WHITEPAPER

# Cross-market integration of biodiversity outcomes into more mature financial instruments

February 2026

nature development company

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**Publication Details**

**Title:** Cross-market Integration of Biodiversity Outcomes into More Mature Financial Instruments

**Publication Date:** February 2026

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**Publisher:** Upstream Partners P/S

**Funded by:** Planetary Responsibility Foundation

**Prepared by:** Upstream Partners P/S in collaboration with Nature Development Company

**Design and Layout:** 4PLUS4

**Image Credits:** Nature Development Company and Unsplash

**Number of Pages:** 28



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# 1. Executive Summary

The global biodiversity finance gap, estimated at USD 700–900bn annually, represents a significant structural market failure in the global economy. Despite growing recognition that biodiversity loss poses material financial, climate, and systemic risks, total finance flows remain insufficient, with private capital contributing only a limited share. Fragmented markets, inconsistent outcome verification, and a lack of scalable, investment-grade instruments continue to constrain mobilisation at institutional scale.

This whitepaper argues that high-integrity biodiversity credits (BDCs) should not be developed solely as a standalone asset class. While voluntary BDC markets are emerging, cumulative transaction volumes remain modest relative to global financing needs. The more pragmatic and scalable pathway is to embed verifiable biodiversity outcomes within established financial markets, particularly green and sustainability-linked bonds, carbon markets, and selected sovereign finance instruments. Rather than establishing parallel markets, BDCs can function as a verifiable biodiversity outcome layer within existing financial structures.

By providing measurable, evidence-based units of biodiversity performance, BDCs can enable financial instruments to reference independently verified ecological outcomes. Integration into established asset classes allows financial institutions to leverage existing liquidity, governance frameworks, and investor familiarity, supporting more efficient and institutionally scalable capital deployment. Cross-market integration offers three principal advantages: improved liquidity, diversified revenue streams that reduce project-level risk, and scalability aligned with fiduciary, regulatory, and disclosure requirements.

Evidence from transactions exceeding USD 2.5bn in issuance volume demonstrates that biodiversity-relevant performance features can be embedded within investment-grade instruments. Although these structures do not yet constitute a liquid BDC market, they show that institutional capital will engage when biodiversity outcomes are incorporated within credible financial and governance frameworks. Conservative scenario analysis suggests that modest penetration of adjacent financial markets could mobilise on the order of USD 20-50bn annually under defined conditions.

Closing the biodiversity finance gap will not be achieved through incremental growth of voluntary markets alone. It requires systemic integration of biodiversity outcomes into established financial markets. While emerging standards, improved measurement tools, and growing investor engagement enable near-term, conditional scaling, progress will be phased. Early activity will focus on pilot transactions and conservatively structured instruments, with broader mobilisation dependent on regulatory convergence, investor confidence, and demonstrated performance over time.

# 2. The biodiversity finance gap and the case for integration

## 2.1 Introduction and context

The world faces an accelerating biodiversity crisis with profound economic implications. Current financial flows from public budgets, international aid, private investments, and innovative instruments fall approximately USD 700-900bn short annually of what is required to meet biodiversity conservation and restoration targets by 2030 (Deutz et al., 2020; UNEP, 2026). This shortfall represents a structural market failure as biodiversity loss undermines climate resilience, ecosystem services, and economic stability, and is increasingly recognised as a systemic financial risk (Dasgupta, 2021; WEF, 2026).

Total annual biodiversity finance is estimated at roughly USD 200bn, of which private finance contributes approximately USD 23bn (OECD, 2023; UNEP, 2026; BloombergNEF, 2025). Although private investment is growing, it remains constrained by fragmented markets, inconsistent standards, limited outcome verification and a shortage of scalable, investment-grade instruments.

The implications extend beyond conservation. Approximately 55% of global GDP (USD 58 trillion) is moderately or highly dependent on nature (PwC, 2023). Ecosystem degradation erodes carbon sequestration capacity, water regulation, soil fertility, pollination, and coastal protection, directly affecting economic productivity and financial stability. The challenge is therefore not only environmental but macroeconomic and systemic (IPBES, 2019; PBScience, 2025).

The Kunming-Montreal Global Biodiversity Framework (GBF) has strengthened commitments to align financial flows with global biodiversity targets (CBD, 2022). The central implementation challenge is mobilising private capital at institutional scale through investable, verifiable, and appropriately risk-adjusted financial structures capable of embedding biodiversity performance within mainstream markets.

Market developments suggest growing demand for outcome-oriented nature finance. However, no single instrument will close the biodiversity finance gap. Mobilisation will require complementary financial structures, including green and sustainability-linked bonds, carbon markets, blended finance mechanisms, and sovereign instruments. In this context, the whitepaper proposes a cross-market integration approach. Rather than constructing parallel biodiversity markets, it advocates for embedding high-integrity biodiversity credits (BDCs) within more mature financial markets particularly fixed-income markets and the voluntary carbon market (VCM). BDCs can function as a verified performance layer, supporting biodiversity-related key performance indicators (KPIs) and independently verified ecological metrics into existing instruments.

Integration enables hybrid structures that enhance liquidity, diversify revenue streams, strengthen governance, and mitigate greenwashing risk. The most pragmatic pathway to mobilising capital at scale therefore lies in embedding biodiversity outcomes within financial markets already capable of institutional deployment.

## 2.2 The imperative for integrated nature finance

Under current fragmented structures, biodiversity finance targets remain unattainable. Traditional conservation funding relies heavily on public budgets, development assistance and philanthropic grants - essential but insufficient and often subject to political and fiscal volatility. Private capital remains only partially engaged due to the absence of standardised, liquid and investable products with measurable performance.

Despite progress and improvement, nature-based financial instruments largely operate in parallel silos, each addressing different aspects of environmental outcomes:

- Green bonds primarily finance project inputs (e.g. conservation infrastructure or land management activities) but often lack quantified, independently verified performance metrics for biodiversity outcomes post-disbursement.
- Carbon credits measure a single output (greenhouse gas reductions or removals) but do not consistently ensure positive biodiversity outcomes, and in some contexts have supported ecologically simplified land-use systems.
- Debt-for-nature swaps restructure sovereign obligations to support conservation but frequently face challenges related to long-term funding continuity and outcome verification.
- Voluntary BDCs are emerging, yet cumulative transaction volumes remain low relative to global financing needs, and markets remain illiquid and heterogeneous.

This fragmentation increases transaction costs, reduces comparability, limits investor confidence, and constrains secondary market development. The absence of interoperable verification and governance frameworks prevents biodiversity outcomes from being systematically embedded within capital markets.

### BDCs and market integration

High-integrity BDCs, as defined by the Biodiversity Credit Alliance, represent measured, evidence-based units of positive biodiversity outcomes that are additional, durable, and verifiable (BCA, 2024). Unlike fungible carbon credits, biodiversity outcomes are inherently site- and context-specific. Scaling therefore depends less on standardising ecological metric and more on harmonising verification, reporting, and governance processes.

BDCs can serve as a common performance reference layer across markets by:

- Quantifying biodiversity outcomes using science-based methodologies
- Verifying additionality and durability
- Enabling transparent registry tracking and retirement
- Supporting performance-linked financial mechanisms

This approach shifts the focus from building a standalone biodiversity market to embedding verified ecological performance within existing financial structures.

## 2.3 Integration as a complementary pathway

Integrating biodiversity outcomes into existing financial markets doesn't replace public finance, philanthropy, community-led finance or jurisdictional conservation programmes. It complements them by expanding access to larger and more durable pools of institutional capital.

Given the scale and urgency of the biodiversity finance gap, integration into established markets provides a pragmatic pathway for mobilisation while maintaining high standards of transparency and governance. By leveraging existing financial infrastructure, disclosure frameworks, and investor familiarity, integration reduces barriers to institutional participation.

### Separation of claims

To maintain credibility and investor confidence, financial instruments must clearly separate distinct claims:

- Financing claims: capital deployed to biodiversity or projects with positive contributions towards nature and biodiversity.
- Outcome claims: measurable ecological impact achieved (e.g., hectares restored, species protected).
- Disclosure claims: reporting and transparency commitments aligned with frameworks like TNFD and CSRD.

Maintaining this separation ensures that capital allocation does not substitute for ecological performance, safeguarding integrity as biodiversity finance scales.

# 3. Market landscape: Where integration can scale

## 3.1 Current market overview

This section assesses where cross-market integration can credibly support scale by reviewing the maturity and capacity of biodiversity credits, green bonds, voluntary carbon markets, and broader impact investing. Together, these markets provide the liquidity, infrastructure, and investor base through which biodiversity outcomes can be embedded into mainstream finance. Their relevance lies not in immediate transformation, but in enabling phased, investment-grade mobilisation.

### Note on data

Estimates of market size, transaction volumes, and growth trajectories vary significantly, differences in definitions, limited disclosure, and the early-stage nature of biodiversity markets. All figures should therefore be interpreted as indicative ranges, contingent on future regulatory, methodological and market developments.

### Biodiversity credit market status

The voluntary BDC market remains nascent. Cumulative transaction volumes estimated at approximately USD 10-15m, with more than 100 projects globally at various stages of development managing several million hectares of land (Bloomlabs, 2026; various market analyses).

Compliance-related nature markets including habitat banking and biodiversity offset schemes generated an estimated USD 6-9bn annually in 2019 (Deutz et al., 2020; OECD, 2024), though definitions, project maturity, and disclosure practices vary.

Longer-term projections suggest gradual growth if high-integrity standards, robust governance frameworks, and institutional demand converge. Conservative estimates indicate transaction volumes could reach the lower end of the single-digit billions by 2030, with larger scenarios extending beyond 2030. These projections remain highly sensitive to policy alignment, methodological credibility, and investor confidence (WEF, 2023).

Key drivers include:

- Corporate nature-positive commitments aligned with the GBF.
- Regulatory momentum, including the EU Roadmap towards Nature Credits (2025-2027) and emerging national schemes.
- Advances in monitoring technologies (e.g., satellite imagery, eDNA) enabling more credible outcome verification.

## Adjacent markets

### Green bond market

The green bond market is highly mature, with cumulative issuance of labelled sustainable bonds exceeding USD 6.3tn. Annual green bond issuance has stabilised at approximately USD 500-600bn, rising toward USD 900bn-1tn when broader sustainable bonds are included (Moody's, 2026; CBI, 2025; BloombergNEF, 2024). Biodiversity and nature-based solutions account for growing share of proceeds. While a minority share, the scale of outstanding issuance (USD 2-3tn) offers substantial liquidity and diversification potential for integrated instruments.

### Voluntary carbon market

The VCM recorded transaction values of approximately USD 535m in 2024 following recent market corrections (Ecosystem Marketplace, 2025). Projections vary widely, ranging from USD 4-7bn by 2030 under conservative assumptions to USD 30-35bn under more optimistic scenarios (MSCI, 2025). Demand is increasingly concentrated on high-integrity removals and nature-based solutions, where verified biodiversity co-benefits are valued. Compliance carbon markets are significantly larger (Mordor, 2026), but more constrained in their ability to explicitly and directly integrate biodiversity outcomes within core regulatory framework.

### Impact investing

Global impact investing assets under management exceed USD 1.5tn (GIIN, 2024a), with substantial allocations to environmental outcomes such as nature conservation and regenerative agriculture and sustainable land use (GIIN, 2024b). While not biodiversity-specific, this capital pool represents meaningful demand for hybrid instruments supported by credible verification frameworks.

**Table 1** – Scale and maturity of adjacent markets

| Market | Current size (2025 estimates) | Projected growth |
|---|---|---|
| Voluntary BDC market | ~USD 10-15m (cumulative transactions) | USD 2bn by 2030, up to USD 69bn by 2050 |
| Green bond market | Annual issuance ~USD 500-900bn; cumulative ~USD 6.3tn+ | Sustained high issuance volumes |
| VCM | ~USD 0.5-1bn annual transaction value | USD 1.7-4bn in 2026, varying long-term |
| Broader impact investing | ~USD 1.5tn AUM | Continued double-digit CAGR |

These comparisons illustrate why integration into larger asset classes is critical for achieving phased but meaningful scale.

## 3.2 Enhancing liquidity and mobilising institutional capital

Cross-market integration is essential to address the liquidity constraints and risk profiles that limit institutional participation. On a standalone basis, BDCs remain illiquid and difficult to scale for larger investors. Integrating biodiversity outcomes into established markets such as green and sustainability-linked bonds or carbon instruments improves risk-adjusted characteristics and broadens investor demand.

### Benefits of hybrid instruments

Institutional investors including pension funds, insurance companies, sovereign wealth funds manage capital under strict fiduciary obligations. Standalone conservation investments often lack sufficient scale, liquidity and predictability. Hybrid instruments improve the investment profile by:

- Diversifying revenue streams, reducing exposure to price volatility in any single market.
- Expanding the buyer base, appealing to both climate- and nature-focused capital.
- Enhancing credibility through multiple independent verification processes, potentially lowering risk premiums.
- Improving liquidity, enabling participation at institutional ticket sizes (USD 10-50m+)

Near-term opportunities are most evident where demand already exists, including biodiversity or nature allocations in green and sustainability-linked bonds, and verified biodiversity co-benefits in the VCM. These pathways support incremental, investment-grade deployment rather than rapid scaling.

### Catalysing pipeline development in biodiversity-rich regions

The biodiversity finance gap is most acute in developing countries, where high upfront costs and perceived risks constrain private investment. Integrated structures help address these barriers by spreading baseline and monitoring costs across multiple revenue streams, and by enabling blended finance structures in which public or philanthropic capital absorbs early-stage risk. This directly supports GBF Target 19 by mobilising private capital toward measurable outcomes in biodiversity-rich regions (CBD, 2022).

### Institutional requirements and scale potential

Disclosure and risk management frameworks such as Corporate Sustainability Reporting Directive (CSRD ESRS E4) Sustainable Finance Disclosure Regulation (SFDR) and Taskforce for Nature-related Financial Disclosure (TNFD) are increasing the materiality of biodiversity in investment decision-making, with more than 700 organisations representing over USD 20tn in assets under management engaged. However, for long-term asset owners and regulated financial institutions, investment decisions remain constrained by requirements for scale, liquidity, governance, and risk-adjusted returns.

Hybrid instruments that integrate biodiversity outcomes into established asset classes are more likely to satisfy institutional requirements. Even modest penetration into adjacent markets can be meaningful:

- 1-3% of annual green and sustainability-linked bond issuance (~USD 500-900bn annually) could mobilise approximately USD 5-25bn annually.
- Verified biodiversity co-benefits in the VCM could contribute USD 1-2bn annually.
- 1-2% of the USD 1.5tn impact investing market could add USD 15-30bn annually.

Combined, these channels could mobilise approximately USD 21-57bn annually under conservative, conditional assumptions. While integration alone will not close the USD 700–900bn annual gap, it provides a credible pathway for phased access to institutional capital at meaningful scale.

### Note

Estimates assume incremental biodiversity-linked structuring within current issuance rather than full reallocation of capital flows. Figures are not additive across markets where overlap may occur (e.g., impact allocations already deployed through labelled bonds) and do not assume full fungibility or immediate liquidity of BDCs. Actual mobilisation would depend on regulatory alignment, investor uptake, pricing dynamics, and verification capacity.

# 4. Pathways for cross-market integration

Cross-market integration requires a tiered framework that embeds verified biodiversity outcomes within existing financial instruments. This approach leverages established legal, technical, and market infrastructure such as bond frameworks, carbon registries, and sovereign finance mechanisms rather than relying on establishing parallel markets.

## 4.1 Carbon markets: Financing verified co-benefits

Carbon markets represent the most immediate pathway for integrating biodiversity outcomes, given their existing liquidity, buyer familiarity, and project-level infrastructure. However, carbon-optimised projects do not automatically deliver positive biodiversity outcomes. In some cases, carbon-focused design—such as monoculture plantations or simplified land-use systems—has resulted in limited or negative ecological impacts.

Carbon optimisation and biodiversity optimisation are distinct objectives. Maximising biodiversity may require lower carbon yields through mixed-species restoration, landscape heterogeneity, or protection of non-forest ecosystems such as grasslands and wetlands. Integrated finance structures must therefore accommodate explicit trade-offs. Accepting lower carbon volumes in pursuit of higher ecological integrity is a design feature of high-integrity integration, not a deficiency (JPM, 2025).

### Mechanisms: Stacking, stapling, bundling

Projects can integrate biodiversity outcomes into carbon markets through three primary approaches:

- Stacking: Carbon credits and biodiversity credits are generated and sold separately.
- Stapling: Carbon and biodiversity outcomes are contractually linked and sold together.
- Bundling: Multiple environmental outcomes are packaged within a single instrument.

Stacking is particularly flexible, as it:

- Diversify revenue streams, reducing exposure to volatility in any single market.
- Broadens the buyer base across climate and nature mandates
- Enable independent verified biodiversity co-benefits alongside carbon outcomes.

Stapling and bundling offer additional and relevant pathways, particularly where buyers seek simplified procurement or integrated impact narratives, though they require careful design to preserve and verify outcome integrity (Bloomlabs, 2025).

### Implementation framework

Effective carbon–biodiversity integration requires robust safeguards to maintain credibility and prevent double counting. Critical success factors include:

- Dual certification methodologies that rigorously measure and verify both carbon and biodiversity outcomes.
- Independent third-party verification.
- Transparent, interoperable registries with clear ownership and retirement rules.
- Clear separation of carbon, biodiversity, and disclosure claims.

Examples include projects combining Verra's Verified Carbon Standard with emerging biodiversity methodologies, as well as integrated carbon–biodiversity offerings such as EcoAustralia's programmes, which link carbon avoidance with certified biodiversity protection for corporate buyers seeking comprehensive environmental impact (Verra, 2024; EcoAustralia, 2023). The International Advisory Panel on Biodiversity Credits (IAPB) supports such hybrid approaches, provided high-integrity principles such as additionality, durability, and robust safeguards against unintended displacement effects are upheld (IAPB, 2024).

## 4.2 Fixed income markets: Outcome-linked finance

Fixed income markets represent the largest pool of institutional capital globally and therefore significant integration potential. While green bonds have successfully channeled substantial capital toward environmental projects, they face a fundamental limitation. Most focus on use of proceeds, funding project inputs rather than verified biodiversity outcomes post-disbursement. This limits accountability and constrains investor confidence in biodiversity performance.

### Mechanism: Enhanced biodiversity tagging within green bonds

The green bond market remains highly mature, with annual issuance around USD 500-900bn in 2025 and cumulative volumes exceeding USD 6tn. Nature and biodiversity allocations are growing but remain secondary to climate mitigation.

Incremental improvements can enhance biodiversity credibility without creating new bond categories:

- Adoption of TNFD-aligned metrics within reporting framework.
- Introduction of a "substantial positive contribution to biodiversity" tag for bonds meeting defined biodiversity KPIs.

These measures build on existing ICMA and sustainability-linked bond frameworks (ICMA, 2025), reducing regulatory frictions and enabling near-term adoption by issuers and investors.

### Mechanism: Biodiversity-linked bonds (BLBs)

Sustainability-linked bonds (SLBs), and emerging biodiversity-linked structures, can tie financial characteristics such as coupon rates to achievement of predefined KPIs. High-integrity BDCs could potentially support independent verification layer, alongside established third-party assurance processes.

Typical design features under consideration include:

- Baseline biodiversity assessments using metrics like Mean Species Abundance (MSA) or Species Threat Abatement and Restoration (STAR).
- Time-bound performance targets.
- Scheduled third-party audits.
- Coupon step-ups or step-downs linked to verified outcomes.

Early examples include results-based instruments such as the World Bank's Wildlife Conservation Bond (WB, 2022), alongside growing experimentation by other multilateral development banks and financial institutions with nature-themed and performance-linked financing structures. These approaches illustrate how outcome-linked bonds could enhance transparency, accountability, and investor confidence while supporting the scaling of high-integrity biodiversity finance.

### Market development impact

These instruments support market development by:

- Aligning financial returns with ecological outcomes.
- Strengthening accountability and disclosure.
- Leveraging the scale and liquidity of sustainable bond markets.
- Potentially driving demand for high-integrity BDCs.

## 4.3 Sovereign debt instruments: Strengthening funding durability

Debt-for-nature swaps allow debtor countries to redirect external debt obligations into toward conservation. However, a key challenge remains ensuring long-term funding continuity beyond the initial swap period, particularly in the face of fiscal constraints or political changes.

### Mechanism: Emerging BDC integration in debt-for-nature swaps

Integrating BDCs into debt-for-nature structures could provide ongoing revenue streams linked to verified conservation outcomes. Rather than relying solely on fiscal allocations, verified biodiversity outcomes can generate marketable credits that can be sold to international buyers. This forward-looking mechanism has the potential to:

- Support funding continuity: BDC revenues provide a predictable source for long-term conservation management.
- Create performance incentives: Continued credit generation is contingent on maintaining biodiversity outcomes.
- Mobilise international capital: Global buyers can directly fund domestic biodiversity protection.
- Diversify risk: Multiple revenue sources reduce dependence on sovereign fiscal capacity.

### Conceptual implementation model

A prospective BDC-enabled debt-for-nature swap structure could include:

- Debt restructuring linked to conservation commitments.
- Designation of protected or restored areas capable of generating BDCs.
- Certification of biodiversity outcomes and registry listing of credits.
- Sales of BDCs to international buyers.
- Allocation of revenues to conservation trusts or project maintenance.

While these steps are technically feasible, no sovereign debt-for-nature swap has to date implemented BDC-based revenue streams. Current swaps, such as those in Ecuador and Gabon (IDB, 2023; TNC, 2022), operate through traditional budget reallocation or donor-backed financing. Integrating BDCs into sovereign conservation finance could, in principle, establish a verifiable outcome layer, enabling broader investment-grade deployment of biodiversity finance. By linking sovereign debt relief to measurable biodiversity outcomes, such mechanisms could expand opportunities across carbon, fixed-income, and sovereign finance pathways, supporting high-integrity biodiversity investment from 2026 onward.

# 5. Governance, integrity and market infrastructure

Scaling cross-market integration from pilot transactions to institutional deployment does not require bespoke governance systems for BDCs. Credibly scaling depends on embedding biodiversity outcomes within existing financial market infrastructures, disclosure regimes, and verification practices. Hybrid instruments therefore rely on a clear separation between financing claims, biodiversity outcome claims, and disclosure obligations, supported by harmonised Verification, Reporting, and Governance (VRG) processes.

Biodiversity presents well-recognised challenges including non-fungibility, measurement complexity, and risks of double counting. These constraints are not unique to biodiversity markets and are not resolved by creating parallel systems. High-integrity integration instead depends on process harmonization, standardising assessment, auditing, registry, and governance procedures, while allowing ecological metrics to remain locally appropriate. Emerging frameworks illustrate how interoperability with carbon markets, fixed-income instruments, and sovereign finance without compromising ecological integrity.

Scalable deployment requires alignment with established disclosure and governance frameworks including TNFD, CSRD (ESRS E4), SFDR, and ICMA Sustainable Bond guidance. Embedding biodiversity outcomes within these frameworks enables integration into existing investment processes rather than creating new compliance layers. Interoperable digital registries, aligned with carbon market infrastructure, are essential to prevent double counting and ensure transparent tracking of issuance, ownership, and retirement.

### Implementation outlook (from 2026)

With cumulative labelled sustainable bond issuance exceeding USD 6tn and stabilization in the VCM, governance convergence is accelerating. Alignment between TNFD and ISSB standards, ICMA's nature-related guidance, and EU regulatory initiatives is creating enabling conditions for scaled deployment of hybrid biodiversity finance from 2026 onward.

Blended finance particularly MDB-backed first-loss structures, remains critical for de-risking early-stage projects, especially in biodiversity-rich developing economies aligned with KMGBF Target 19. Together, these governance foundations position BDC as a credible outcome-verification layer across markets supporting institutional capital mobilisation while safeguarding ecological integrity.

## Reference tables: governance enablers for cross-market integration

The tables below summarise principal governance challenges and corresponding integration solutions.

**Table 2** – Core governance challenges and integration responses

| Challenge | Description | Integration response |
|---|---|---|
| Non-fungibility | Biodiversity outcomes are site-specific and not direct substitutable. | Harmonise verification and governance processes rather than metrics; apply standardised auditing protocols adapted to local contexts. |
| Measurement inconsistency | Divergent methodologies reduce comparability and credibility. | Adopt third-party audited, science-based tools; integrate scalable technologies (remote sensing, eDNA, AI). |
| Double counting | Outcomes risk being claimed across multiple instruments. | Require interoperable digital registries tracking issuance, ownership, linkages, and retirement |
| Reporting fragmentation | Inconsistent disclosures hinder investor integration. | Align reporting with TNFD, CSRD (ESRS E4), SFDR, EU Taxonomy, and ICMA Green Bond Principles (nature guidance). |

**Table 3** – Market barriers and enabling solutions

| Barrier | Description | Emerging solutions |
|---|---|---|
| Standardisation gaps | Lack of universally accepted metrics increases transaction costs and fragmentation. | High-integrity frameworks emphasising process harmonisation, interoperability with carbon and bond infrastructure, and science-based methodologies (IAPB 2024; Verra; Gold Standard) |
| Market liquidity | Low volumes and limited secondary markets constrain institutional participation. | Integration with mature markets (green bonds ~USD 500–900bn annual issuance; VCM ~USD 1–2bn) through stacking, bundling and performance-linked bonds. |
| Verification complexity | Dual audits, temporal misalignment, and trade-offs increase monitoring costs. | Integrated MRV systems using satellite/drone imagery, AI/ML, eDNA, and IoT sensors to reduce costs and improve scalability. |
| Governance and transparency | Ambiguity in standards, conflict resolution, and regulatory treatment. | Independent governance bodies, registry transparency, and alignment with established regulatory frameworks. |
| Project development risk | High upfront costs and perceived sovereign risk in developing economies. | Blended finance (MDB guarantees, first-loss tranches), public technical assistance, and policy alignment (EU Roadmap for Nature Credits 2025-2027; KMGBF Target 19). |

# 6. Demonstrated integration

## 6.1 Case studies: Integration in practice

Integration of biodiversity-relevant outcomes into established financial instruments is already occuring under defined and carefully structured conditions. While fully standardised and liquid biodiversity credit markets remain nascent, a growing number of sovereign, multilateral development bank (MDB), and corporate transactions demonstrate how nature-related performance metrics or proxies can be embedded within large, investment-grade debt and hybrid instruments. These cases show how biodiversity considerations can be incorporated into existing financial market infrastructure, mobilising capital at significant scale, while maintaining investor-grade risk, disclosure, and governance standards.

### Market evidence: Selected integrated transactions

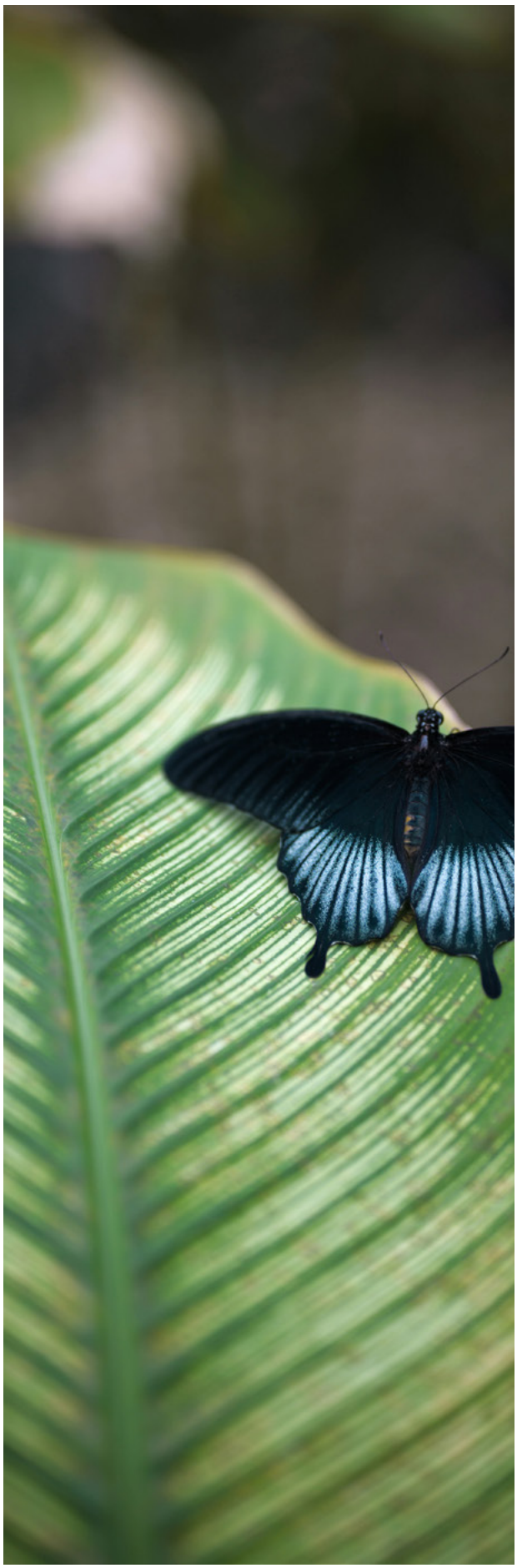
The transactions below illustrate different modes of integration including outcome-linked structures, KPI-based coupon adjustments and use-of-proceeds allocations.

**Table 4** – Selected global transactions

| Issuer / project | Instrument type | Transaction size | Integration mechanism | Biodiversity-relevant metric or proxy |
|---|---|---|---|---|
| Republic of Uruguay | Sovereign Sustainability-Linked Bond | USD 1.5bn (2022) | Two-way coupon step-up/step-down | Maintenance of native forest area relative to 2012 baseline |
| World Bank (IBRD) | Wildlife Conservation Bond | USD 150m (2022) | Outcome-based success payment (GEF-backed) | Black rhino population growth rate |
| Suzano (Brazil) | Corporate Sustainability-Linked Bond | USD 750m (various) | KPI-linked coupon adjustment | Native vegetation conservation and restoration (land-use proxy) |
| World Bank (IBRD) | Amazon Reforestation-Linked Outcome Bond | USD 225m (2024) | Coupon component linked to verified carbon removal units (CRU) | Reforestation area with biodiversity and community co-benefits |
| Asian Development Bank | Blue/nature themed Bond | Multiple issuances (2024–2025) | Use-of-proceeds thematic bond | Ecosystem protection and restoration (project-level allocation) |
| EcoAustralia | Hybrid carbon-biodiversity product | Variable | Stapled carbon credits with government-accredited habitat units | Gold Standard carbon credit + accredited habitat units. |

**Note:**

Transaction sizes reflect total issuance amounts; biodiversity components may represent a subset of proceeds or performance features.



## Observed market patterns

Collectively, these transactions represent over USD 2.5bn in issuance volume featuring biodiversity-relevant performance features or allocations, and are dominated by investment-grade issuers, including sovereigns and MDBs. Three consistent patterns emerge:

- Debt market leverage: Integration into sovereign, MDB, and corporate bond markets channels significantly more capital toward nature-related objectives than standalone biodiversity credit markets currently achieve.

- De-risking through issuer credit quality: Sovereign and MDB issuance mitigates perceived execution, permanence, and delivery risk, enabling institutional participation without requiring biodiversity outcomes themselves to be traded as financial assets.

- Outcome-linked credibility where feasible: Where biodiversity-relevant metrics can be independently verified and embedded into financial mechanics, they enhance transparency and accountability, even when biodiversity is measured through proxies rather than fully standardised credit unit

## Case study highlights

### Case study: Uruguay Sovereign Sustainability-Linked Bond

In 2022, Uruguay issued a USD 1.5bn sovereign sustainability-linked bond featuring coupon step-up and step-down mechanics tied to national environmental performance indicators. These include maintenance of native forest area relative to a 2012 baseline, alongside greenhouse gas emissions targets. Performance against these KPIs directly affects bond coupons, aligning investor returns with verified environmental outcomes.

While not structured around BDCs, the bond demonstrates that nature-related outcomes can be embedded within standard sovereign debt covenants, providing an important precedent for future outcome-linked biodiversity finance at investment-grade scale (GoU, 2022).

### Case study: World Bank Wildlife Conservation Bond

The World Bank's USD 150m Wildlife Conservation Bond, issued in 2022, is a principal-protected outcome bond in which investor returns are linked to verified growth in black rhino populations in South Africa. Success payments are funded by the Global Environment Facility (GEF) and are contingent on independently verified conservation outcomes.

This structure illustrates that institutional investors are willing to accept biodiversity-specific KPIs when embedded within AAA-rated issuance frameworks and supported by blended finance mechanisms. It provides a clear proof-point for outcome-linked biodiversity finance without requiring biodiversity outcomes to be traded as standalone credits (WB, 2022).

### Case study: World Bank Amazon Reforestation-linked outcome bond

In August 2024, the World Bank issued a USD 225m Amazon Reforestation-Linked Outcome Bond, linking a portion of investor returns to the generation of verified Carbon Removal Units (CRUs) from reforestation projects. Biodiversity and community benefits are embedded as project-level design features and co-benefits, but do not directly determine financial performance (WB, 2024)

This transaction demonstrates a scalable carbon-led monetisation pathway in which biodiversity outcomes are safeguarded and enhanced within an investment-grade structure, without yet pricing biodiversity outcomes independently.

### Case study: EcoAustralia hybrid carbon-biodiversity product

EcoAustralia, developed by South Pole, offers a market product that staples internationally verified carbon credits with Australian Biodiversity Units (ABUs), which are government-recognised instruments representing protected native vegetation. Each unit combines one tonne of internationally verified carbon credit with ~1.5 $m^2$ of protected biodiversity habitat, enabling corporates to support climate and biodiversity outcomes together in a single product (EcoAustralia, 2023). The product enables corporate buyers to support climate mitigation and biodiversity protection together, leveraging existing voluntary carbon market infrastructure to channel funding toward habitat conservation.

While not a liquid or standardised BDC market, this model illustrates how hybrid products can accelerate early demand for biodiversity outcomes by integrating them into established environmental markets.

## 6.2 Key lessons and scalability factors

### I. Standardise financial linkage, not ecology

Scaling does not require standardising biodiversity itself, but rather standardising how verifiable ecological change is translated into financial performance or disclosure within existing instruments.

### II. Leverage existing market infrastructure

Integration into established bond frameworks, registries, and carbon market standards reduces regulatory, mandate, and operational barriers compared to creating parallel biodiversity-only markets.

### III. Biodiversity as risk mitigation

Sovereign and corporate examples demonstrate that biodiversity integration can support physical and transition risk management, reinforcing credit quality rather than acting solely as an impact overlay.

### IV. Role of blended finance

Public and concessional capital, including success payments and guarantees, remains critical in early transactions to bridge risk-return gaps and crowd in private capital.

## 6.3 Current limitations

Despite demonstrated feasibility, these examples do not imply that BDCs are already liquid, fungible, or universally investable. Most transactions rely on context-specific indicators or proxies, and many operate at pilot or early-adopter scale with public or concessional support. Measurement approaches and governance frameworks remain heterogeneous, limiting comparability and secondary market development.

These limitations reinforce the case for integration as a phased pathway. Embedding biodiversity outcomes within established financial structures is institutionally acceptable and technically viable, but further work on standardisation, assurance, and market confidence is required before broad, investment-grade replication can occur at scale.

# 7. Conclusions and recommendations

The global biodiversity finance gap estimated at USD 700–900bn annually by 2030 remains a significant structural market failure of the global economy. Standalone biodiversity credit markets can't and shouldn't close this gap alone. Cumulative voluntary BDC transactions of approximately USD 10-15m remain immaterial relative to global needs, and even optimistic projections suggest only low single-digit billions in annual volumes by 2030.

Cross-market integration offers a pragmatic pathway. Embedding high-integrity BDCs as a verified outcome layer within carbon markets, fixed-income instruments, and sovereign finance enables access to substantially larger capital pools. Adjacent markets demonstrate the scale potential: cumulative green and sustainable bond issuance exceeds USD 6tn, annual green bond volumes approach USD 500-900bn, and the voluntary carbon market, currently USD 0.5–1bn annually, shows signs of stabilisation and recovery.

Pioneering integrated transactions including Uruguay's USD 1.5bn sustainability-linked bond, the World Bank's USD 150m Rhino Bond, and the USD 225m Amazon Reforestation-linked outcome bond have collectively mobilized over USD 2.5bn, demonstrating that institutional capital will engage when biodiversity outcomes are embedded within investment-grade structures.

Integration provides three structural advantages: enhanced liquidity through access to established bond and carbon markets; diversified revenue streams reducing project-level risk, and institutional scalability aligned with fiduciary, disclosure and governance requirements.

Conservative projections suggest that modest penetration of existing markets, 1-3% of green bond issuance, verified co-benefits in the VCM, and 1-2% of impact investing allocations could mobilise USD 21-57bn annually under defined conditions. While this alone will not close the USD 700-900bn gap, it represents a credible pathway for phased, investment-grade deployment that complements other financing mechanisms.

Scaling integration requires continued progress on governance and market infrastructure. Biodiversity's non-fungibility, methodological heterogeneity, and double counting risks necessitate harmonised verification, registry interoperability, and consistent disclosure standards. Enabling conditions are strengthening: TNFD adoption across more than 700 organisations representing over USD 20tn in assets, high-integrity frameworks advanced by the IAPB, EU regulatory momentum through the Nature Credits Roadmap (2025–2027), and technological advances reducing monitoring costs.

The opportunity now lies in coordinated implementation. Technical tools exist, investor interest is growing, and regulatory convergence is advancing. Mainstreaming biodiversity finance will require sustained political commitment, investment in governance infrastructure, and disciplined execution across markets. Cross-market integration does not replace other financing channels, but it represents the most credible near- to medium-term pathway for mobilising institutional capital toward nature at meaningful scale.

## Critical success factors

Investment-grade scaling depends on:

(1) Harmonised verification, reporting, and governance frameworks standardising assessment and auditing processes
(2) Interoperable digital registries preventing double counting
(3) Cost-effective monitoring leveraging remote sensing, AI, and eDNA
(4) International policy coherence through GBF, TNFD, CSRD and related frameworks
(5) Robust social safeguards ensuring Free, Prior and Informed Consent and equitable benefit-sharing with Indigenous Peoples and Local Communities
(6) Coordinated stakeholder collaboration across standard-setters, financial institutions, developers, policymakers, and civil society.

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