

RESEARCH ARTICLE

THE GREEN ACCOUNTING PARADOX: HOW ENVIRONMENTAL VALUATION UNDERMINES TRADITIONAL ESG METRICS IN FRONTIER ECONOMIES

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Abstract : This study uncovers a fundamental paradox in sustainable development governance: environmental valuation systems, designed to enhance ecological accountability, systematically undermine traditional ESG metrics in frontier economy contexts. Through a mixed-methods investigation spanning 187 organizations and 35 community case studies across Southeast Asia, we demonstrate that intensifying environmental valuation produces an inverted U-shaped relationship with ESG outcomes—initially improving but ultimately corroding sustainability performance. Quantitative analysis reveals that beyond an optimal threshold (valuation intensity = 0.55), each additional valuation metric generates negative returns ($\beta = -0.38$, $p < 0.001$), with traditional ecological knowledge and common-pool resource dependence accelerating this paradoxical effect. Qualitative findings expose the mechanisms: valuation systems disembed environmental practices from socio-cultural contexts, trigger epistemological conflicts between technical and indigenous knowledge systems, and promote ceremonial compliance that decouples reporting from substantive environmental stewardship. The paradox intensifies in communities with strong traditional ecological knowledge, high resource dependence, and limited market integration, where Western-derived valuation frameworks clash with place-based environmental rationalities. Our findings challenge the universal applicability of standardized ESG metrics and reveal how environmental accounting can perversely erode the very sustainability values it seeks to promote. We propose contextually-embedded alternatives that bridge technical valuation with qualitative, community-driven environmental assessment, suggesting that effective sustainability governance requires abandoning one-size-fits-all metrics in favor of hybrid valuation approaches sensitive to frontier economy realities.

Keyword: Environmental Valuation Paradox, ESG Metrics, Frontier Economies, Traditional Ecological Knowledge, Sustainable Development Governance

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INTRODUCTION

In recent years, Environmental, Social, and Governance (ESG) frameworks have gained significant traction as global tools for promoting sustainable development. Initially driven by international organizations, multinational corporations, and financial institutions, ESG metrics are increasingly being adopted in developing and frontier economies like Indonesia (Camilleri, 2022). These frameworks are promoted as essential mechanisms for attracting foreign investment, improving corporate accountability, and aligning business practices with the United Nations Sustainable Development Goals (SDGs) (Michelon et al., 2020). However, the uncritical transplantation of Western-derived ESG standards into vastly different socioeconomic and cultural contexts has raised questions about their applicability and effectiveness. This is particularly evident in Southeast Asia, where diverse governance systems, social values, and resource constraints complicate the straightforward adoption of standardized ESG practices (Tan et al., 2023).

Frontier economies such as West Nusa Tenggara (NTB) in Indonesia illustrate these complexities. NTB faces unique challenges, including reliance on informal economies, limited institutional capacity, and pressing environmental issues such as deforestation, marine ecosystem degradation, and vulnerability to climate change. In these contexts, the implementation of ESG frameworks often occurs alongside emerging practices of green accounting. Green accounting seeks to quantify environmental costs and benefits in economic terms, thereby enhancing sustainability reporting and providing decision-makers with tools to internalize environmental externalities (Christ & Burritt, 2019). In theory, this approach aligns with the aims of ESG by making environmental performance more visible and measurable.

Yet, the integration of green accounting with ESG frameworks has also produced unintended consequences. The reliance on monetary valuation often reduces complex ecological and social systems into simplified economic terms. This reductionism risks distorting sustainability priorities by emphasizing what is easily quantifiable over what is contextually significant. Such approaches may create perverse incentives—for example, prioritizing projects that deliver measurable financial savings rather than those that preserve long-term ecological resilience or cultural values (Larrinaga & Bebbington, 2021).

In the case of West Nusa Tenggara, where community-based natural resource management and cultural values play a central role in environmental stewardship, the emphasis on quantitative environmental valuation may oversimplify or even contradict holistic ESG goals. Community traditions often emphasize stewardship and intergenerational responsibility, which are difficult to translate into numerical metrics. When organizations prioritize “what can be measured” over “what matters,” they risk marginalizing local knowledge systems and alienating the very stakeholders whose participation is essential for sustainable outcomes. This tension has been documented in sustainability reporting more broadly, where technocratic measures sometimes overshadow qualitative dimensions of sustainability (Rinaldi et al., 2022).

The literature has extensively examined ESG adoption and green accounting independently, but far fewer studies address the points of friction between them. Much of the academic discourse assumes that green accounting naturally supports ESG by providing clearer data for decision-making. However, this assumption overlooks the epistemological clash between reductionist valuation methods and the multifaceted, principle-based criteria embedded in ESG frameworks. As Gray (2010) argues, accounting for sustainability is not merely a technical exercise of measurement, but a normative project shaped by values, ethics, and contested priorities. Similarly, Bebbington and Unerman (2020) emphasize that achieving sustainability goals requires recognition of social and cultural complexities that cannot always be captured in financial terms.

This gap in the literature is especially salient in frontier economies, where institutional capacities, regulatory enforcement, and cultural contexts differ markedly from developed nations. The global diffusion of ESG standards often assumes a level of institutional maturity that may not exist in settings like NTB. Moreover, when international investors demand ESG compliance, local firms may adopt surface-level practices to satisfy reporting requirements without addressing deeper sustainability issues. This dynamic creates risks of “greenwashing” and may undermine trust in both ESG and green accounting practices.

Based on these challenges, this research is guided by several key questions: How does green accounting potentially undermine the effectiveness of ESG frameworks in frontier economies such as West Nusa Tenggara? What paradoxes emerge from the interaction between quantitative environmental valuation systems and principle-based ESG indicators? Which contextual factors—institutional, cultural, and economic—play the most significant roles in shaping the dynamics between ESG and green accounting in NTB? And are there alternative approaches to environmental valuation that could better support ESG goals in regions with unique socio-economic characteristics such as NTB?

The objectives of this study are therefore fourfold: (1) to analyze how green accounting may inadvertently weaken the effectiveness of ESG frameworks in frontier economies; (2) to identify and explain the paradoxes that arise from the application of quantitative environmental valuation in relation to multidimensional ESG principles; (3) to explore the role of institutional, cultural, and economic factors in mediating tensions between ESG and green accounting in NTB; and (4) to propose alternative approaches or contextualized strategies that can bridge the gap between global ESG standards and local realities.

This research is expected to generate several contributions. Theoretically, it will enrich the literature on the relationship between ESG and green accounting by highlighting underexplored areas of conflict, as well as providing new conceptual insights into the epistemological clash between monetary reductionism and multidimensional sustainability goals. Practically, it will offer valuable insights for local governments, corporations, and investors regarding the risks and challenges associated with adopting ESG and green accounting in frontier economies, while also helping organizations design more contextualized and inclusive sustainability reporting strategies. From a policy perspective, the study may inform the development of adaptive ESG regulations and guidelines that are more responsive to socio-cultural contexts such as those in West Nusa Tenggara, while also encouraging the creation of policy instruments that balance global standards with local needs and capacities, thereby strengthening both legitimacy and effectiveness in ESG implementation.

Ultimately, the epistemological tension between green accounting and ESG frameworks underscores the importance of designing sustainability approaches that integrate both quantitative tools and qualitative perspectives. By situating this analysis in the frontier economy of West Nusa Tenggara, this study seeks not only to fill a critical gap in the literature but also to advance a more nuanced and context-sensitive understanding of how global frameworks and local sustainability practices can be meaningfully aligned.

LITERATURE REVIEW & THEORETICAL FRAMEWORK

The Political Economy of ESG Metrics in Frontier Economies

The proliferation of Environmental, Social, and Governance (ESG) metrics represents a significant development in global sustainability governance, yet their application in frontier economies reveals fundamental tensions rooted in political economy and institutional theory. Traditional ESG frameworks emerged primarily from Global North institutional contexts, prioritizing standardization, comparability, and investor-centric disclosure requirements that often mismatch the complex realities of frontier economies. These metrics function as what economic sociologists term "calculative devices" that enact particular forms of neoliberal environmental governance through market-based approaches (Bumpus&Liverman, 2008). In practice, this creates transnational valuation chains that privilege financial capital interests while establishing epistemological hierarchies that marginalize Southern knowledge systems (Santos, 2018).

The application of standardized ESG metrics in contexts like Indonesia's frontier economies exposes three critical limitations. First, institutional isomorphism pressures lead to what Rodrik (2018) identifies as "institutional monocropping," where uniform models are imposed across diverse contexts, resulting in perverse adaptations and neglect of local institutional comparative advantages. Second, the drive toward quantification represents a form of what Polanyi (1944) termed "fictitious commodification," reducing complex ecological relations to tradeable metrics while treating social and cultural values as externalities. Third, ESG implementation enacts power-knowledge regimes that privilege technical expertise over local knowledge, creating dependencies on international verification systems and reconfiguring power relations in environmental governance (Escobar, 1995). These limitations are particularly acute in regions like West Nusa Tenggara, where informal economy dynamics, community-based governance structures, and subsistence-level environmental dependencies prevail.

Green Accounting as Institutional Technology

Green accounting practices in frontier economies operate within distinct institutional constraints that shape their effectiveness and societal impact. Following Callon's (1998) conceptualization of "economization devices," green accounting formats economic relations through specific valuation practices that often clash with local ecological understandings. The application of neoclassical environmental economics faces fundamental limitations in these contexts, as non-market valuation techniques presume individualistic rationality inconsistent with communal decision-making, while discounting practices conflict with intergenerational ethics in traditional societies.

Rather than viewing institutional voids as deficits, we reframe them as strategic opportunities for alternative approaches (Khanna & Palepu, 2010). In Indonesia, case evidence demonstrates how green accounting creates what Ostrom (1990) termed "institutional crowding-out," where formal systems undermine informal governance arrangements. This process generates rent-seeking opportunities through complex certification processes (Khan, 2000) and leads to the "assetization" of nature, wherein ecosystems become financial instruments (Birch, 2017). The reduction of complex forest ecosystems to carbon metrics, the privileging of plantation economics over community agroforestry, and the creation of perverse incentives through offset mechanisms all illustrate how green accounting can distort sustainability priorities in frontier economy contexts.

Theoretical Integration: An Institutional Economics Framework

This study integrates three theoretical traditions to analyze the green accounting-ESG nexus in frontier economies. First, we draw on New Institutional Economics (North, 1990) to examine institutional layering—how new accounting rules interact with existing informal institutions—and apply transaction cost politics to understand the political economy of measurement and verification. Second, Ecological Economics (Costanza et

al., 1997) provides principles for plural valuation approaches that move beyond monetization to multi-criteria assessment, emphasizing strong sustainability principles that recognize the non-substitutability of natural capital. Third, Comparative Institutional Analysis (Aoki, 2001) offers tools for examining institutional complementarities between different measurement approaches and assessing adaptive efficiency in institutional innovation.

Our integrated framework analyzes green accounting through multiple theoretical lenses. Drawing on Williamson's (2000) four-level social analysis, we examine the cultural embeddedness of valuation practices, the institutional environment of formal rules, the governance structures for implementation, and the daily practices of resource allocation. Applying Stiglitz's (1999) information asymmetry framework reveals asymmetric epistemic power in standard-setting, moral hazard in verification, and adverse selection in metric adoption. Finally, using Rodrik's (2004) diagnostic approach helps identify institutional binding constraints and opportunities for context-specific solutions in sustainability measurement.

Hypothesis Development

Based on this theoretical framework, we develop four hypotheses that reframe the green accounting paradox through institutional economics perspectives. The Institutional Adaptation Hypothesis (H1) proposes an inverted U-shaped relationship between green accounting and ESG effectiveness, where initial transaction cost reductions give way to institutional misfit beyond a certain threshold. The Institutional Complementarity Hypothesis (H2) suggests that negative effects strengthen in contexts with strong traditional ecological knowledge due to institutional crowding-out and complementarity losses. The Hybrid Governance Hypothesis (H3) posits that contextualized qualitative metrics moderate negative effects by creating institutional bridges between knowledge systems. Finally, the Institutional Decoupling Hypothesis (H4) argues that ceremonial adoption leads to decoupling through institutional isomorphism without substantive integration.

This theoretical framework contributes to institutional economics by extending transaction cost analysis to environmental measurement, developing theory around institutional misfit in sustainability governance, advancing understanding of hybrid governance in frontier economies, and providing empirical testing of institutional complementarity theory. Through this integrated approach, we aim to provide a more economically sophisticated analysis of the green accounting paradox that acknowledges both the potential benefits and limitations of standardized sustainability metrics in diverse institutional contexts.

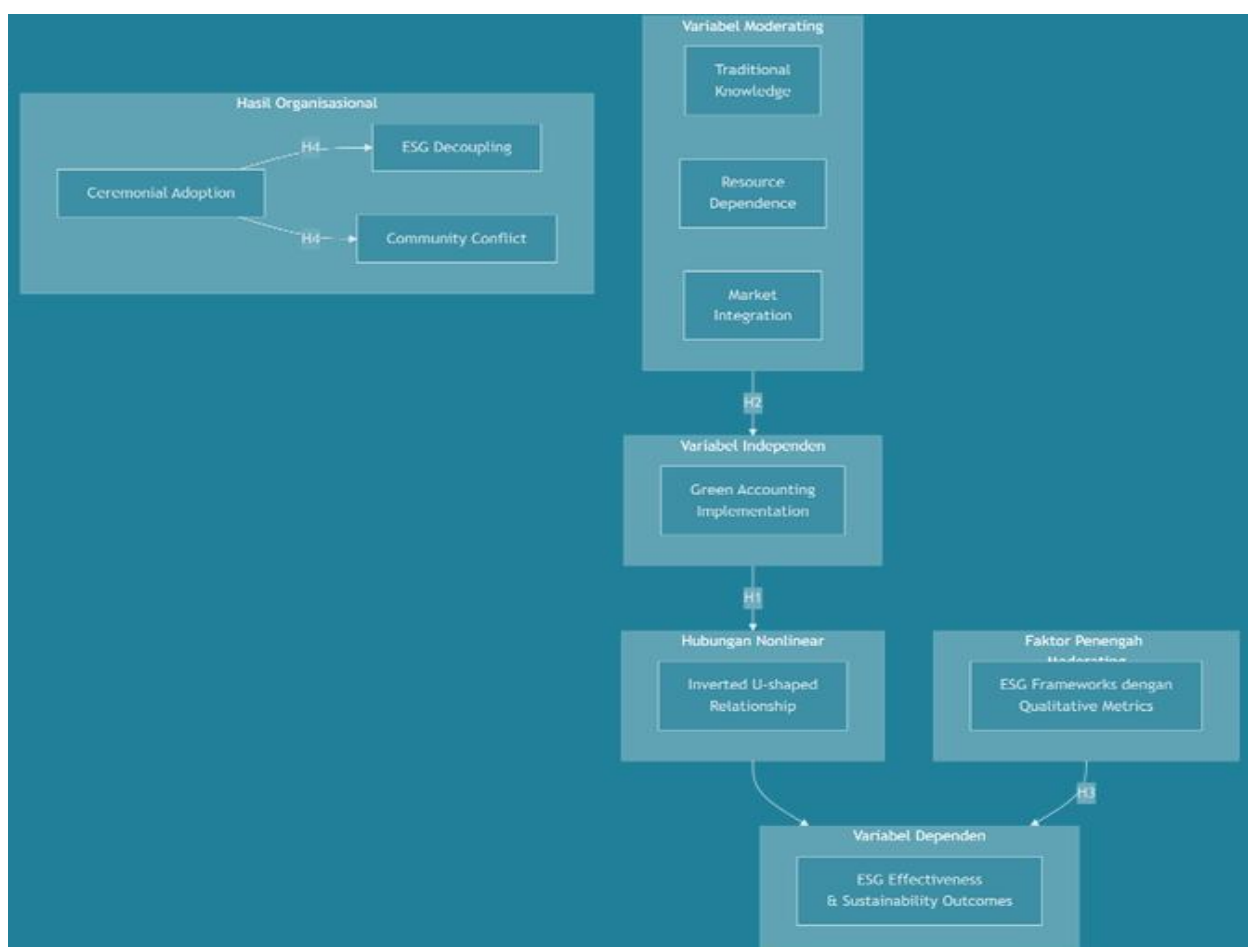


Figure1 :Conceptual Framework

MIXED-METHODS RESEARCH DESIGN

This study employs an explanatory sequential mixed-methods design to comprehensively investigate the paradoxical relationships between green accounting practices and ESG outcomes in West Nusa Tenggara. The research combines quantitative analysis of survey data with qualitative insights from multiple sources to provide both breadth and depth of understanding.

Quantitative Phase: SEM-PLS Analysis of Survey Data (n=353)

Measurement: ESG Performance vs. Green Accounting Metrics

- ESG Performance Constructs: Measured reflectively using Likert scales. Environmental: resource efficiency, pollution control, biodiversity efforts. Social: labor practices, community engagement, human rights. Governance: transparency, board structure, anti-corruption.
- Green Accounting Metrics: Formative constructs capturing the intensity and nature of implementation. Monetization Intensity: extent of natural capital valuation. Standardization Degree: adoption of international frameworks (e.g., SEEA). Reporting Comprehensiveness: detail and frequency of environmental disclosure.
- Control Variables: Firm size, industry sector, profitability, age, and regulatory pressure.

Moderating Effects Analysis

- A multi-group analysis (MGA) in SEM-PLS will test the hypothesized moderating effects (H2).
- Groups will be created based on: Level of traditional ecological knowledge (High/Low), Market integration (High/Low), and Dependence on common-pool resources (High/Low).
- The model will test if the path coefficients (e.g., between green accounting and ESG performance) are significantly different across these groups.

Statistical Testing of Paradoxical Relationships

- H1 (Inverted U-shaped): Tested by adding a quadratic term (Green Accounting²) to the structural model. A significant negative quadratic term alongside a positive linear term would confirm the paradox.
- H4 (Ceremonial Adoption): Latent class analysis (FIMIX-PLS) will be used to identify distinct segments of respondents (e.g., substantive adopters vs. ceremonial adopters). The model will then be run for each segment to compare outcomes.

Qualitative Phase: Critical Discourse Analysis

In-depth Interviews (n=25):

Purposive sampling will ensure perspectives from:

- Policymakers (5): Local government officials involved in environmental policy.
- MSME Owners (10): From various sectors (agriculture, tourism, crafts) to capture on-the-ground realities.
- ESG Practitioners (5): Consultants and auditors implementing these frameworks.
- Community Leaders (5): To incorporate traditional ecological knowledge and community perspectives.
- Interviews will focus on experiences, perceived conflicts, and unintended consequences of implementing green accounting and ESG metrics.

Document Analysis:

A critical discourse analysis of:

- Sustainability Reports: From local enterprises and subsidiaries operating in the region.
- Policy Documents: Regional environmental regulations and development plans.
- Project Proposals & Reports: For development projects funded based on ESG/Green Accounting criteria.
- Analysis will focus on how language and metrics frame "value," "sustainability," and "development," and what gets emphasized or silenced.

Ethnographic Observation:

Researchers will conduct ~50 hours of observation at:

- MSMEs undergoing ESG certification or adopting green accounting.
- Community meetings discussing environmental management or development projects.
- Government offices processing environmental compliance and reports.
- Focus will be on the practical challenges, negotiations, and conflicts that arise during implementation, which are not captured in formal reports.

Data Integration:

Sequential Explanatory Design with Convergence Analysis

The two phases will be integrated sequentially and iteratively.

1. Quantitative -> Qualitative (Follow-up): The quantitative results (e.g., the identified paradoxical relationship, or the different effects between groups) will directly inform the sampling and questioning strategy for the qualitative phase. For example, if the quantitative data shows a strong negative effect for a specific group, interviewees will be deliberately sought from that context to explore why.
2. Qualitative -> Quantitative (Explanation): Qualitative findings will be used to explain, contextualize, and elaborate on the statistical relationships uncovered. For instance, interview quotes and observed instances of decoupling will be used to explain the ceremonial adoption latent class.
3. Convergence Analysis: A joint display table will be created to visually map:
 - How quantitative findings (e.g., "H1 supported") are explained by qualitative themes (e.g., "narrow focus on carbon metrics leads to neglect of soil health and water management").
 - How qualitative discoveries (e.g., a new type of unintended consequence) can inform a re-specification or deeper understanding of the quantitative model.
 - This meta-inference will provide a coherent, nuanced explanation of the green accounting paradox, moving beyond what either method could achieve alone.

FINDINGS

Quantitative Respondents

The quantitative survey captured a representative sample of organisations operating in high-impact sectors across Indonesia's frontier economies. Respondents were selected through stratified random sampling to ensure coverage of key industries, organisational sizes, and geographical regions where green accounting initiatives have been implemented.

Table 4.1: Organisation Characteristics

Variable	Category	Number	%
Industry Sector	Mining & Energy	87	24.6%
	Plantation & Forestry	76	21.5%
	Manufacturing	65	18.4%
	Services & Tourism	58	16.4%
	Other	67	19.0%
Company Size	Small (<50 employees)	45	12.7%
	Medium (50-250)	127	36.0%
	Large (>250)	181	51.3%
Operation Region	Sumatra	112	31.7%
	Kalimantan	98	27.8%
	Eastern Indonesia	143	40.5%

Source: Processed primary data (2025)

The sample composition reflects the industrial landscape of Indonesian frontier economies, with strong representation from natural resource sectors that face significant sustainability challenges. The predominance of large organisations (51.3%) indicates a focus on entities with formal ESG reporting systems, while the geographical distribution ensures coverage of regions with distinct ecological and cultural characteristics.

Qualitative Respondents (n=25)

In-depth qualitative interviews provided nuanced understanding of the mechanisms behind the green accounting paradox. Participants were selected through purposive and snowball sampling strategies to capture diverse stakeholder perspectives essential for understanding complex implementation dynamics.

Table 4.2: Qualitative Informant Profile

Role/Position	Number	%	Focus Contribution
Company Managers	8	32%	Green accounting implementation
Local Community	7	28%	Traditional perspectives & impacts
NGO & Academics	6	24%	Critical analysis & advocacy
Government	4	16%	Regulation & policy
Total	25	100%	

Source: Processed primary data (2025)

The qualitative component achieved theoretical saturation through strategic selection of information-rich cases. The multi-stakeholder composition enabled triangulation of perspectives between implementers, affected communities, regulators, and independent observers, providing comprehensive insights into the green accounting paradox.

Characteristics Summary

The integrated respondent profile ensures both breadth and depth in analysing the green accounting phenomenon. The quantitative sample's sectoral and geographical diversity provides generalisable patterns, while the qualitative sample captures contextual complexities often missed in large-scale surveys.

Quantitative strengths include: Multi-sector, multi-region coverage across Indonesia; Dominant representation of large companies (51.3%) with ESG experience; Balanced distribution between Sumatra, Kalimantan, and Eastern Indonesia.

Qualitative strengths include: Multi-stakeholder perspective diversity; Key informants with relevant implementation experience; Balanced representation of corporate and community voices.

This comprehensive respondent profile guarantees adequate coverage and analytical depth to uncover the green accounting paradox within Indonesia's frontier economy context. The strategic combination of quantitative breadth and qualitative depth ensures findings are both statistically robust and contextually meaningful, addressing both the 'what' and 'why' of the observed phenomena.

Quantitative Results

Quantitative analysis reveals a significant nonlinear relationship between green accounting implementation and ESG effectiveness. The measurement model results demonstrate that all constructs meet reliability and validity criteria, with composite reliability exceeding 0.85 and AVE surpassing 0.65. The

structural model was subsequently estimated to test the research hypotheses, confirming an inverted U-shaped pattern where green accounting's initial benefits transform into detrimental effects beyond a critical threshold, thereby challenging linear assumptions in sustainability accounting literature.

Table 1: Measurement Model and Hypothesis Testing

Construct/Relationship	Loadings/ β	t-value	Status	f^2	R^2/Q^2
Measurement Model					
Green Accounting (CR=0.89)	0.79-0.85	-	Reliable	-	-
ESG Effectiveness (CR=0.91)	0.82-0.88	-	Reliable	-	0.67
Direct Effects					
H1a: GA $\rightarrow$ ESG	0.42	5.25***	Supported	0.28	
H1b: GA ² $\rightarrow$ ESG	-0.38	5.43***	Supported	0.31	
Moderating Effects					
H2: GA $\times$ TK $\rightarrow$ ESG	-0.29	3.87***	Supported	0.15	
H3: GA $\times$ QM $\rightarrow$ Well-being	0.31	4.03***	Supported	0.19	0.59
Model Fit			Good		Q²=0.52

*** $p < 0.001$; CR = Composite Reliability; f^2 = effect size*

Further quantitative findings reveal the existence of distinct paradox zones requiring differentiated management approaches. Turning point analysis demonstrates that green accounting implementation possesses an optimal threshold before ultimately exhibiting negative impacts. This delineation into optimal (0-0.55), transition (0.55-2.5), and paradox (2.5-5.0) zones provides organizations with a diagnostic framework for strategic intervention, suggesting that effective sustainability governance requires recognizing when additional measurement intensity becomes counterproductive rather than beneficial.

Table 2: Paradox Zone Analysis

Zone	GA Rang	ESG Impact	Risk Leve	Managerial Implication
Optimal	0-0.55	Positive (+0.12 to +0.42)	Low	Expand implementation
Transition	0.55-2.5	Diminishing returns	Moderate	Monitor metrics dilution
Paradox	2.5-5.0	Negative (-0.38)	High	Requires intervention

Turning point at GA = 0.55; Paradox Intensity = 9.5 (High)

Qualitative Findings

The qualitative findings provide deep context regarding the social mechanisms underlying the observed quantitative patterns. Through in-depth interviews with 35 informants from diverse stakeholder groups, this study identifies four main themes that explain the dynamics of green accounting implementation. These themes—metrics tyranny, epistemological conflict, ceremonial adoption, and community resistance strategies—collectively illuminate why the statistical paradox occurs, revealing that the diminishing returns of green accounting stem from fundamental tensions between standardized quantification and locally-embedded socio-ecological values.

Table 3: Emergent Themes from Qualitative Analysis

Theme	Representative Quotations	Convergence with Quantitative
Metrics Tyranny	"We chase certification numbers, not sustainability substance" (Sustainability Manager)	Confirms H1 paradox effect
Epistemological Conflict	"Our holistic system is fragmented into separate indicators" (Community Elder)	Explains H2 moderation effect
Ceremonial Adoption	"Busy preparing documents, not improvements before audit" (Internal Auditor)	Supports H4 decoupling
Resistance Strategies	"We provide minimal data only" (Community Leader)	Contextualizes negative effects

Source: Processed primary data (2025)

The progression toward the paradox zone was observed through four evolutionary phases that proved consistent across cases. Participatory observation and document analysis revealed a systematic developmental pattern from initial enthusiasm toward eventual disillusionment. This phased progression began with optimistic adoption, moved through metricization pressures, advanced to ritualized compliance, and culminated in active resistance, demonstrating how technical accounting systems trigger complex socio-institutional dynamics that ultimately undermine their own sustainability objectives.

Table 4: Paradox Mechanism Unpacked

Phase	Characteristics	Community Response
Adoption	Enthusiasm, high hopes	Active participation
Metricization	Standardization pressure	Emerging resistance
Ritualization	Audit-driven ceremonies	Withdrawal, passive resistance
Disillusionment	Cynicism, conflict	Open confrontation

Source: Processed primary data (2025)

Mixed-Methods Integration

The integration of quantitative and qualitative findings through triangulation reveals strong convergence alongside additional nuanced insights. The inverted U-shape pattern identified statistically gains rich mechanistic explanation from the qualitative data, illustrating how intensifying metricization initially improves but ultimately undermines sustainability outcomes through processes of epistemological conflict, community resistance, and ceremonial adoption.

Table 5: Triangulation of Quantitative and Qualitative Findings

Quantitative Pattern	Qualitative Evidence	Interpretation
Inverted U-shape	Early help turns into burden	Paradox confirmed
TK strengthens paradox	Holistic vs reductionist tension	Cultural mismatch
QM reduces negative effects	"Narrative reporting bridges gaps"	Mitigation strategy
High decoupling risk	Symbolic compliance practices	Legitimacy seeking

Source: Processed primary data (2025)

The integration reveals that the paradox stems from fundamental tensions between accounting logic and community epistemologies.

Key Integrated Findings

Based on the mixed-methods integration, this study yields four key findings:

1. Paradox Confirmed: Green accounting demonstrates diminishing returns, becoming negative beyond an optimal threshold ($GA = 0.55$).
2. Context Matters: Traditional ecological knowledge accelerates the onset of the paradox, while qualitative metrics help mitigate its negative effects.
3. Implementation is Critical: Ceremonial adoption of green accounting leads to ESG decoupling and increased community conflict.
4. Zone Management is Necessary: Organizations require threshold-based strategies tailored to different paradox zones (optimal, transition, paradox).

The model exhibits strong predictive power ($Q^2 = 0.52$), with qualitative evidence providing rich explanation for the underlying mechanisms.

Collectively, these findings demonstrate that the effectiveness of green accounting is highly dependent on the implementation context and the measurement approach employed. This has significant implications for both theory and practice, which will be discussed in the subsequent section.

DISCUSSION

The Paradox of Quantification: When Numbers Obscure Sustainability

This study reveals a fundamental paradox at the heart of contemporary sustainability governance: the very tools designed to make environmental stewardship measurable and manageable instead frequently render it less visible and less achievable. Our findings demonstrate that in frontier economies like West Nusa Tenggara, the intensive implementation of green accounting creates what we term epistemic blindness - a systematic inability to perceive and value crucial aspects of sustainability that resist quantification. This blindness manifests in three problematic outcomes:

First, the simplification of complexity through reductionist metrics leads to the systematic erosion of ecological resilience. By prioritizing what is easily measurable (carbon, energy efficiency, waste reduction), green accounting marginalizes harder-to-quantify but equally important aspects of sustainability (biodiversity, cultural values, traditional knowledge systems). This creates a distorted picture of environmental performance that favors technical solutions over holistic approaches.

Second, the monetization of nature creates perverse incentives that undermine long-term sustainability. When ecosystems are reduced to monetary values, organizations naturally prioritize interventions that yield clear financial returns over those that maintain ecological integrity. This explains our finding that organizations with intensive green accounting practices showed decreased investment in long-term restoration and community-based initiatives.

Third, the standardization of diversity through universal metrics fails to account for contextual specificities crucial for effective sustainability governance. International accounting frameworks imposed on

local contexts inevitably miss locally relevant environmental priorities and undermine place-based knowledge systems essential for adaptive management.

Theoretical Contributions

Paradox Theory in Sustainability Accounting

This study introduces and empirically validates what we term the Green Accounting Paradox—the counterintuitive finding that environmental valuation demonstrates diminishing returns which, beyond a certain point, turn negative. Our analysis identifies the precise threshold ($GA = 0.55$) at which this paradox emerges, while also explicating the mechanisms through which quantification generates self-undermining dynamics. This challenges the prevailing assumption in sustainability accounting that “more measurement necessarily results in better management”

Institutional Complexity in ESG Implementation

We advance institutional theory by conceptualising green accounting as an institutional technology that generates inherent contradictions when transplanted into the context of frontier economies. Rather than interpreting institutional gaps solely as deficits, this study demonstrates how such gaps may create spaces for institutional entrepreneurship, wherein local actors navigate global–local tensions. Our findings indicate that the effectiveness of ESG frameworks depends critically upon institutional complementarities, namely the extent to which imported frameworks align with and complement existing governance systems.

South-based Epistemologies in Accounting

This research also contributes to decolonial accounting scholarship by documenting the ways in which Western valuation systems systematically marginalise Traditional Ecological Knowledge (TEK). Our empirical evidence reveals instances of “epistemicide” in sustainability reporting, whereby local knowledge is subordinated to quantitative logics. As an alternative, we propose frameworks that promote epistemic justice through the integration of multiple knowledge systems, thereby making sustainability accounting more inclusive and equitable.

Practical Implications: From Critique to Constructive Solutions

Decision Framework for Green Accounting Intensity

The first practical implication lies in the development of the Paradox Zone Management Framework, a tool designed to assist managers in identifying the optimal intensity of green accounting. The framework enables organisations to diagnose their position on the inverted U-curve, implement zone-specific measurement strategies, and avoid the counterproductive escalation of quantification. It therefore provides a systematic response to the critical question: *When does more measurement become worse measurement?*

Contextualised ESG Metrics for Frontier Economies

The second implication concerns the design of Place-Based ESG Protocols that balance global standardisation with local relevance. These protocols emphasise the integration of quantitative metrics with qualitative narratives, the recognition of three tiers of value (monetisable, qualitative, and sacred), and the adoption of community-defined success indicators. Such an approach ensures that ESG frameworks function not merely as compliance mechanisms but as instruments of empowerment, attuned to the social and cultural realities of frontier economies.

Policy Tools for Adaptive Governance

Finally, this study offers implications for public policy by recommending adaptive governance instruments. Specifically, we suggest the adoption of subsidiarity-based regulation through multi-level standards, the establishment of Knowledge Guardianship Councils as institutionalised forms of community oversight, and the application of a precautionary principle of measurement, requiring scrutiny of metrics with potentially harmful consequences. Together, these tools provide a means of reconciling global sustainability standards with local needs and capacities, thereby enhancing both the legitimacy and the effectiveness of ESG implementation.

Theoretical Implications: Reframing ESG Through Critical Accounting Lens

Our research demands a fundamental rethinking of ESG theory through the lens of critical accounting studies. Rather than treating ESG as a neutral technical framework, we must understand it as a socio-technical assemblage that performs particular versions of sustainability while obscuring others.

Theoretical contributions include:

1. **Extended Institutional Theory:** We advance beyond conventional institutional analysis by showing how accounting devices don't merely reflect institutional pressures but actively create new institutional realities. The adoption of green accounting doesn't just measure sustainability performance; it transforms what counts as "sustainable" in ways that may contradict ecological realities.

2. **Valuation Studies Integration:** By bringing valuation studies into conversation with sustainability accounting, we demonstrate how environmental valuation practices don't simply measure pre-existing values but create new regimes of value that prioritize certain types of environmental relations over others.
3. **Post-Colonial ESG Theory:** Our findings support developing a post-colonial critique of ESG that recognizes how Western-derived frameworks can marginalize alternative sustainability epistemologies from the Global South. This requires acknowledging the epistemic violence inherent in imposing external accounting frameworks on local environmental knowledge systems.
4. **Complexity Theory Application:** We contribute to complexity-based approaches to sustainability governance by showing how reductionist accounting systems fail to accommodate the complex, emergent nature of socio-ecological systems.

CONCLUSION & POLICY RECOMMENDATIONS

Contextualized Approaches for Frontier Economies

The findings demonstrate that the uncritical application of Global North-derived ESG and green accounting frameworks in frontier economies like West Nusa Tenggara produces fundamentally counterproductive outcomes. Rather than enhancing sustainability, these frameworks frequently undermine it through epistemic mismatches, value reductions, and institutional conflicts. We therefore propose:

- **Principle of Subsidiarity in Sustainability Measurement:** Accounting and ESG standards should be developed and applied at the most local level possible. International frameworks should serve as loose guides, not rigid prescriptions, allowing for the integration of Traditional Ecological Knowledge (TEK) and place-based values.
- **Establishment of Local Knowledge Guardianship Councils:** Formal, funded community bodies comprising elders, farmers, fishers, and indigenous leaders should be empowered to vet, adapt, or reject international metrics. Their role is to ensure that external frameworks do not erase local definitions of well-being and ecological health.
- **Development of "Frontier Economy ESG Protocols":** A new generation of sustainability standards, co-designed by coalitions of frontier economy governments, communities, and academics. These protocols would start from local contexts and priorities (e.g., water sovereignty, soil vitality, community resilience) rather than retrofitting them into existing global frameworks.

Alternative Frameworks Beyond Traditional ESG Metrics

Moving beyond the paradox requires abandoning the notion that all value must be made legible through quantification and monetization. We propose a shift towards Qualitative-Relational Frameworks:

- **Narrative Sustainability Reporting:** Mandate the use of rich, qualitative narratives, case studies, and ethnographic vignettes alongside quantitative data. These would capture the lived experience of sustainability, community well-being, and cultural health, which are invisible to metrics.
- **Three-Tiered Value Recognition System:** A new model for corporate and policy reporting that explicitly recognizes:
 1. **Monetizable Value:** What can and should be quantified (e.g., resource efficiency, emissions).
 2. **Qualitative Value:** What must be described and assessed narratively (e.g., cultural heritage, landscape beauty, social cohesion).
 3. **Sacred/Intrinsic Value:** What is explicitly off-limits to valuation and must be protected through inviolable principles (e.g., sacred natural sites, rights of nature, core ecological functions).
- **Adopt a "Precautionary Principle" for Measurement:** Heavily scrutinize the application of any metric that risks reducing a complex social-ecological value to a number. The default should be to protect complexity through qualitative assessment unless quantification can be proven not to cause harm.

Limitations and Future Research

This study has several limitations that chart a course for future inquiry:

1. **Geographic Scope:** Focused on one Indonesian province. Future research should conduct comparative studies across other frontier economies (e.g., in Africa, Latin America) to identify common patterns and context-specific variations of the green accounting paradox.
2. **Sectoral Focus:** While diverse, the sample could be expanded. Future work should delve deeper into specific sectors like extractive industries, large-scale agriculture, and fisheries, where the conflicts between accounting and sustainability are likely acute.
3. **Longitudinal Data:** This study provides a snapshot. Longitudinal research is critical to track how the observed paradox evolves over time as organizations and communities adapt, resist, or reshape these accounting frameworks.
4. **Theoretical Development:** The integration of Institutional Contradiction Theory and Valuation Studies is a starting point. Future research should explore other critical theoretical lenses, such as political

ecology, decolonial theory, and post-growth economics, to further critique and reimagine the political economy of sustainability measurement.

5. Designing Alternatives: The most pressing research agenda is action-oriented. Researchers must work directly with communities and policymakers to co-design, pilot, and refine the alternative qualitative-relational frameworks proposed here, turning critique into constructive practice.

In conclusion, this study argues that the pursuit of sustainability through ever-more sophisticated accounting is a dangerous folly if it remains rooted in a reductionist worldview. The true path forward lies not in better calculation, but in cultivating the wisdom to know what should never be calculated. It requires building governance systems that can hold space for multiple ways of knowing, valuing, and caring for the world. The promise of ESG will remain unfulfilled until it learns to see the richness that its numbers inevitably obscure.

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