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Natural Capital and National Strategy: Positioning India in the Global Carbon and Biodiversity Markets

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Ajoy Kumar Dey

Department of Operations Management and Decision Sciences, IILM University, Gurugram and IILM Institute of Higher Education, Lodhi Road, New Delhi, India.
Email: *ajoy.dey@iilm.edu*

Abstract

The global economy is undergoing a profound transformation, shifting from treating clean air, ecosystem stability, and biodiversity as non-market public goods to valuing them as monetizable and investible natural assets. This paper explores the strategic consequences of this transition with particular attention to India's emerging role in expanding carbon and biodiversity credit markets. Using a comparative case study of six leading nature-based solutions (NbS) initiatives, including Reliance's Vantara project in India, the analysis evaluates divergent models of scale, governance structures, measurement-reporting-verification (MRV) systems, community participation, and market legitimacy. The results indicate that India's early mover advantage, strengthened by policy instruments such as the Carbon Credit Trading Scheme (CCTS), can translate into significant competitive positioning. But capturing this value depends critically on deploying rigorous MRV protocols and ensuring fair and transparent benefit-sharing arrangements to protect against loss of reputation. Overall, the study argues that India's extensive natural capital reserve and forward-looking regulatory approach lay the ground for global leadership provided firms and policy makers prioritise long-term ecological stewardship over narrow, short-term financial gains.

Keywords: Carbon market, India, Biodiversity market, Global, Ecosystem

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Introduction

The Revaluation of Nature

For much of the modern economic history, natural resources such as clean air, fresh water systems, and biodiversity were treated as elements lying outside of the core logic of production and market exchange (Stern, 2007). Under the mounting pressure of climate change, this paradigm is rapidly shifting. One of the most significant transformations of this century is the formal recognition and institutionalisation of ecosystem services as measurable, tradeable and financially investible assets (Guerry et al., 2012). Simultaneously, corporate strategic focus is evolving from what firms can produce to what ecological value they conserve or regenerate, especially when such value can be measured and verified (Dasgupta, 2021).

India, straddling rapid industrial expansion and mounting ecological stress, stands at an inflexion point. With the introduction of CCTS, the central government has established a structured domestic market to support India's contribution to the global initiative (GOI, 2022). This enables large corporations to integrate environmental stewardship into their long-range strategic planning.

The Reliance Vanatara (meaning 'Star of the forest' in Hindi), a large-scale animal rescue and rehabilitation initiative, is not a public zoo. Equipped with advanced medical facilities, Vantara is a private sanctuary for injured, endangered, and abandoned animals. By converting a substantial ecological footprint into a functional carbon sink and biodiversity refuge, Reliance has grabbed the first-mover advantage in the evolving carbon credit market (ET Online, 2024). The project is a forward-looking approach to aligning ecological restoration with financial and regulatory incentives.

The paper contributes to the emerging literature on nature-based asset markets by comparing Vantara with five major global initiatives in forest conservation and carbon sequestration. Using a five-part framework, the study identifies the structural, regulatory, and governance parameters required for India to establish competitive advantages in the quickly expanding ecosystem propelled service economy.

Nature as a Balance Sheet Asset

With the financialisation of nature, which transforms ecosystem services like carbon capture and ecosystem restoration into tangible and measurable balance sheet assets (OECD, 2023), the asset theory is witnessing a fundamental shift. Firms that proactively align their strategy with this trend stand to benefit from an early-mover advantage.

The emerging commodities market is driving financialisation. Carbon credits are on the path of maturity as a tradable instrument in both the Voluntary Carbon Markets (VCM) and mandatory compliance markets, such as India's Carbon Credit Trading Scheme (CCTS) (IEA, 2021). The

market value of these credits is determined by stringent criteria of credibility, performance, and additionality; failure on any point invalidates the asset (Cardenas & Ayala, 2023). The future lies in expanding the Biodiversity credits (Sanctuary Mountain, 2023). While these are highly site-specific and complex, they attract the highest premium if the projects deliver combined benefits of carbon sequestration and biodiversity enhancement.

India is well poised to capitalise on this shift (UNDP, 2025; WEF, 2024). India possesses immense natural capital, and its developed industrial sector offers an opportunity to offset. Crucially, the CCTS provides a regulatory framework to create bankable ecosystem projects. The Indian investors have to take a strategic decision of either becoming owners or service providers of these new ecosystem asset classes. Early movers may exploit the potential to dominate the market once the framework stabilises in a mature market (Osborne Clarke, 2024; WEF, 2025).

Table 1: Comparison of five global projects

Project Name	**Location**	**Scale (Hectare)**	**Focus**	**Primary Standards**
Vantara (Reliance)	India (Gujarat)	3,000	Restoration & Rescue (Biodiversity /Carbon Co-benefits)	Future Domestic CCTS Compliance
Rimba Raya	Indonesia	64,500	Avoided Deforestation (REDD+) & Community	Verra (CCB/VCS)
Kasigau Corridor	Kenya	200,000	Avoided Deforestation (REDD+) & Community	Verra (VCS)
Azuero Reforestation	Panama	10,000	Reforestation /Afforestation & Community	Verra (VCS/CCB)
Cordillera Azul	Peru	1,600,000	Avoided Deforestation (REDD+) & Protected Area	Verra (CCB/VCS)
Sanctuary Mountain	New Zealand	3,400	Biodiversity Credit Pilot (Fenced Sanctuary)	Domestic /Sovereign Standard (NZ DOC)

Notes: CCB - Climate, Community & Biodiversity; NZ DOC - New Zealand Department of Conservation; VCS - Verified Carbon Standard ; Verra sets the world's leading standards for climate action and sustainable development (Website: https://verra.org/about/overview/)

Comparative Case Studies: Global Approaches to Nature-Backed Assets. To understand the opportunities and pitfalls for projects like Vantara, we compare it against five diverse, internationally recognised nature-based solution initiatives, representing varied geographies, funding, and environmental focuses (Table 1).

Comparative Lens 1: Scale and Geography

Projects vary dramatically in size and environmental function. Cordillera Azul (1.6M Ha) and Kasigau Corridor (200k Ha) are vast, leveraging wilderness areas for large-scale Avoided Deforestation (REDD+). Reducing Emissions from Deforestation and Forest Degradation Plus, REDD+ is a UN-backed framework helping developing countries get paid to protect forests, reduce emissions, and manage forests sustainably, turning forests into valuable assets for climate mitigation, biodiversity, and local livelihoods by creating carbon credits from saved emissions. Their scale is necessary to create viable economic and ecological buffer zones (Wildlife Works, 2019; CIMA Peru, 2020). Rimba Raya (64.5k Ha) protects a globally critical, high-carbon peat swamp forest (InfiniteEARTH, 2021). In contrast, Vantara (3,000 acres, India) and Sanctuary Mountain (3,400 Ha, New Zealand) focus on intensive, managed intervention. One acre equals roughly 0.4047 hectares. Vantara's semi-arid location dictates managed biodiversity rescue (Kumar et al., 2024), while Sanctuary Mountain's small scale is defined by a pest-proof fence perimeter, prioritising intense habitat quality and species protection for its biodiversity asset (NZ DOC, 2022). Azuero Reforestation (10k Ha) is an intermediate-scale initiative focused purely on transforming degraded pastureland through high-impact A/R (Rubicon Carbon, 2023).

Comparative Lens 2: Governance and Funding Model

The funding structure dictates long-term stability and risk.

- Vantara relies on a single, massive corporate entity (Reliance), granting execution speed but centralising financial and reputational risk (Kumar et al., 2024). Governance is likely top-down.
- Most international projects use blended models sustained by the Voluntary Carbon Market (VCM). Rimba Raya and Kasigau Corridor are classic examples: private developer-led, with long-term sustainability tied to VCM revenue, and governance shared with local community associations (InfiniteEARTH, 2021; Wildlife Works, 2019).
- Cordillera Azul is a unique public-private partnership, where a local NGO (CIMA) sells REDD+ credits to fund the operational costs of a national park, ensuring public oversight (CIMA Peru, 2020).
- Sanctuary Mountain operates as a non-profit charitable trust, relying heavily on public grants (NZ DOC) and philanthropic donations, piloting a domestic biodiversity credit

market.

- Azuero represents new funding, backed by institutional buyers (Microsoft) and natural capital funds, which provide upfront capital to de-risk reforestation (Rubicon Carbon, 2023).

Comparative Lens 3: MRV, Standards, and Crediting Pathways

Comparison of five projects on the parameter of Measurement, Reporting, and Verification (MRV) that establishes asset credibility (Verra Standard Documents, 2020) (Table 2).

Table 2: Comparison of five projects on the MRV focus

Project	Standard /Pathway	MRV Focus
Vantara	Likely Domestic CCTS	Intensive Biodiversity conservation indicators (species count, habitat quality) using remote sensing and bioacoustics.
Rimba Raya & Kasigau	Verra VCS/CCB (VCM)	Tracking Avoided Deforestation against a credible baseline; ground surveys for carbon stock and community impact.
Azuero Reforestation	Verra VCS (A/R Methodology)	Tracking the growth and survival rate of planted trees over decades for long-term removal credits.
Cordillera Azul	Verra VCS/CCB	Differentiating threat reduction due to national park management versus carbon finance additionality.
Sanctuary Mountain	Domestic/Sovereign Pilot	Ecological integrity metrics: pest eradication success, native species reintroduction, and population health (non-carbon asset).

Comparative Lens 4: Community, Rights, and Benefit Sharing

The social license to operate is critical for long-term viability (Redford & Adams, 2009).

- Vantara's community interface is primarily through CSR initiatives and employment, distinct from the direct revenue-sharing models of international REDD+ projects (Kumar et al., 2024).
- Rimba Raya and Kasigau Corridor are benchmarks for benefit sharing. A significant, mandated portion of VCM revenue flows back to local communities for healthcare and education, structured through legally binding agreements and ensuring Free, Prior, and

Informed Consent (FPIC) to safeguard traditional land rights (InfiniteEARTH, 2021; Wildlife Works, 2019).

- Azuero focuses on involving local farmers as active economic partners through land-use agreements and employment in nursery operations (Rubicon Carbon, 2023).
- For Cordillera Azul, community trust and acceptance are key because its conservation success relies on local people. Losing that goodwill threatens long-term protection against pressures like resource extraction, making genuine engagement vital for sustainability beyond just legal permits.
- Sanctuary Mountain is rooted in kaitiakitanga (guardianship), working closely with local Māori iwi (tribes) to restore a landscape significant to cultural identity (NZ DOC, 2022).

Comparative Lens 5: Controversies and Market Credibility

Reputational risk is the single largest threat to asset valuation (Murray, 2004).

- Vantara's primary risk is questioning additionality due to its vast corporate wealth, requiring absolute transparency in MRV to gain international credibility (Kumar et al., 2024).
- Rimba Raya faced land-tenure risks and disputes with adjacent industries but maintains high credibility due to its long track record and adherence to social standards (InfiniteEARTH, 2021).
- Kasigau Corridor overcame initial perceptions of exploitation by prioritising audited revenue flow and transparency, making it a global model for community-centric REDD+ (Wildlife Works, 2019).
- Azuero (A/R) faces biophysical risk from non-permanence (fire, drought) and long credit cycles, requiring sustained institutional backing (Rubicon Carbon, 2023).
- Cordillera Azul's main risk is political instability and the costly challenge of policing illegal logging across its colossal protected area (CIMA Peru, 2020).
- Sanctuary Mountain is insulated from carbon market risk but faces operational risk (predator fence failure) and relies on the high integrity of its sovereign-backed ecological monitoring (NZ DOC, 2022).

Discussion

Charting India's Strategic Path

The comparative analysis reveals that while the financial promise of nature as capital is immense, execution is fraught with political, social, and technical complexity. Success is contingent on

navigating specific jurisdictional risks, and no single global model is perfect.

The New Role of Corporate Purpose

Projects like Vantara signal a crucial paradigm shift: conservation moves from a passive CSR line item to a potentially core business asset (Kumar et al., 2024). This strategic integration of ecological preservation is essential for future competitive advantage. As credits are commoditised, market liquidity will favour assets demonstrating permanence and high co-benefits.

The Imperative of High-Integrity MRV

The primary lesson from the Voluntary Carbon Market (VCM) is that low-integrity credits destroy market value (MSCI, 2024). For India to build a competitive advantage, the CCTS must enforce standards that meet or exceed international best practices. For the five projects comparison of MRV and Credibility Drivers is displayed in Table 3.

Table 3: Comparison of MRV and Credibility Drivers

Project Name	MRV Focus	Core Credibility Driver	Primary Reputational Risk
Vantara (IN)	Advanced Technology, Biodiversity Metrics	Corporate Execution, CCTS Alignment	Additionality/Greenwashing Perception
Rimba Raya (ID)	Satellite REDD+ Monitoring, Ground Surveys	CCB/VCS Certification, Long Track Record	Land Tenure Disputes
Kasigau Corridor (KE)	Leakage Calculation, Community Impact Audits	Community Uplift, Benefit Sharing Model	Price Volatility of VCM
Azuero Reforestation (PA)	A/ R Growth & Survival Rates (Decadal)	Institutional Buyer Backing (Microsoft)	Non-permanence (Drought/Fire Risk)
Cordillera Azul (PE)	Protection Enforcement, Threat Reduction Mapping	Public-Private Governance, National Park Status	Political Instability, Illegal Logging
Sanctuary Mountain (NZ)	Ecological Integrity (Pest/Species Data)	Sovereign Standard, Cultural Integration	Funding Dependence on Philanthropy

India must strategically invest in the service provider segment, developing domestic expertise in remote sensing, ground-truthing, and blockchain-enabled registries to ensure every credit generated is auditable and unique (Guerry et al., 2012).

The Mandate for Equity and Rights

India's natural capital is intrinsically linked to the land rights and livelihoods of local communities. The success of Kasigau Corridor and Rimba Raya demonstrates that projects that empower and financially benefit local stewards are inherently more stable, permanent, and therefore more valuable assets (Redford & Adams, 2009).

If the corporate sector seeks to own ecosystem assets at scale, it must establish clear, transparent, and legally enforceable benefit-sharing agreements aligned with the principles of Free, Prior, and Informed Consent (FPIC). Failure to integrate equity will result in social conflict and the destruction of market credibility.

The Strategic Value of Biodiversity

While carbon is easily tradable, biodiversity represents massive untapped value (NZ DOC, 2022). Given India's mega-diverse status, its long-term competitive advantage lies in packaging carbon credits with verified biodiversity co-benefits, potentially through a domestic framework akin to the New Zealand pilot. This integrated approach, exemplified by Vantara's focus, allows Indian projects to access premium global markets, differentiating them from low-quality initiatives.

Conclusion

The frontier of investment has fundamentally shifted to safeguarding nature. India, with its domestic market signals (CCTS) and large emissions-intensive industries, is poised for an unprecedented transition. By viewing Vantara as a strategic early-mover experiment, Indian strategists can derive critical lessons. The comparison with global projects from the scale of Cordillera Azul to the social integration of Kasigau underscores that success demands:

i). Financial stability coupled with social equity.

ii). Rigorous MRV systems that guarantee permanence and additionality.

The core choice for India is whether to build a low-integrity market focused solely on domestic compliance or to create a high-integrity, premium-asset economy that competes globally. Prioritising the integrity of its natural assets through rigorous MRV, equitable community partnership, and political support will allow India to build a competitive advantage, transforming its natural resources into the most valuable capital of the 21^{st} century.

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About Author:

Ajoy Kumar Dey

Dr. Ajoy Kumar Dey is a Professor of Operations Management and Decision Sciences at IILM University, Gurugram and IILM Institute of Higher Education, Lodhi Road. He serves as Director at Large for NACRA (North American Case Research Association), USA, and has guided many doctoral candidates. Previously, he worked at Birla Institute of Management Technology (BIMTECH) where he was Chairperson of the Centre for Management Case Development and Editor of the South Asian Journal of Business & Management Cases, a SAGE Publication.

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