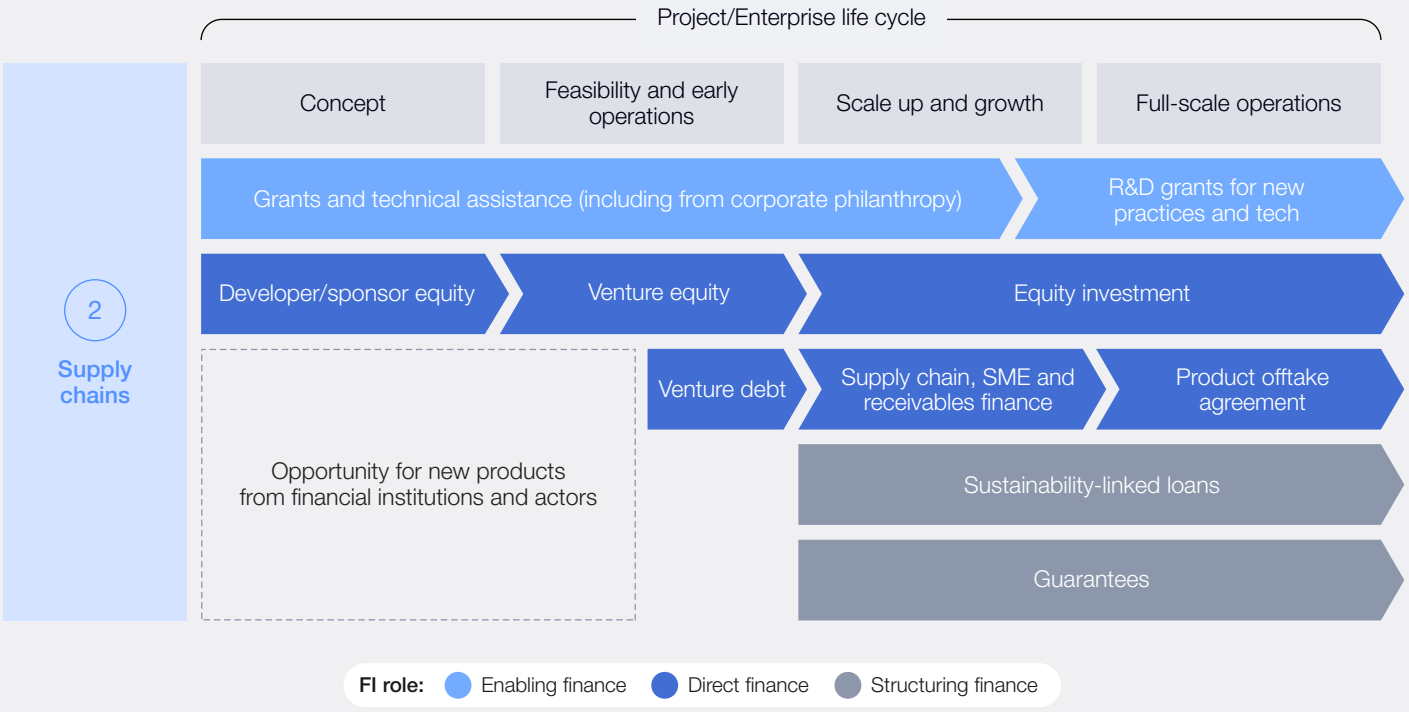
TABLE 8 | **Solutions to unlock finance flows through supply chains**

| | |
|---|---|
| **Direct finance** | Embed sustainability conditions in loans, trade finance and offtake agreements that tie capital terms to verified outcomes for blue supply chains. This practice also serves to support de-risking due to more resilient production practices.<br><br>Provide targeted working capital and transition finance for small and mid-scale producers and coastal SMEs in the blue supply chain. Doing so broadens a financier's investible universe while supporting inclusive growth.<br><br>Provide long-term, non-predatory offtake models from upstream purchasers to offer certainty to suppliers on the value of transitioning to sustainable practices. This mitigates the purchaser's climate and nature risk and potentially provides access to premium markets and sustainable finance.<br><br>Fund capex for acquisition of equipment required for sustainable post-harvest handling, storage and cold-chain logistics, helping producers access premium aquaculture markets. |
| **Structured finance** | Structure instruments such as sustainability-linked loans, trade finance, guarantees and blended finance to tie capital costs/terms to measurable outcomes.<br><br>Provide guarantee facilities to reduce perceived default risks for sustainable producers and SME borrowers, thereby enabling lenders to competitively price credit for transition to sustainable operations. |
| **Enabling finance** | Provide concessional, philanthropic or technical assistance to support pilots, certifications, capacity building and upfront investment in sustainable aquaculture practice change from production through to post-harvest.<br><br>Work with local financial institutions to deploy SME-focused lending products, using guarantees, first-loss capital or technical assistance to reduce risk and expand their ability to finance coastal producers. This strengthens delivery channels and catalyses broader market participation over time. |

↓ **Image credit:** The Earthshot Prize

Various financial solutions can serve to unlock private finance flows to conservation and restoration projects in blue carbon ecosystems via supply chains.

FIGURE 2 | **Types of capital to advance supply chain projects at different stages of project life cycle**




**Source:** Pollination Group

# 2.3 Infrastructure

Infrastructure development presents both risks and opportunities for financing blue carbon ecosystems. These ecosystems can act as natural infrastructure, providing cost-effective protection and long-term resilience to coastal communities. Mangroves, seagrasses and tidal wetlands buffer coastlines against storm surges, stabilize sediments and reduce coastal flooding, offering cost-effective alternatives to seawalls and levees.

Incorporating such "coastal blue infrastructure" into development can reduce capital and maintenance costs and, potentially, insurance premiums while delivering significant additional benefits in the form of carbon sequestration and biodiversity conservation.

TABLE 9 **Using infrastructure to finance blue carbon ecosystems**

| Dimension | Summary | Classification |
|---|---|---|
| **Market maturity** | The integration of blue carbon ecosystems into infrastructure design is at an early stage but is gaining momentum as investor and government interest in hybrid blue-grey infrastructure models is rising. | Low |
| **Risk exposure** | Early-stage risk is high, reflecting data gaps, limited precedents and policy bias towards hard infrastructure. However, once implemented, blue carbon ecosystems can notably reduce physical risks, improving asset resilience and lowering long-term loss ratios for investors and insurers. Further, given that infrastructure is an established asset class, existing financial products/guarantees are available to de-risk investments. | Variable |
| **Return potential** | Returns derive from reduced operating expenditure (opex) and capex (relative to grey solutions), avoided losses from natural hazards and long-term asset resilience. Monetizable additional benefits (e.g. carbon credits through mangrove restoration) can enhance returns, though revenue models are still emerging. | Medium |
| **Dependence on concessional finance** | These projects are highly dependent on catalytic and concessional capital to fund technical feasibility, environmental valuation and demonstration projects to prove cost-effectiveness, update engineering standards and crowd-in commercial and institutional finance. Dependence is expected to decline as standards mature and governments incorporate blue infrastructure into procurement frameworks. | High |
| **Typical ticket size** | Blue-grey infrastructure projects typically require $100m+, depending on scope, scale and complexity (e.g. inter-island or in contiguous coastal area). | High |

## The opportunity and role for private finance

For financiers, the opportunity lies in redefining infrastructure investment to incorporate the climate resilience benefits of blue carbon ecosystems. Growing appreciation from sovereigns, municipalities and private developers of the need for climate-resilient infrastructure and the effectiveness of nature-based infrastructure solutions creates a pipeline of potential investments that integrate natural assets with built assets.

Many of the design, construction and maintenance services for such projects are delivered by local SMEs, such as engineering firms, local contractors and other service providers, meaning that blue infrastructure investment can also direct value into local economies and strengthen community-level resilience.

CASE STUDY 3

## EcoShape and Wetlands International: Redefining coastal infrastructure by "Building with Nature"

EcoShape, a Dutch foundation, and Wetlands International, a global NGO, are demonstrating how nature-based infrastructure can deliver climate resilience, biodiversity gains and improved community livelihoods through financially viable models. Operating as a consortium of 15 partners – including government parties, engineering consultants, knowledge institutes, contractors and NGOs – EcoShape and Wetlands International's Building with Nature Indonesia project in Demak, Central Java, integrates mangrove restoration with engineered sediment-trapping structures built from locally sourced bamboo and wood. These semi-permeable barriers slow waves, capture sediment and create the right conditions for natural mangrove regeneration – thereby achieving long-term coastal protection at lower cost than conventional sea walls.[31]

The project employs a "bio-rights" financing mechanism that directly links community engagement with conservation outcomes. Local households receive small loans to develop sustainable aquaculture and other income-generating activities; once restoration targets are met, the loans convert into grants. This model creates clear, performance-based incentives for community participation while aligning ecological restoration with livelihood security. Embedded in the work plan of the Indonesian Ministry of Marine Affairs and Fisheries, the approach has now been replicated in the Philippines, Viet Nam and Sri Lanka, demonstrating its scalability and policy influence across Asia.

These experiences illustrate the financing interventions and enabling conditions needed to mainstream blue nature-based infrastructure. Enabling finance through development and philanthropic capital helped de-risk early community engagement and pilot hybrid structures. Structured finance solutions were used in raising long-term maintenance and monitoring funds – currently absent from most public budgets – to support project durability. At the direct finance level, they integrated hybrid coastal protection into procurement pipelines and public-private partnerships, to help mobilize institutional investors seeking resilience-linked returns. The project demonstrates that combining infrastructure and financial solutions with ecosystem restoration and community incentives can deliver durable coastal resilience outcomes.

Though the integration of blue infrastructure solutions into coastal infrastructure design has the potential to deliver significant and multidimensional benefits, a number of barriers currently inhibit their uptake and, consequently, their capacity to attract private finance flows.

**Image credit:** Nanang Sujana/Wetlands International

TABLE 10 | **Barriers to private finance flows in infrastructure**

| | |
|---|---|
| **Lack of awareness of available solutions** | At a threshold level, coastal blue infrastructure solutions must compete with well-established grey infrastructure models. Many actors across the infrastructure value chain – governments, asset owners, financiers, insurers, design, engineering and construction firms, including local SMEs – are unaware of the coastal blue infrastructure options available and the benefits of integrating them into coastal infrastructure assets. |
| **Government planning and procurement prioritization of grey infrastructure** | Many national infrastructure plans and government procurement systems are attuned to established grey infrastructure solutions. Without their explicit recognition in infrastructure planning and tender processes, coastal blue infrastructure solutions may not qualify for public financing or public-private partnership (PPP) structures nor secure required permits or approvals from government. Further, cost-benefit analyses to select infrastructure solutions often do not involve adequate consideration of the significant, long-term additional benefits provided by coastal blue infrastructure solutions, including potential carbon credits, climate mitigation, biodiversity maintenance and livelihoods benefits.[32] |
| **Data and research gaps** | Grey infrastructure models are highly predictable, with design and material decisions informed by well-understood engineering standards.[33] Though evidence is building, comparatively little research into the effectiveness and longevity of coastal blue infrastructure solutions is available across geographies and different use cases.[34] |
| **Lack of integration into engineering standards and codes** | Related to the above, coastal blue infrastructure is often not integrated into engineering standards, codes and practice guides.[35] Beyond providing the technical pathway to mainstream coastal blue infrastructure solutions, inclusion in these standards and codes is critical for design, engineering and construction firms to manage their own risk and liability when advising on the integration of these solutions into coastal infrastructure assets. |
| **Comparatively unfamiliar opex and capex cost curves** | Coastal blue infrastructure solutions are likely to have capex and opex profiles that are unfamiliar to investors and financiers, who in turn are used to grey infrastructure cost curves. While grey infrastructure will generally have high upfront capex and relatively low opex (until decommissioning and replacement), coastal blue infrastructure often has comparatively lower upfront capex, but higher ongoing opex requirements for monitoring, adaptive management and maintenance. Also, grey infrastructure eventually diminishes in effectiveness and requires decommissioning and replacement, while well-designed and maintained coastal blue infrastructure can be resilient and self-sustaining. |

TABLE 11 | **Solutions to unlock private finance in blue infrastructure**

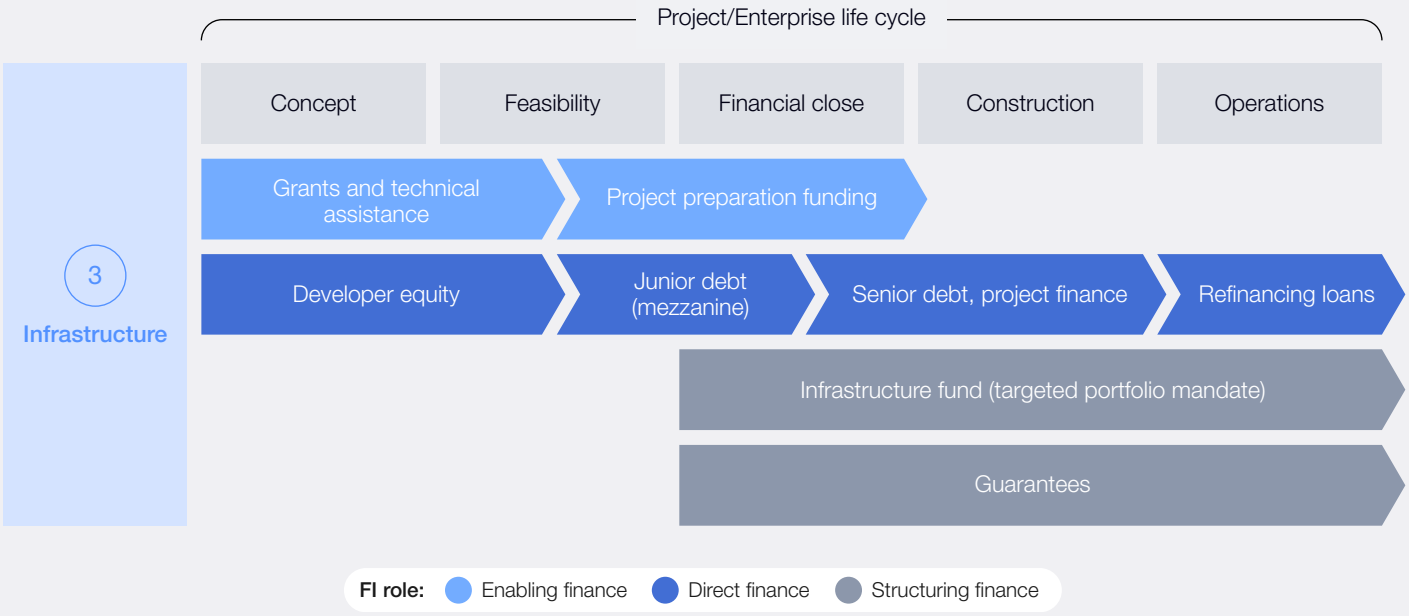
| | |
|---|---|
| **Direct finance** | Design sustainability-linked loans for asset owners deploying/integrating coastal blue infrastructure solutions into assets.<br><br>Enable equity participation in hybrid blue-grey infrastructure projects that embed blue carbon ecosystems to enhance resilience to physical climate risks.<br><br>Provide tailored working capital for local SME contractors and service providers engaged in the design, construction and maintenance of coastal blue infrastructure, helping to build a reliable delivery ecosystem around these assets.<br><br>Implement performance-based financing (akin to energy savings performance contract) where investors fund blue-grey upgrades and are repaid through verified savings such as reduced maintenance costs, avoided losses or insurance premium reductions. |
| **Structured finance** | Arrange or underwrite blue or sustainability-linked instruments or blended finance vehicles that allocate proceeds towards blue carbon-aligned infrastructure.<br><br>Design thematic infrastructure bonds explicitly including/targeting coastal blue infrastructure solutions.<br><br>Aggregate small/fragmented project sites to meet minimum ticket thresholds. |
| **Enabling finance** | Provide catalytic concessional capital to support mainstreaming of coastal blue infrastructure solutions, building technical capacity and investor confidence.<br><br>Extend concessional or catalytic finance for feasibility studies, early-stage pilots and valuation of blue carbon ecosystem services in key areas for new infrastructure, and the integration of blue carbon ecosystem values into infrastructure design standards. |

## Financial solutions to unlock private finance flows

Various financial solutions can serve to unlock private finance flows to blue nature-based infrastructure.

These interventions are likely to be sequenced across the life cycle of a coastal blue infrastructure project. As noted above, the appropriateness of each finance intervention will be dictated by a project's commercial and operating context.

FIGURE 3 | **Types of capital to advance infrastructure projects at different stages of project life cycle**




**Source:** Pollination Group

# 2.4 Insurance

The investment factors considered for the other financing avenues (risk exposure, return potential, typical ticket size and dependence on concessional finance) have not been included for this section as insurance operates differently to the other financing avenues.

The use of insurance and risk-transfer instruments to de-risk blue carbon ecosystem investments remains at an early stage of market development, with only a handful of pilots globally – such as The Nature Conservancy's Coral Reef Insurance in Mexico, RARE and WTW's parametric insurance solution for small-scale fishers in the Philippines[36] and RISCO's mangrove insurance pilots in the Philippines (see case study 4 below).

However, momentum is building rapidly. Insurers, reinsurers, development finance institutions and multilateral development banks are increasingly exploring how the risk-reduction value of mangroves, seagrasses and tidal wetlands can be integrated into underwriting practices, resilience bonds and blended finance mechanisms.

TABLE 12 **Use of insurance to channel private finance into blue ecosystems**

| Dimension | Summary | Classification |
|---|---|---|
| **Market maturity** | The use of insurance and risk-transfer instruments to finance or de-risk blue carbon ecosystems is nascent, with only a handful of pilots globally (e.g. The Nature Conservancy's Coral Reef Insurance in Mexico and RISCO's mangrove insurance pilots in the Philippines). However, interest is rising among insurers, reinsurers, DFIs and multilateral development banks seeking scalable climate-resilience models. | Low |

## The opportunity and role for private finance

Insurance has a critical role in both creating and enabling private finance flows into the conservation and restoration of blue carbon ecosystems. As demonstrated below, insurance can serve both as an independent financing avenue and as a fundamental enabler for credit markets, supply chain finance and infrastructure.

TABLE 13 **Role of insurance**

### Insurers financing blue ecosystem conservation and restoration as a means to reduce their financial liability and moderate premiums

Blue carbon ecosystems are highly effective in reducing climate and nature-related risk. These services reduce payouts and moderate premiums, improving loss ratios and supporting product viability. However, several challenges weaken the business case:

Risk-reduction benefits are public goods, meaning insurers investing in blue carbon conservation share benefits with non-paying beneficiaries.[37]

Incorporating nature-based risk reduction into underwriting depends on quantifying avoided insured losses, which is not yet established practice.

Insurers' capacity to appropriately incorporate nature-based risk reduction into their underwriting practices is contingent on being able to quantify avoided insured losses provided by natural systems.[38] Though research has sought to facilitate this, it is not yet established practice.[39]

Insurers will only be incentivized to consider direct investments of this nature where there is a high geographic concentration of insured, high-value assets.

### Insurers offering products to mobilize private finance

The following products can provide finance and de-risk projects:

Parametric insurance, which facilitates the rapid payout of a pre-agreed amount when certain trigger conditions are met.[40] These triggers can include specific environmental conditions or events.[41] Rapid payouts, without the need for traditional claim handling measures, offer advantages for financing immediate post-disaster damage mitigation and restoration activities, including for coastal SMEs and small-scale producers whose cash flows are highly exposed to extreme events.[42]

Carbon credit insurance can support investor confidence by providing credit purchasers or project developers with compensation in the event of certain covered risks materializing.[43] Though nascent, these insurance products are growing in momentum and importance,[44] and could likely be replicated for biodiversity credits when the market is sufficiently mature.

Insurers are also deploying existing products to de-risk nature-based debt[45] and reach previously uninsured communities (see case study 4).

### Insurers promoting and incentivizing behaviours and business practices that reduce the degradation of blue carbon ecosystems and promote restoration

Through premiums and underwriting, insurers can incentivize practices that reduce degradation and promote restoration, such as:

Green building or infrastructure insurance aligned with sustainability standards and blue infrastructure.

Sustainability-linked insurance premiums that provide businesses with premium discounts tying their impacts and/or positive contributions to blue carbon ecosystems, particularly where those activities have a nexus to their exposure to nature-related risk.[46]

Integrating nature-related resilience into risk management, underwriting and pricing,[47] leveraging insurers' influence over investment decisions.[48]

Leveraging their significant in-house expertise and climate-risk related data, insurers can also provide technical assistance to policy-makers on how blue nature-based ecosystems can reduce climate and nature-related risks.[49]

CASE STUDY 4

## From risk to resilience: How RISCO is turning insurance into a driver for blue carbon restoration

The Restoration Insurance and Financial Service Company (RISCO) is pioneering an integrated model that links insurance, lending and blue carbon restoration to strengthen the resilience of coastal communities in the Philippines. RISCO operates as a quasi micro-finance provider, pairing parametric insurance with low-interest loans, whereby repayment is linked to revenue generation instead of fixed schedules. RISCO's model is centred on community-level interventions: partnering with universities such as the Western Philippines University to offer borrowers technical support, offering legal support and partnering with governments to assist borrowers to navigate permit and formalization processes, and partnering with supply chain actors to secure market access. RISCO's lending activities target small coastal businesses and aquaculture operators, and it typically offers finance in the order of ~$25-50,000.

To finance its blue carbon and lending activities, RISCO uses philanthropic and internal capital as a first-loss tranche, seeking to attract impact investors targeting fixed, risk-adjusted returns. Premium revenues received by its insurance arm feed into its lending activities. RISCO is working with municipalities in Puerto Princesa to earmark a portion of their mandated disaster-risk budgets for parametric insurance premiums, creating a repeatable, public-private funding loop for resilience.

RISCO's experience highlights both the challenges and opportunities in leveraging insurance for blue ecosystem finance. While direct insurer funding for restoration remains elusive, bundled, community-oriented financial products can overcome affordability barriers and create investable pathways for resilience.

Despite growing recognition of the protective and financial value of blue carbon ecosystems, insurance-linked finance remains in its early stages. A combination of technical, regulatory and market barriers continues to limit the scale-up of ecosystem-linked insurance products.

**Image credit:** RISCO

TABLE 14 **Barriers to private finance flows towards blue carbon ecosystems through insurance**

| | |
|---|---|
| **Valuation and attribution challenges** | A fundamental barrier to scaling insurance-linked investment is the difficulty of accurately quantifying and attributing the risk-reduction value provided by blue carbon ecosystems. Downscaling research into blue carbon ecosystems' effectiveness in risk reduction into location-specific actuarial models remains complex. Without standardized approaches to measuring avoided losses and incorporating them into pricing, insurers face uncertainty in designing products and setting premiums. |
| **Limited performance data and track records** | There is limited historical data on how restored or conserved coastal ecosystems perform under extreme weather events, making it challenging to model expected outcomes or price risk accurately. Insurers who depend on robust probabilistic modelling may view this uncertainty as an unacceptable underwriting risk. This lack of performance data also constrains investor confidence in catastrophe bonds or other securitized instruments linked to nature-based outcomes. |
| **Regulatory and accounting constraints** | Insurance regulation and accounting standards in most jurisdictions have yet to integrate natural capital into solvency calculations, risk-based capital requirements or reserving frameworks. Without clear regulatory recognition of ecosystem-based risk mitigation, insurers and reinsurers have limited incentive to incorporate these benefits into product design or portfolio risk models. |
| **Transaction complexity and cost** | Designing parametric policies or other resilience-linked financial instruments requires interdisciplinary collaboration between ecologists, engineers and actuarial experts. These transactions are often bespoke and expensive to structure, limiting scalability and discouraging early market entrants. Transaction costs are particularly high for SMEs and small-scale and/or community-led projects, where potential premium savings or avoided losses may not justify the cost of product development. |
| **Misalignment of incentives and limited demand** | As noted above, the "public goods" nature of risk reduction benefits and the need for a high concentration of high-value assets to underpin insurers' business case for investing and engaging presents challenges to insurance models scaling. |

TABLE 15 **Solutions to unlock insurance finance for blue carbon ecosystems**

| | |
|---|---|
| **Direct finance** | Support pilot projects that demonstrate the feasibility and performance of ecosystem-linked insurance products, such as parametric storm policies or resilience bonds, with payouts tied to ecosystem condition/restoration outcomes.<br>Explore investment in catastrophe or resilience bonds linked to the protective value of blue ecosystems, generating risk-adjusted returns while funding restoration.<br>Design insurance products tailored to coastal SMEs and small-scale producers, potentially with premium subsidies or first-loss support from concessional capital, to create repeatable, scalable risk-transfer channels that complement other financing pathways. |
| **Structured finance** | Partner with governments and multilateral institutions to structure sovereign risk-transfer programmes that integrate nature-based solutions into disaster risk financing.<br>Leverage insurance products to de-risk novel transaction types targeting blue ecosystem conservation and restoration. |
| **Enabling finance** | Invest in improving data, modelling and valuation methodologies to strengthen the actuarial basis for blue carbon ecosystem-linked insurance products.<br>Participate in multistakeholder platforms to develop standardized approaches for measuring and reporting the risk-reduction benefits of blue carbon ecosystems. |

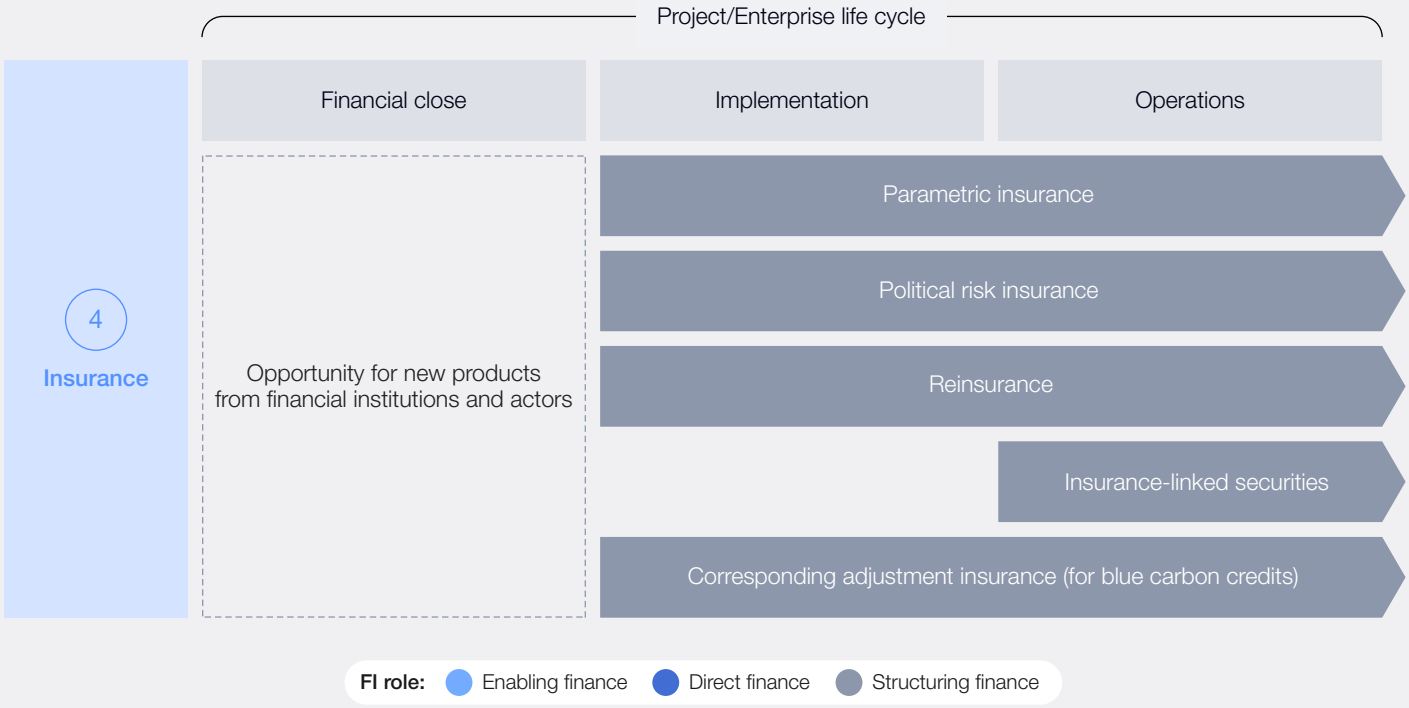
## Financial solutions to unlock private finance flows

Targeted financial solutions can help overcome these barriers and accelerate the flow of private capital into insurance and risk-transfer solutions linked to blue carbon ecosystems.

There is a growing range of instruments that financial institutions can deploy across the blue carbon project life cycle, from parametric and political risk insurance during implementation to reinsurance, insurance-linked securities and resilience bonds once assets are operational.

While most products are currently available post-construction, a significant gap remains at the pre-construction stage where early feasibility and design development works are largely done on risk. This gap constrains capital flows into project preparation but also signals a market opportunity: insights from downstream products can inform the design of new projects and enterprises that de-risk early stage works, strengthen bankability, and may enable the growth of a pipeline of blue carbon projects and enterprises brought to market.

FIGURE 4 | **Types of capital to advance insurance instruments at different stages of life cycle**




**Source:** Pollination Group

# 3 Conclusion and recommendations

The investment case for blue ecosystem restoration and conservation is both urgent and viable. Healthy coastal and marine ecosystems underpin climate and economic resilience and community livelihoods across the globe. Yet despite their outsized value, they remain significantly undercapitalized. This report demonstrates that scaling private investment into blue ecosystems is not a matter of creating a new asset class, but can be achieved through alignment of financial instruments, enabling policy and building a credible pipeline of projects.

Four financing avenues, namely credit markets, supply chains, infrastructure and insurance, offer investors the most scalable and advanced entry points. Each avenue varies in maturity, risk profile and ticket sizes, but together they form a spectrum of investable opportunities to restore and conserve blue ecosystems.

Credit markets channel the climate and biodiversity value of healthy blue ecosystems into measurable and tradable financial instruments.

Supply chains can embed blue ecosystem stewardship within sustainable aquaculture commodities.

Coastal resilience and ecosystem health integrated into infrastructure investment decisions strengthens asset longevity and safeguards its returns.

Insurance leverages risk-transfer instruments to protect and finance restoration.

Collectively, they translate ecological benefits into economic value through established financial mechanisms.

Each of the four financing avenues explored in this report offers opportunities for financial institutions to play a role in enabling, structuring and directly financing projects and enterprises, with each role offering a different degree of control and influence over project activities and outcomes.

TABLE 16 **A call to action**

| | Financing avenues | | | |
|---|---|---|---|---|
| | **Credit markets** | **Supply chains** | **Infrastructure** | **Insurance** |
| **Direct finance** | Provide project-level loans or equity to blue carbon project developers; invest in blue carbon funds; forward purchase verified credits. | Offer sustainability-linked loans or working capital to businesses, tied to verified environmental performance in blue carbon ecosystems. | Provide project-level long-term debt capital to hybrid infrastructure projects that incorporate blue carbon ecosystems for risk resilience benefits. | Underwrite or invest in insurance products linked to blue carbon ecosystems. |
| **Structured finance** | Structure pooled vehicles to aggregate multiple small projects for institutional investors. | Structure trade-finance programmes with concessional partners for sustainable aquaculture or seafood production. | Underwrite or issue blue bonds with a meaningful portion of proceeds allocated toward blue carbon ecosystems. | Develop and structure blended finance facilities for blue carbon ecosystems with credit enhancement through insurance components. |
| **Enabling finance** | Use philanthropic or grant funds to support early-stage project preparation, MRV capacity and development of SMEs. | Fund technical assistance for SMEs to meet certification or traceability standards. | Provide technical input, de-risking or concessional support for early feasibility studies and design standards. | Support valuation studies, modelling and enabling data systems to quantify risk reduction benefits of blue carbon ecosystems. |

The tools required to mobilize capital into blue ecosystems already exist. Conventional instruments such as equity, debt, project finance, guarantees and insurance can be applied to blue ecosystem projects with appropriate structuring. Early-stage concessional and philanthropic finance remain essential to de-risk investments and fund enabling activities such as securing land tenure, feasibility studies, community engagement and establishing MRV systems. As data and performance track records accumulate, risk premiums can be progressively reduced, and commercial capital can scale.

Public and private coordination is the defining enabler of market growth. Governments can accelerate capital flows by clarifying land tenure, integrating blue-grey infrastructure into procurement frameworks, embedding nature within sustainable finance taxonomies and enabling disaster-risk budgets to support insurance premiums. Development finance institutions and philanthropic actors play a catalytic role through blended structures and technical assistance. Private financiers, in turn, can amplify these efforts by embedding ecosystem outcomes into their portfolio build, disclosure frameworks and risk models. The opportunity is no longer theoretical.

Importantly, governments are working to streamline and align policies and regulations to facilitate investment into these ecosystems. The work done by the governments of Indonesia and the Philippines, in partnership with the Blue Carbon Action Partnership, has resulted in the launch of national action plans and roadmaps outlining priorities identified across stakeholders in-country with key next steps to support finance and implementation.[50] A similar approach is now underway in Viet Nam. Governments in South-East Asia, Latin America and Africa have been working with The Mangrove Breakthrough on country plans for investing in mangrove conservation and restoration.[51]

Investing in blue ecosystems is investing in resilience. It strengthens economies, stabilizes supply chains, protects infrastructure and enhances climate resilience. With targeted interventions, blended capital and policy alignment, blue carbon ecosystem restoration and conservation can move from pilot projects to an institutional investment theme that safeguards both natural and financial capital for generations to come.

# Acknowledgements

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# Endnotes


1. Bhavesh, C., Dhar, V., & Pawase, A. S. (2024). Blue carbon and the role of mangroves in carbon sequestration: Its mechanisms, estimation, human impacts and conservation strategies for economic incentives. *Journal of Sea Research*, 199. https://doi.org/10.1016/j.seares.2024.102504.
2. National Ocean Service – National Oceanic and Atmospheric Administration. (2025). Coastal Blue Carbon. https://oceanservice.noaa.gov/ecosystems/coastal-blue-carbon/.
3. Claes, J. et al. (2022). *Blue carbon: The potential of coastal and oceanic climate action*. McKinsey & Company. https://www.mckinsey.com/~/media/mckinsey/business%20functions/sustainability/our%20insights/blue%20carbon%20the%20potential%20of%20coastal%20and%20oceanic%20climate%20action/blue-carbon-the-potential-of-coastal-and-oceanic-climate-action-vf.pdf.
4. Betram, C. et al. (2021). *The blue carbon wealth of nations. Nature Climate Change*, 11, 886. https://doi.org/10.1038/s41558-021-01172-w.
5. Brook, T. et al. (2023). *Responsible Finance for Blue Carbon Ecosystems*. WWF International. https://wwfafrica.awsassets.panda.org/downloads/responsible-finance-for-blue-carbon-ecosystems.pdf?47044%2FResponsible-finance-for-blue-carbon-ecosystems=.
6. Polidoro, B. A., et al. (2010). *The Loss of Species: Mangrove Extinction Risk and Geographic Areas of Global Concern. PLOS ONE, 5*(4), e10095. https://doi.org/10.1371/journal.pone.0010095.
7. Leal, M. & Spalding, M. D. (2022). *The State of the World's Mangroves*. Global Mangrove Alliance. https://tnc.app.box.com/s/3oa059wtbh7no929o9i1531gdn7nk4eb.
8. Carter, J. & Kelly, E. (2025). *Investing in Mangroves: The Corporate Playbook*. World Economic Forum. https://www.weforum.org/publications/investing-in-mangroves-the-corporate-playbook/.
9. Leal, M. & Spalding, M. D. (2024). *The State of the World's Mangroves*. Global Mangrove Alliance. https://www.mangrovealliance.org/_files/ugd/46cc4e_9570347e230a43b7945e73d03e7c3929.pdf.
10. Mangrove Breakthrough. (2025). *Rewiring how the world values mangroves*. https://www.mangrovebreakthrough.com/.
11. Builders Vision. (2024). *Ocean Resilience and Climate Alliance Continues to Gain Momentum as it Reaches $300 Million in Commitments and Announces New Director*. https://www.buildersvision.com/news-and-media-coverage/ocean-resilience-and-climate-alliance-continues-to-gain-momentum-as-it-reaches-300-million-in-commitments-and-announces-new-director.
12. Rare. (n.d.). *Community-led Solution for People and Nature*. https://rare.org/.
13. The Nature Conservancy. (n.d.). *Five Ways Conservation Keeps Wildlife Moving*. https://www.nature.org/en-us/.
14. Wetlands International. (n.d.). *Wetlands International recognised as top nature non-profit*. https://www.wetlands.org/.
15. World Wildlife Fund. (n.d.). *Our mission is to build a future in which people live in harmony with nature*. https://www.worldwildlife.org/.
16. Conservation International. (n.d.). *The Earth Will Know Your Name*. https://www.conservation.org/.
17. UBS. (n.d.). *UBS Climate Collective*. https://www.ubs.com/global/en/sustainability-impact/social-impact-and-philanthropy/product-and-services/collective-philanthropy.html.
18. Gordon and Betty Moore Foundation. (n.d.). *Home*. https://www.moore.org/.
19. Salesforce. (2022). *Salesforce Launches New Initiatives to Grow Sustainable Ocean-Based Carbon Markets*. https://www.salesforce.com/news/stories/salesforce-launches-new-initiatives-to-grow-sustainable-ocean-based-carbon-markets/.
20. Symbiosis Coalition. (n.d.). *Symbiosis Coalition*. https://www.symbiosiscoalition.org/.
21. COAST Facility. (n.d.). About COAST. https://coastfacility.my.canva.site/about-coast.
22. Blue Action Fund. (n.d.). *Blue Action Fund*. https://www.blueactionfund.org/.
23. Global Fund for Coral Reefs. (n.d.). *About*. https://globalfundcoralreefs.org/about/.
24. Oceans Finance Company. (2024). *Oceans Finance Company Wins IJ Global ESG Award for Galapagos Marine Bond in Ecuador Debt-for-Nature Swap*. https://www.oceansfc.com/press-release/oceans-finance-company-wins-ij-global-esg-award-for-galapagos-marine-bond-in-ecuador-debt-for-nature-swap.
25. Outrigger Impact. (n.d.). Outrigger Impact. https://www.outriggerimpact.com/.
26. Biodiversity Credit Alliance; International Advisory Panel on Biodiversity Credits; Bloom Labs; & International Emissions Trading Association. (2024). *COP16 summary: Biodiversity credits market analysis*. https://www.ieta.org/cop16-summary-report-biodiversity-credits-market-analysis; Pollination Group. (2024). https://pollinationgroup.com/wp-content/uploads/2024/09/BiodiversityCreditMarkets_2024-FINAL.pdf.
27. It is important to note that many biodiversity credit schemes have initially focused on terrestrial ecosystems and market development for *marine* biodiversity credits remains slower and less well advanced. Nevertheless, some market players are exploring marine biodiversity credit options in the hope that they may provide avenues for layered revenue streams (alongside carbon), or opportunities for financing project types ineligible or uneconomically viable through carbon markets.

28. Verra Registry. (2021). *Mangrove restoration and coastal greenbelt protection in the East coast of Aceh and North Sumatra Province, Indonesia* (ID: 1493). https://registry.verra.org/app/projectDetail/VCS/1493.

29. Global Mangrove, Pioneering best in class community based regeneration work in blue carbon forestry. https://globalmangrove.org/.

30. Yayasan Gajah Sumatera. (2001-2025). *Yagasu Climate Action: GHG Emission Reductions*. https://yagasu.or.id/ghg-emission-reductions-2/.

31. Tol, S. (2022). *Building with Nature in Indonesia: Restoring an Eroding Coastline and Inspiring Action at Scale*. weADAPT. https://weadapt.org/knowledge-base/nature-based-solutions/building-with-nature-in-indonesia-restoring-an-eroding-coastline-and-inspiring-action-at-scale/.

32. IUCN and Blue Natural Capital Finance Facility. (2020). *Towards sustainable blue infrastructure finance: the need, opportunity and means to integrate Nature-based Solutions into coastal resilience planning and investments*. https://www.4climate.com/dev/wp-content/uploads/2020/08/BIF-summary-FINAL-WEB-low.pdf.

33. Ibid.

34. Ibid.

35. Kuwae, T. (2021). Linking climate change mitigation and adaptation through coastal green-gray infrastructure: A perspective. *Coastal Engineering Journal, 63*(3), 188–199. https://www.tandfonline.com/doi/full/10.1080/21664250.2021.1935581; Engineering With Nature. (2025). *Engineering practice guides for natural infrastructure*. https://ewn.erdc.dren.mil/engineering-practice-guides-for-natural-infrastructure/.

36. Willis Towers Watson. (2025). *Willis and Rare partners to launch innovative insurance solution for fishers in the Philippines* [Press release]. https://www.wtwco.com/en-hk/news/2025/11/willis-and-rare-partners-to-launch-innovative-insurance-solution-for-fishers-in-the-philippines.

37. Environmental Defense Fund. (2025). *Nature for insurance and insurance for nature* (p. 12). https://library.edf.org/AssetLink/uky3347ks0532vxm44um360jb0x2uwup.pdf.

38. Ibid.

39. Ibid.

40. Environmental Defense Fund. (2025). *Nature for insurance and insurance for nature* (p. 21). https://library.edf.org/AssetLink/uky3347ks0532vxm44um360jb0x2uwup.pdf.

41. Ibid; Insurance Council of Australia. (2024). *Advancing resilient nature-positive insurance in Australia* (p. 22). https://insurancecouncil.com.au/wp-content/uploads/2024/10/ICA_Nature-Insurance-Report.pdf.

42. Insurance Council of Australia. (2024). *Advancing resilient nature-positive insurance in Australia* (p. 22). https://insurancecouncil.com.au/wp-content/uploads/2024/10/ICA_Nature-Insurance-Report.pdf; Pollination & Howden. (2024). *Through the wilderness: The role of insurance in unlocking nature finance* (p. 30). https://pollinationgroup.com/global-perspectives/the-role-of-insurance-in-unlocking-nature-finance/.

43. Ibid.

44. For example, insurance offered by the World Bank Group's Multilateral Investment Guarantee Agency (MIGA) is becoming central to the operation of international carbon market transactions under Article 6, with key carbon credit standards such as Verra and Gold Standard requiring insurance to be secured from MIGA (or another approved insurer) for credits to receive certain Article 6 relevant labels. See: Multilateral Investment Guarantee Agency. (n.d.). *Deploying World Bank Group guarantee platform to de-risk carbon markets*. https://www.miga.org/press-release/deploying-world-bank-group-guarantee-platform-de-risk-carbon-markets; Verra. (2025). *CORSIA label guidance document* (January 20, 2025). https://verra.org/wp-content/uploads/2025/01/CORSIA-Label-Guidance-Document-20-Jan-2025.pdf; Gold Standard. (n.d.). *CORSIA criteria for approved insurance policies or related documents*. https://globalgoals.goldstandard.org/standards/116_v.2.0_CORSIA_Criteria-for-Approved-Insurance-Policies-or-Related-Documents.pdf.

45. Pollination & Howden. (2024). *Through the wilderness: The role of insurance in unlocking nature finance* (p. 25). https://pollinationgroup.com/global-perspectives/the-role-of-insurance-in-unlocking-nature-finance/. See case study regarding the important role insurance played in the Ecuador Galápagos Debt Conversion for Nature.

46. Insurance Council of Australia. (2024). *Advancing resilient nature-positive insurance in Australia* (p. 26). https://insurancecouncil.com.au/wp-content/uploads/2024/10/ICA_Nature-Insurance-Report.pdf.

47. Pollination & Howden. (2024). *Through the wilderness: The role of insurance in unlocking nature finance* (p. 30). https://pollinationgroup.com/global-perspectives/the-role-of-insurance-in-unlocking-nature-finance/.

48. Insurance Council of Australia. (2024). *Advancing resilient nature-positive insurance in Australia* (p. 24). https://insurancecouncil.com.au/wp-content/uploads/2024/10/ICA_Nature-Insurance-Report.pdf.

49. Environmental Defense Fund. (2025). *Nature for insurance and insurance for nature* (p. 17). https://library.edf.org/AssetLink/uky3347ks0532vxm44um360jb0x2uwup.pdf.

50. Antara News. (2026, February 20). *Indonesia launches national action plan for blue carbon ecosystems*. https://en.antaranews.com/news/405234/indonesia-launches-national-action-plan-for-blue-carbon-ecosystems.

51. Mangrove Breakthrough. (n.d.). *Partners*. https://www.mangrovebreakthrough.com/partners.

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