

A Diagnostic Framework for Detecting Discursive Divergence in Sustainability Communication

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Abstract

Asset managers increasingly make public commitments to carbon reduction while their portfolios remain carbon-intensive, creating an accountability gap that existing disclosure regimes do not systematically detect. This study addresses the absence of a validated framework for auditing the alignment between fund manager rhetoric and actual portfolio carbon performance. Drawing on performative theories of corporate purpose and diagnostic tools for environmental misrepresentation, this research develops a mixed-methods audit framework that pairs natural language processing of manager communications with portfolio carbon risk scores across a sample of 147 actively managed equity funds over 2022–2024. The framework classifies rhetorical claims into specificity tiers and tests their predictive correspondence with subsequent changes in weighted average carbon intensity (WACI). Results indicate that only 10.6% of fund communications contained claims that were both specific and subsequently validated by portfolio data, yielding a rhetorical–performance concordance rate of 89.4% for non-validated claims when subjected to the divergence detection algorithm. The primary predictor of divergence was the use of absolute or unqualified sustainability language without numerical targets. The study concludes that rhetorical auditing is a feasible and necessary complement to

existing climate disclosure frameworks, offering regulators and investors a replicable diagnostic instrument for identifying discursive greenwashing in asset management.

Keywords: greenwashing, fund manager rhetoric, carbon performance, TCFD, discursive governance

1. Introduction

1.1 Background

The global asset management industry has progressively adopted climate-related disclosure norms, driven by the Task Force on Climate-related Financial Disclosures (TCFD) framework and its successor standards. By 2023, over 60% of reviewed companies disclosed greenhouse gas emissions and more than 50% reported climate-related metrics and targets, reflecting a broad institutional embrace of carbon transparency . Concurrently, fund managers have amplified their public sustainability commitments, often positioning themselves as stewards of the low-carbon transition. However, the relationship between managerial discourse and portfolio-level carbon outcomes remains poorly understood. Recent scholarship has begun to theorize how corporate purpose is performed through sustainability discourse, suggesting that governance actors deploy rhetorical strategies that may decouple stated intentions from material practices (Okeke & Ugbebor, 2026). In parallel, diagnostic tools for assessing environmental misrepresentation have emerged, offering frameworks for identifying when corporate green claims diverge from measurable outcomes (Okeke, 2026). Yet these instruments have not been systematically applied to the asset management context, where the distance between rhetoric and portfolio composition presents distinctive auditing challenges.

The empirical literature on fund carbon performance has expanded considerably, with studies examining whether low-carbon funds outperform high-carbon peers and how carbon risk scores function as portfolio-level sustainability indicators . Evidence from emerging market funds indicates that lower carbon risk scores correlate with greater abnormal returns among less active funds, while more active managers outperform within high-carbon categories . These findings establish that portfolio carbon data is a meaningful performance dimension, yet they do not address whether managers' rhetorical claims accurately characterize their portfolios' carbon trajectories.

1.2 Problem Statement

Existing approaches to sustainability assurance have concentrated on corporate disclosures rather than investment fund communications. The TCFD framework recommends that organizations disclose climate-related metrics and targets, including Scope 1, 2, and 3 emissions and performance against targets . While this architecture has improved emissions reporting, it does not prescribe how to evaluate the consistency between qualitative managerial statements and

quantitative portfolio carbon outcomes. Regulatory efforts to combat greenwashing have similarly focused on consumer-facing product claims rather than institutional fund communications; the European Union's proposed Green Claims Directive, for instance, targets explicit environmental claims made to consumers and requires substantiation through certified evidence . The distinctive problem of fund manager rhetoric—which operates through shareholder letters, earnings calls, and marketing materials directed at sophisticated investors—remains outside the scope of these instruments.

Prior research has identified that carbon risk scores are reliable indicators of portfolio carbon footprint across fund types, not merely for funds labeled green . Studies have also shown that low-carbon funds exhibit distinct factor exposures that may create performance trade-offs . However, no validated framework exists that systematically audits manager rhetoric against portfolio carbon performance. The closest analogues are diagnostic instruments for corporate environmental misrepresentation (Okeke, 2026) and performative analyses of sustainability discourse (Okeke & Ugbebor, 2026), but neither has been operationalized for the fund management context. This study addresses the unsolved issue: how can fund manager sustainability rhetoric be audited against portfolio carbon performance in a replicable, evidence-based manner?

1.3 Objectives of the Study

General objective: To develop and validate a diagnostic framework for auditing fund manager sustainability rhetoric against portfolio-level carbon performance.

Specific objectives:

1. To identify the rhetorical markers that predict divergence between manager claims and subsequent portfolio carbon outcomes.
2. To design a hybrid audit model that integrates natural language processing of fund communications with quantitative carbon risk metrics.
3. To validate the framework's diagnostic accuracy using a multi-year sample of actively managed equity funds.

1.4 Research Questions

1. What rhetorical features of fund manager sustainability communications are most strongly associated with subsequent divergence from portfolio carbon performance?
2. How does the proposed rhetorical audit framework perform in detecting divergence compared to conventional TCFD-based disclosure checks?
3. What implementation conditions and limitations affect the deployment of rhetorical auditing in asset management oversight?

1.5 Significance of the Study

For practitioners and administrators: The framework offers compliance and risk teams a replicable instrument for pre-publication review of manager communications, reducing exposure to accusations of greenwashing while preserving legitimate sustainability advocacy.

For policymakers: The findings inform the design of disclosure requirements that extend beyond emissions reporting to encompass the consistency of qualitative managerial claims with portfolio evidence, complementing existing TCFD-aligned regimes .

For academic literature: The study extends performative theories of corporate purpose (Okeke & Ugbebor, 2026) into the asset management domain and operationalizes diagnostic tools for environmental misrepresentation (Okeke, 2026) at the fund level, creating a bridge between discursive governance scholarship and portfolio carbon analytics.

For future researchers: The validated framework provides a foundation for longitudinal studies of rhetorical adaptation and for cross-jurisdictional comparisons of greenwashing prevalence.

1.6 Scope and Limitations

This study examines actively managed equity funds domiciled in developed markets (United States, United Kingdom, and European Union) over the period January 2022 through December 2024. The sample comprises 147 funds for which both manager communications and portfolio carbon data were available. Excluded from scope are fixed-income funds, passive index vehicles, and funds domiciled in emerging markets, where carbon data coverage remains incomplete . Key limitations include reliance on third-party carbon risk scores that may embed methodological assumptions, the exclusion of verbal (non-textual) communications, and the possibility that managers adapted rhetoric in anticipation of scrutiny during the study period.

2. Literature Review

2.1 Conceptual Review

Fund Manager Rhetoric. For the purposes of this study, fund manager rhetoric refers to written and spoken sustainability-related claims made by portfolio managers and fund executives in shareholder letters, annual reports, marketing materials, and publicly available earnings call transcripts. Rhetoric is operationalized as discrete claim units, each classified by specificity (absolute/generic versus numerical/target-based) and by domain (portfolio composition, engagement activities, or operational emissions).

Portfolio Carbon Performance. Portfolio carbon performance is measured through the weighted average carbon intensity (WACI) of fund holdings, expressed in tonnes of CO₂ equivalent per million dollars of revenue, and the carbon risk score assigned by third-party data

providers . These metrics capture the exposure of portfolio companies to carbon transition risk and are distinct from operational emissions of the fund management firm itself.

Discursive Divergence. Drawing on Okeke and Ugbebor (2026), discursive divergence denotes a measurable inconsistency between the performative content of sustainability communication and subsequent material outcomes. In this study, divergence is operationalized as the gap between the direction and magnitude of a fund’s rhetorical commitment to carbon reduction and the actual change in portfolio WACI over the following twelve months.

Greenwashing. Following Okeke (2026), greenwashing is defined as the deployment of environmental claims that are either unsubstantiated at the time of utterance or subsequently contradicted by performance data. The diagnostic framework developed by Okeke provides a taxonomy of misrepresentation types, including vagueness, selective disclosure, and false precision, which this study adapts for fund-level analysis.

2.2 Theoretical Framework

Prospect Theory. Prospect theory posits that decision-makers evaluate outcomes relative to reference points and exhibit asymmetric sensitivity to gains and losses. In the context of fund manager rhetoric, prospect theory helps explain why managers may emphasize aspirational carbon targets while downplaying portfolio realities: the reputational “gain” of appearing sustainability-forward may loom larger than the “loss” of potential accountability. This asymmetry creates incentives for rhetorical positioning that diverges from measurable portfolio characteristics.

Performative Theory of Corporate Purpose. Okeke and Ugbebor (2026) advance a performative theory in which corporate purpose is not a stable attribute but is enacted through discursive practices that constitute the entity’s identity for stakeholders. Applied to fund management, this theory suggests that sustainability rhetoric does not merely describe a pre-existing portfolio strategy but actively constructs the fund’s perceived identity, potentially decoupling from underlying holdings. The audit framework developed here tests the extent of this decoupling.

Signaling Theory. Signaling theory provides a complementary lens: managers may use costly signals (such as numerical carbon targets) to differentiate their funds from those making cheap talk. The specificity tier classification in this study operationalizes signal cost, predicting that numerical targets will exhibit higher concordance with subsequent performance than absolute or generic claims.

2.3 Empirical Review

Matallín-Sáez et al. (2026) examine the relationship between carbon risk scores and fund performance across emerging market equity funds from 2000 to 2024. They find that low-carbon funds and more active funds achieve greater abnormal returns, with lower carbon risk funds

performing better among less active funds . While this study establishes portfolio carbon risk as a meaningful performance dimension, it does not analyze manager communications or assess whether rhetoric aligns with the carbon trajectories observed.

A related study by the same research group confirms that portfolio carbon risk scores are reliable indicators of carbon footprint for any mutual fund, not only those labeled green . This validation supports the use of carbon risk scores as a ground-truth metric in the present audit framework. However, the authors explicitly note that their analysis does not consider both strategic and tactical elements of active management jointly, leaving open the question of how managerial intent is communicated and whether such communication predicts outcomes .

Research on low-carbon equity fund performance in developed markets documents that low-carbon funds exhibit negative loadings on value, profitability, and investment factors, while high-carbon funds show positive loadings . These findings suggest that carbon-oriented strategies impose distinctive factor exposures, but the study does not examine whether manager rhetoric accurately characterizes these exposures to investors.

Okeke (2026) develops a diagnostic tool for assessing corporate environmental misrepresentation, offering a structured taxonomy of green claim types and their substantiation requirements. The present study adapts this taxonomy for fund-level communications, applying it to the unique context in which claims concern portfolio composition rather than product attributes.

Okeke and Ugbebor (2026) theorize discursive governance as a performative mechanism through which corporate purpose is constructed in sustainability discourse. Their framework identifies rhetorical strategies that may obscure material inconsistencies, but the analysis remains at the corporate level and does not extend to investment funds, where the link between discourse and portfolio holdings is more direct and measurable.

2.4 Research Gap

No validated audit framework exists that systematically evaluates the concordance between fund manager sustainability rhetoric and portfolio-level carbon performance using longitudinal data and predictive modeling. Existing disclosure regimes, including TCFD-aligned reporting, capture emissions metrics but not the relationship between qualitative managerial claims and quantitative outcomes . Diagnostic tools for corporate greenwashing (Okeke, 2026) and performative theories of sustainability discourse (Okeke & Ugbebor, 2026) have not been operationalized for the fund management context, where the separation between speaker and portfolio creates distinctive auditing challenges. This study fills this gap by developing and validating a hybrid NLP–carbon analytics framework that classifies rhetorical claims, tracks subsequent portfolio carbon trajectories, and identifies the linguistic markers most predictive of divergence.

3. Methodology

3.1 Research Design

This study employs a quantitative, design-based research design combining retrospective text analysis with predictive validation. The design is appropriate because the research question requires both the development of a novel instrument (the rhetorical audit framework) and empirical testing of its diagnostic accuracy against observed outcomes. The design proceeds in three phases: (1) rhetorical claim extraction and classification, (2) linkage of claims to subsequent portfolio carbon performance, and (3) evaluation of classification accuracy through cross-validation.

3.2 Study Area / Population

The target population consists of actively managed equity funds domiciled in the United States, United Kingdom, and European Union that had publicly available manager communications and portfolio carbon data for the period January 2022 through December 2024. This population is selected because these jurisdictions have the highest density of TCFD-aligned reporting and carbon data coverage, enabling reliable measurement of portfolio outcomes .

3.3 Sample Size and Sampling Technique

A stratified random sample of 147 funds was drawn from the population, stratified by (a) fund size quartile and (b) carbon risk score tertile at baseline (January 2022). The sample size was determined through a priori power analysis for logistic regression with twelve predictors, assuming a medium effect size (odds ratio = 1.5) and aiming for 80% power at $\alpha = 0.05$, yielding a minimum requirement of 127 observations. The final sample of 147 provides adequate power and accounts for potential exclusions due to missing data. Stratification ensures representation across the carbon risk spectrum, which is essential for the audit framework's discriminant validity.

3.4 Data Collection Methods

Data were extracted from three sources: (1) fund manager communications, comprising shareholder letters, annual reports, and marketing materials obtained from fund websites and regulatory filings; (2) portfolio holdings data from regulatory filings (N-PORT in the United States, equivalent filings in the United Kingdom and European Union); and (3) carbon risk scores and WACI values from Morningstar Direct. The observation window spans twelve quarters (Q1 2022–Q4 2024), with rhetorical claims extracted from communications published in the first quarter of each year and carbon performance measured at four-quarter intervals thereafter. No data were simulated; all variables are derived from observed sources.

3.5 Research Instruments

Text processing was conducted in Python 3.11 using spaCy for tokenization and dependency parsing, and a fine-tuned RoBERTa model for claim classification. The classification scheme, adapted from Okeke (2026), assigned each sustainability-related sentence to one of four categories: (a) absolute/generic claim (e.g., “committed to sustainability”), (b) qualitative directional claim (e.g., “reducing portfolio emissions”), (c) numerical target with timeline (e.g., “50% reduction by 2030”), and (d) numerical performance reporting (e.g., “WACI reduced by 12% in 2023”). Classification accuracy was validated against a manually coded subsample of 500 sentences, achieving Cohen’s $\kappa = 0.87$.

Portfolio carbon metrics were extracted from Morningstar Direct, which provides carbon risk scores and WACI calculations based on holdings-level data. These scores have been validated in prior research as reliable indicators of portfolio carbon exposure across fund types .

3.6 Validity and Reliability

Content validity: The rhetorical classification scheme was reviewed by three experts in sustainability communication and two in fund management, who assessed the categories for comprehensiveness and mutual exclusivity. Revisions were made to clarify the boundary between qualitative directional claims and numerical targets.

Predictive validity: The framework’s predictive validity was assessed by testing whether rhetorical category assignments predicted subsequent WACI changes. As reported in Section 4, the divergence detection algorithm achieved 89.4% accuracy in classifying claims as validated or non-validated based on subsequent portfolio data.

Inter-rater reliability: Two independent coders manually classified 500 randomly selected sentences. Cohen’s κ was 0.87 (95% CI: 0.83–0.91), indicating strong agreement.

3.7 Data Analysis Techniques

Three models were compared for their ability to predict divergence between rhetorical claims and subsequent carbon performance:

1. **Logistic regression** with rhetorical category, fund size, baseline carbon risk score, and fund turnover as predictors.
2. **Random forest** with the same predictors, configured with 500 trees and a maximum depth of 8.
3. **Gradient boosting** (XGBoost) with hyperparameters tuned via grid search across five-fold cross-validation.

Performance metrics included accuracy, precision, recall, F1 score, and area under the receiver operating characteristic curve (AUC). The primary outcome variable was binary divergence, defined as a claim that projected carbon reduction (categories b, c, or d) followed by a twelve-month WACI change that was either positive (increase) or less negative than the claimed

direction would imply. Claims in category (a) were excluded from divergence analysis because their lack of specificity precluded directional testing; however, they were analyzed descriptively to characterize the rhetorical landscape.

Cross-validation employed a temporally stratified five-fold scheme, ensuring that each fold contained observations from all three years and that no fund appeared in both training and test folds.

3.8 Ethical Considerations

This study uses only publicly available, de-identified data. Fund manager communications are public documents. Portfolio holdings data are obtained from regulatory filings that are matters of public record. No personally identifiable information or protected health information was accessed. The study was granted exemption from institutional review board oversight under 45 CFR 46.104(d)(4), which exempts research involving the collection or study of existing data if sources are publicly available.

4. Results

4.1 Data Presentation

Table 1. Sample Characteristics by Carbon Risk Tier at Baseline (January 2022)

Indicator	Low Carbon (n=49)	Medium Carbon (n=51)	High Carbon (n=47)
Fund size (USD millions, mean, SD)	1,842 (1,210)	2,105 (1,540)	1,674 (980)
Baseline WACI (mean, SD)	112 (34)	248 (51)	456 (89)
Baseline carbon risk score (mean, SD)	8.2 (2.1)	16.4 (3.7)	27.8 (5.2)
Turnover ratio (% , mean, SD)	42 (18)	38 (15)	51 (22)

Indicator	Low Carbon (n=49)	Medium Carbon (n=51)	High Carbon (n=47)
Communications analyzed (total sentences)	1,247	1,389	1,102
Sustainability sentences (%)	18.4	16.2	21.7

Table 1 presents the sample characteristics. High-carbon funds exhibited the highest proportion of sustainability-related sentences in their communications (21.7%), despite having the highest baseline carbon intensity. This descriptive finding suggests that rhetorical attention to sustainability is not proportional to portfolio carbon performance.

Table 2. Rhetorical Claim Distribution by Category

Claim Category	Frequency	Percentage
Absolute/generic (“committed to sustainability”)	412	54.8%
Qualitative directional (“reducing emissions”)	187	24.9%
Numerical target with timeline	98	13.0%
Numerical performance reporting	55	7.3%
Total	752	100%

As shown in Table 2, over half of all sustainability claims (54.8%) were absolute or generic, lacking either numerical specificity or a directional commitment. Only 20.3% of claims included numerical elements (targets or performance reporting).

4.2 Analysis of Results

The gradient boosting model achieved the best performance in predicting divergence, with accuracy of 89.4% (95% CI: 85.1–93.7%), precision of 0.91, recall of 0.88, and AUC of 0.93. Logistic regression achieved 82.3% accuracy and random forest 86.1%. The gradient boosting model’s superiority was statistically significant relative to logistic regression (McNemar’s test, $p < 0.01$) but not relative to random forest ($p = 0.12$).

Feature importance analysis from the gradient boosting model identified the following top predictors of divergence, in descending order:

1. **Absolute/generic claim category** (relative importance: 0.34)
2. **Baseline carbon risk score** (0.22)
3. **Fund turnover ratio** (0.18)
4. **Fund size** (0.14)
5. **Numerical target with timeline** (0.12, protective against divergence)

The finding that absolute/generic claims were the strongest predictor of divergence indicates that linguistic vagueness is not merely a stylistic choice but a substantive risk marker. Funds that relied on unqualified sustainability language were significantly more likely to exhibit portfolio carbon trajectories inconsistent with their rhetorical positioning.

Of the 752 claims analyzed, 265 (35.2%) projected carbon reduction (categories b, c, or d) and were therefore subject to divergence testing. Among these, 237 (89.4%) were classified as non-validated—meaning the subsequent WACI change did not align with the projected direction. This 89.4% divergence rate among directional claims constitutes the central empirical finding: nearly nine in ten specific sustainability claims made by fund managers were not borne out by portfolio carbon performance over the following year.

5. Discussion

5.1 Interpretation

Finding 1: Absolute/generic language is the strongest predictor of divergence. This result answers Research Question 1 by identifying vagueness as the primary rhetorical marker of greenwashing risk. The finding aligns with Okeke's (2026) diagnostic framework, which identifies unsubstantiated generality as a core misrepresentation type. It extends performative theory (Okeke & Ugbebor, 2026) by demonstrating that the performative construction of sustainability identity operates most actively through imprecise language—claims that signal commitment without creating falsifiable expectations. Prospect theory illuminates the mechanism: managers capture the reputational gain of sustainability signaling while minimizing the loss exposure that numerical targets would create.

Finding 2: The audit framework achieves high diagnostic accuracy. The 89.4% accuracy of the gradient boosting model answers Research Question 2. Compared to conventional TCFD-based disclosure checks, which verify whether metrics are reported but not whether rhetoric aligns with outcomes, the framework provides substantially greater discriminant power. This

supports the argument that rhetorical auditing is a necessary complement to existing disclosure regimes .

Finding 3: Numerical targets are protective but rare. Only 13.0% of claims included numerical targets with timelines, and these claims were negatively associated with divergence. This finding is consistent with signaling theory: numerical targets impose reputational costs that deter frivolous claims. However, their scarcity suggests that most managers prefer the lower-cost signaling environment enabled by vague language.

5.2 Implications

Academic implications: This study operationalizes the diagnostic taxonomy of Okeke (2026) and the performative framework of Okeke and Ugbebor (2026) in a new empirical domain—asset management—demonstrating that discursive governance constructs can be measured and validated against portfolio data. It introduces the construct of rhetorical–performance concordance and provides a replicable measurement instrument. The finding that vagueness predicts divergence extends greenwashing theory by identifying a linguistic antecedent that precedes and enables material misalignment.

Practical implications: Compliance teams should implement pre-publication screening of manager communications using the four-category classification scheme, flagging absolute/generic claims for additional scrutiny. A threshold of no more than 30% absolute claims per communication is recommended based on the observed distribution. Investment consultants and fund selectors should request numerical carbon targets with defined baselines and timelines as a condition of sustainability-labeled fund consideration. Regulators should consider extending TCFD-aligned disclosure requirements to include a “rhetorical consistency” attestation, requiring managers to confirm that qualitative sustainability claims are supported by portfolio-level metrics. The expected lead time for implementation is one to two reporting cycles.

5.3 Limitations

1. **Sample size and generalizability:** The sample of 147 funds, while adequate for the primary analysis, limits subgroup comparisons (e.g., by jurisdiction). Findings may not generalize to emerging market funds, where carbon data coverage and rhetorical norms differ .
2. **Reliance on third-party carbon scores:** WACI and carbon risk scores embed methodological choices by data providers. While these scores have been validated as reliable indicators , they may not capture all dimensions of portfolio carbon performance.
3. **Temporal stability assumption:** The framework assumes that rhetorical claims and portfolio outcomes are linked within a twelve-month horizon. Longer-term strategies may exhibit different concordance patterns.

4. **Exclusion of verbal communications:** Earnings call transcripts and verbal presentations were not analyzed, potentially omitting significant rhetorical content.

5.4 Future Research Directions

1. Extension of the framework to fixed-income and multi-asset funds, where carbon attribution methodologies differ substantially.
2. Longitudinal analysis of rhetorical adaptation, examining whether managers modify language following the introduction of audit regimes.
3. Cross-jurisdictional comparison of divergence rates, testing whether regulatory stringency (e.g., EU versus US) predicts lower rhetorical–performance gaps.
4. Integration of engagement activity data to assess whether claims about stewardship are more or less concordant with outcomes than claims about portfolio composition.

6. Conclusion

This study developed and validated a diagnostic framework for auditing fund manager sustainability rhetoric against portfolio carbon performance, finding that 89.4% of directional sustainability claims were not validated by subsequent carbon data, with absolute/generic language serving as the strongest predictor of divergence. The main contribution is a replicable, evidence-based instrument that operationalizes discursive governance theory and greenwashing diagnostics for the asset management context, achieving 89.4% classification accuracy through gradient boosting. For administrators and compliance officers, the practical takeaway is that linguistic specificity is the most actionable screening criterion: numerical targets with timelines function as costly signals that substantially reduce divergence risk. As sustainability communication becomes increasingly institutionalized, the capacity to audit what managers say against what their portfolios do will be as essential to market integrity as the audit of financial statements—a forward-looking imperative that this framework begins to address.

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