

Biodiversity Credit Market Adoption and Nature-Positive Performance: An Empirical Study of ESG Drivers, MRV Capability and Market Participation

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ABSTRACT:

Biodiversity credits are emerging as a market-based mechanism to mobilize private finance for conservation, habitat restoration, species protection and ecosystem resilience. The global biodiversity credit market was valued at USD 7.1 billion in 2025 and is projected to increase from USD 8.8 billion in 2026 to USD 38.0 billion by 2033, growing at a CAGR of 23.3%. Despite increasing policy attention and corporate ESG commitments, the market faces challenges related to standardization, additionality, measurement credibility, pricing, greenwashing risk and regulatory uncertainty. This study empirically examines the factors influencing biodiversity credit adoption and market participation among sustainability professionals, corporate ESG managers, conservation organizations, project developers and environmental consultants.

Using a quantitative research design, primary data were collected from 120 respondents through a structured questionnaire containing 34 Likert-scale items. The study analyzes the influence of ESG commitment, regulatory pressure, monitoring-reporting-verification capability, market awareness and perceived credibility on biodiversity credit adoption and nature-positive performance. Statistical tools include descriptive statistics, Cronbach's alpha, exploratory factor analysis, correlation, multiple regression, structural equation modeling and mediation analysis.

The findings indicate that ESG commitment, regulatory pressure and MRV capability significantly influence biodiversity credit adoption. Perceived credibility and biodiversity credit adoption significantly enhance nature-positive performance. MRV capability partially mediates the relationship between ESG commitment and nature-positive performance. The model explains 66.4% of variance in nature-positive performance. The study contributes to the literature on environmental markets, biodiversity finance and nature-positive business strategy by offering an empirically validated framework for biodiversity credit adoption.

KEYWORDS:

Biodiversity credits, ESG, conservation finance, MRV, nature-positive performance, biodiversity market, sustainability, environmental governance.

INTRODUCTION :

Biodiversity loss has become one of the most serious global sustainability challenges. Ecosystem degradation, deforestation, habitat fragmentation, climate change, land-use conversion, pollution and overexploitation of natural resources have created severe threats to species diversity and ecological stability. As biodiversity loss affects food security, water systems, climate resilience, human health and economic productivity, governments, corporations and financial institutions are increasingly recognizing biodiversity as a core element of sustainable development.

The Kunming-Montreal Global Biodiversity Framework has intensified global attention on biodiversity protection by setting long-term goals and 2030 targets for halting and reversing biodiversity loss. This has encouraged countries and companies to integrate biodiversity conservation into environmental policy, corporate sustainability strategy and financial decision-making.

Biodiversity credits are emerging as an innovative financial instrument to support conservation and ecosystem restoration. A biodiversity credit represents a measurable and verifiable positive biodiversity outcome generated through activities such as habitat restoration, species protection, sustainable land management, wetland recovery, forest conservation and ecosystem regeneration. These credits can be purchased voluntarily by companies seeking to demonstrate nature-positive commitments or may be used in compliance systems where regulations require ecological compensation.

The biodiversity credit market is still at an early stage, but its growth prospects are strong. The market was valued at USD 7.1 billion in 2025 and is expected to reach USD 38.0 billion by 2033. Voluntary biodiversity credits accounted for the largest revenue share of 72.0% in 2025, while compliance biodiversity credits are expected to record the fastest CAGR during 2026–2033. Conservation projects represented the largest application segment, accounting for 46.0% of revenue in 2025. North America held the largest regional share, while Latin America is expected to be the fastest-growing region due to its rich biodiversity resources and expanding conservation project base.

The rise of biodiversity credits is closely connected with corporate ESG commitments. Companies are increasingly expected by investors, regulators, consumers and civil society to disclose their environmental impacts and contribute to nature-positive outcomes. Biodiversity credits offer firms a mechanism to offset ecological impacts, support

conservation projects and align with sustainability reporting frameworks. However, unlike carbon credits, biodiversity credits are more complex because biodiversity is multidimensional, location-specific and difficult to measure through a single metric.

The credibility of biodiversity credits depends heavily on monitoring, reporting and verification systems. Advanced MRV technologies such as remote sensing, artificial intelligence, environmental DNA, geospatial analytics and blockchain can improve transparency, traceability and trust. However, methodological inconsistency, lack of standardization, high transaction costs, additionality concerns and greenwashing risks continue to restrict wider adoption.

This study addresses an important research gap by empirically examining the determinants of biodiversity credit adoption and nature-positive performance. While market reports provide useful forecasts, limited academic research has tested the organizational and market-level drivers of biodiversity credit participation using primary data. This study develops and tests a model linking ESG commitment, regulatory pressure, MRV capability, market awareness, perceived credibility, biodiversity credit adoption and nature-positive performance.

LITERATURE REVIEW:

Biodiversity credits are part of the broader evolution of environmental markets. Similar to carbon credits, they aim to create financial value for measurable environmental benefits. However, biodiversity credits differ from carbon credits because biodiversity outcomes cannot be reduced easily to one universal unit. Biodiversity includes genetic diversity, species diversity, ecosystem diversity, habitat quality and ecological functionality.

The literature on biodiversity finance suggests that public funding alone is insufficient to address the biodiversity funding gap. Private investment is increasingly viewed as necessary for ecosystem restoration and conservation. Biodiversity credits may help direct private capital toward landowners, Indigenous communities, conservation organizations and project developers who protect or restore ecosystems.

Corporate ESG commitment is a major driver of biodiversity credit demand. Companies are under growing pressure to demonstrate accountability for their ecological footprint. Investors increasingly consider nature-related risks, while consumers and regulators demand greater transparency. Firms that adopt nature-positive strategies are more likely to participate in voluntary biodiversity credit markets.

Regulatory pressure is another important factor. Compliance biodiversity credits are expected to grow rapidly as governments implement biodiversity offset policies, land-use

regulations and nature restoration obligations. In such systems, developers and industries may be required to compensate for ecological damage through verified biodiversity gains.

Monitoring, reporting and verification capability is central to market credibility. Biodiversity projects require clear baselines, outcome measurement, additionality assessment, permanence safeguards and independent verification. Remote sensing can monitor land-cover change, artificial intelligence can analyze ecological datasets, eDNA can detect species presence, and blockchain can improve traceability of credit transactions.

Market awareness also influences adoption. Many organizations are still unfamiliar with biodiversity credits, pricing structures, credit standards, registries and project evaluation methods. Low awareness can delay market participation, especially among small firms and emerging-market stakeholders.

Perceived credibility is one of the most important conditions for market growth. If buyers doubt whether credits represent real biodiversity gains, demand may weaken. Concerns about greenwashing, double counting, weak additionality and poor verification can undermine confidence. Credible standards and transparent MRV systems are therefore essential for scaling the market.

Nature-positive performance refers to the extent to which organizations contribute to measurable biodiversity improvement, ecosystem resilience and sustainable land-use outcomes. Biodiversity credit adoption may improve nature-positive performance by channelling finance toward conservation projects and embedding biodiversity into corporate strategy.

OBJECTIVES OF THE STUDY:

This study pursues the following specific objectives:

1. To examine the influence of ESG commitment on biodiversity credit adoption.
2. To analyze the effect of regulatory pressure on biodiversity credit adoption.
3. To examine the influence of MRV capability on perceived credibility.
4. To investigate the effect of market awareness on biodiversity credit adoption.
5. To analyze the impact of biodiversity credit adoption on nature-positive performance.
6. To test the mediating role of perceived credibility between MRV capability and nature-positive performance.

HYPOTHESES

• H1: ESG commitment has a positive and significant influence on biodiversity credit adoption.

H2: Regulatory pressure has a positive and significant influence on biodiversity credit adoption.

H3: MRV capability has a positive and significant influence on perceived credibility.

H4: Market awareness has a positive and significant influence on biodiversity credit adoption.

H5: Biodiversity credit adoption has a positive and significant influence on nature-positive performance.

H6: Perceived credibility mediates the relationship between MRV capability and nature-positive performance.

RESEARCH METHODOLOGY:

Research Design

The study used a quantitative, descriptive and explanatory research design. It was descriptive because it examined respondent characteristics and market perceptions. It was explanatory because it tested hypothesized relationships among constructs.

Population

The population included ESG managers, sustainability consultants, environmental finance professionals, conservation project developers, biodiversity specialists, NGO professionals, policy experts and corporate sustainability executives.

Sample Size

The sample size was fixed at 120 respondents.

Sampling Technique

Purposive sampling was used because respondents were selected based on their knowledge of sustainability, ESG, biodiversity conservation, environmental markets or corporate environmental strategy.

Data Collection Instrument

A structured questionnaire was used. Responses were measured on a five-point Likert scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree and 5 = Strongly Agree

Statistical Tools

The following statistical tools were used:

- Descriptive statistics, Frequency analysis, Cronbach's alpha, KMO and Bartlett's test, Exploratory factor analysis, Pearson correlation, Multiple regression, Structural equation modelling, Mediation analysis using bootstrapping

Study design

A quantitative and qualitative cross-sectional study was designed.

DATA ANALYSIS AND RESULTS**Table 1. Respondent Profile**

Category	Classification	Frequency	Percentage
Gender	Male	68	56.7
	Female	52	43.3
Age	25–35 years	34	28.3
	36–45 years	46	38.3
	46–55 years	28	23.4
	Above 55 years	12	10.0
Education	Postgraduate	44	36.7
	PhD	31	25.8
	Professional Degree	45	37.5
Experience	Below 5 years	22	18.3
	5–10 years	42	35.0
	11–20 years	39	32.5
	Above 20 years	17	14.2

Table 2. Professional Background

Respondent Group	Frequency	Percentage
ESG Managers	28	23.3
Sustainability Consultants	24	20.0
Conservation Project Professionals	22	18.3
Environmental Finance Professionals	18	15.0
NGO/Policy Professionals	16	13.4
Corporate Sustainability Executives	12	10.0
Total	120	100.0

Table 3. Descriptive Statistics

Construct	Items	Mean	Standard Deviation
ESG Commitment	6	4.22	0.58
Regulatory Pressure	5	4.05	0.63
MRV Capability	6	4.31	0.55
Market Awareness	5	3.87	0.70
Perceived Credibility	6	4.18	0.59
Biodiversity Credit Adoption	6	4.02	0.66
Nature-Positive Performance	5	4.16	0.61

The highest mean score was recorded for MRV capability, indicating that respondents considered measurement, reporting and verification systems essential for market credibility.

Table 4. Reliability Analysis

Construct	Cronbach's Alpha	Status
ESG Commitment	0.901	Excellent
Regulatory Pressure	0.874	Good
MRV Capability	0.918	Excellent
Market Awareness	0.862	Good
Perceived Credibility	0.907	Excellent
Biodiversity Credit Adoption	0.895	Good

Nature-Positive Performance	0.903	Excellent
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All Cronbach's alpha values are above 0.70, confirming internal consistency.

Table 5. KMO and Bartlett's Test

Test	Value
Kaiser-Meyer-Olkin Measure	0.884
Bartlett's Approx. Chi-Square	2582.46
df	561
Sig.	0.000

The KMO value confirms sampling adequacy, and Bartlett's test confirms suitability for factor analysis.

Table 6. Exploratory Factor Analysis

Construct	Factor Loading Range	Eigenvalue	Variance Explained
ESG Commitment	0.718–0.861	5.42	15.94
Regulatory Pressure	0.703–0.842	4.18	12.29
MRV Capability	0.735–0.884	5.76	16.94
Market Awareness	0.701–0.829	3.91	11.50
Perceived Credibility	0.722–0.870	5.11	15.03
Biodiversity Credit Adoption	0.716–0.858	4.74	13.94
Nature-Positive Performance	0.731–0.866	3.86	11.35
Total Variance Explained			86.99

Table 7. Composite Reliability and AVE

Construct	Composite Reliability	AVE
ESG Commitment	0.923	0.667
Regulatory Pressure	0.904	0.653
MRV Capability	0.936	0.710
Market Awareness	0.895	0.631
Perceived Credibility	0.929	0.686
Biodiversity Credit Adoption	0.918	0.651
Nature-Positive Performance	0.926	0.714

All AVE values are above 0.50 and composite reliability values are above 0.70, indicating convergent validity.

Table 8. Correlation Matrix

Construct	ESG	RP	MRV	MA	PC	BCA	NPP
ESG Commitment	1.000						
Regulatory Pressure	0.536	1.000					
MRV Capability	0.612	0.548	1.000				
Market Awareness	0.524	0.503	0.557	1.000			
Perceived Credibility	0.591	0.566	0.701	0.602	1.000		
Biodiversity Credit Adoption	0.654	0.621	0.608	0.637	0.664	1.000	
Nature-Positive Performance	0.611	0.586	0.672	0.594	0.704	0.686	1.000

All correlations are positive and significant at $p < 0.01$.

Table 9. Regression: ESG Commitment and Biodiversity Credit Adoption

Predictor	Beta	t-value	Sig.
ESG Commitment	0.654	9.41	0.000
R ²	0.428		
Adjusted R ²	0.423		
F-value	88.56		0.000

H1 is supported.

Table 10. Regression: Regulatory Pressure and Biodiversity Credit Adoption

Predictor	Beta	t-value	Sig.
Regulatory Pressure	0.621	8.60	0.000
R ²	0.386		
Adjusted R ²	0.381		
F-value	73.96		0.000

H2 is supported.

Table 11. Regression: MRV Capability and Perceived Credibility

Predictor	Beta	t-value	Sig.
MRV Capability	0.701	10.67	0.000
R ²	0.491		
Adjusted R ²	0.487		
F-value	113.85		0.000

H3 is supported.

Table 12. Regression: Market Awareness and Biodiversity Credit Adoption

Predictor	Beta	t-value	Sig.
Market Awareness	0.637	8.98	0.000
R ²	0.406		
Adjusted R ²	0.401		
F-value	80.64		0.000

H4 is supported.

Table 13. Multiple Regression on Nature-Positive Performance

Predictor	Beta	t-value	Sig.
Biodiversity Credit Adoption	0.356	4.72	0.000
Perceived Credibility	0.421	5.63	0.000
MRV Capability	0.218	2.91	0.004
R ²	0.664		
Adjusted R ²	0.655		
F-value	76.41		0.000

H5 is supported.

Table 14. SEM Path Results

Hypothesis	Path	Beta	t-value	p-value	Result
H1	ESG Commitment → Biodiversity Credit Adoption	0.654	9.41	0.000	Supported
H2	Regulatory Pressure → Biodiversity Credit Adoption	0.621	8.60	0.000	Supported
H3	MRV Capability → Perceived Credibility	0.701	10.67	0.000	Supported

H4	Market Awareness → Biodiversity Credit Adoption	0.637	8.98	0.000	Supported
H5	Biodiversity Credit Adoption → Nature-Positive Performance	0.356	4.72	0.000	Supported
H6	MRV Capability → Perceived Credibility → Nature-Positive Performance	0.295	5.14	0.000	Supported

Table 15. Model Fit Indices

Fit Index	Recommended Value	Obtained Value	Status
Chi-square/df	< 3.00	2.11	Good
CFI	> 0.90	0.952	Good
TLI	> 0.90	0.941	Good
IFI	> 0.90	0.956	Good
RMSEA	< 0.08	0.058	Good
SRMR	< 0.08	0.044	Good

DISCUSSION/SUGGESTIONS:

The findings reveal that ESG commitment is a major predictor of biodiversity credit adoption. Organizations that prioritize biodiversity in their sustainability strategy are more likely to participate in biodiversity credit markets. This supports the argument that corporate demand is currently driving the voluntary biodiversity credit segment.

Regulatory pressure also significantly influences adoption. As governments strengthen biodiversity offset policies and nature-related disclosure requirements, compliance biodiversity credits are expected to become increasingly important. This finding supports the market expectation that compliance credits will register rapid growth during the forecast period.

MRV capability showed the strongest influence on perceived credibility. This is a critical finding because biodiversity credits depend on credible measurement of ecological outcomes. Unlike carbon markets, biodiversity outcomes are difficult to standardize. Therefore, remote sensing, AI, blockchain, eDNA, independent verification and transparent reporting are essential for improving trust.

Market awareness significantly influenced biodiversity credit adoption. This indicates that limited awareness remains a barrier to market expansion. Organizations may support biodiversity goals but may not yet understand credit mechanisms, registries, certification systems or pricing models.

Biodiversity credit adoption and perceived credibility significantly influenced nature-positive performance. This suggests that biodiversity credits can generate environmental value when they are credible, verified and connected to genuine conservation outcomes.

The mediation result confirms that perceived credibility is a key mechanism through which MRV capability improves nature-positive performance. Strong MRV systems increase confidence, reduce greenwashing concerns and make biodiversity credits more attractive to corporate buyers and investors.

CONCLUSION:

Biodiversity credits are emerging as an important environmental finance instrument for supporting conservation, ecosystem restoration and nature-positive business strategy. This study empirically examined the determinants of biodiversity credit adoption using data from 120 respondents.

The findings show that ESG commitment, regulatory pressure and market awareness significantly influence biodiversity credit adoption. MRV capability strongly influences perceived credibility, and both biodiversity credit adoption and perceived credibility enhance nature-positive performance. The mediation analysis confirms that perceived credibility acts as a key pathway through which MRV capability improves environmental outcomes.

The study concludes that the future of the biodiversity credit market depends on credibility, standardization, transparent MRV systems and genuine ecological impact. Biodiversity credits can become a powerful tool for mobilizing private finance for nature, but only if they are supported by strong governance, scientific measurement and ethical market design.

CONFLICT OF INTEREST:

This paper is based on a conceptual review of published literature and does not involve direct funding or collaboration with commercial biotechnology entities. The author declares no financial or personal conflicts of interest related to the subject matter discussed.

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