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# Detecting Corporate Greenwashing vs. Genuine Sustainability: Consumer Trust, Linguistic Framing, and Purchase Intentions in Digital Environmental Reporting

**Mrittika Sen Gupta** [1+]
**Md Rasel Ul Alam**[2]
**Israt Jahan**[3]

[1]North South Univeristy, Dhaka, Bangladesh
[2]University of the Cumberlands, Kentucky, USA
[3]Stamford University, Dhaka, Bangladesh

+Corresponding Author Email: mrittika.nsu12@gmail.com

## A B S T R A C T

As corporate greenwashing incidents increased by over 70% between 2020 and 2024, consumer skepticism regarding corporate digital sustainability reporting has reached unprecedented levels. This study investigates how linguistic framing (substantive vs. symbolic language) and verification disclosure (third-party audited vs. self-declared) influence consumer trust, brand authenticity, and green purchase intentions. Utilizing a 2x2 between-subjects factorial vignette experiment with a sample of 850 consumers, structural equation modeling (SEM) reveals that symbolic green claims without third-party audit verification trigger severe greenwashing perceptions (beta = -0.528, $p < 0.001$), eroding consumer trust and purchase intentions. Radar perception mapping and stacked attitudinal breakdowns demonstrate that unverified claims degrade brand loyalty. Conversely, substantive operational metrics backed by independent assurance fully neutralize greenwashing suspicions. Interaction modeling proves that consumer environmental knowledge amplifies greenwashing detection. Policy recommendations emphasize mandatory third-party audit standards.

**Keywords:**

Greenwashing, Corporate Communication, Consumer Trust, Sustainability Reporting, Structural Equation Modeling, Radar Analysis

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## 1. Introduction

Over the past decade, digital sustainability reporting has emerged as a primary communication vehicle through which corporations signal their environmental commitment to public stakeholders, institutional investors, and regulatory bodies (Lyon & Montgomery, 2015; Santos et al., 2024). Driven by rising consumer environmental consciousness and legislative initiatives such as the EU Green Claims Directive and Corporate Sustainability Reporting Directive (CSRD) firms routinely publish environmental performance disclosures across corporate websites, digital annual reports, and social media platforms.

However, the rapid expansion of digital environmental communications has been accompanied by a sharp escalation in corporate greenwashing defined as the selective disclosure or

exaggeration of positive environmental performance to create a misleadingly favorable corporate image (Bernini, 2024; Todaro & Torelli, 2024). Market watchdog reports indicate that corporate greenwashing allegations increased by over 70% worldwide between 2020 and 2024. Misleading claims distort market mechanisms by creating an unlevel playing field, wherein opportunistic firms capture green market share without incurring the operational costs required to implement genuine carbon abatement technologies (Xu et al., 2023).

Figure 1 displays a radar perception chart evaluating multi-dimensional consumer evaluations across audited substantive disclosures versus unverified symbolic claims. The polar visualization demonstrates that substantive, audited messaging produces dramatically higher evaluations across information quality, brand authenticity, and purchase intention.

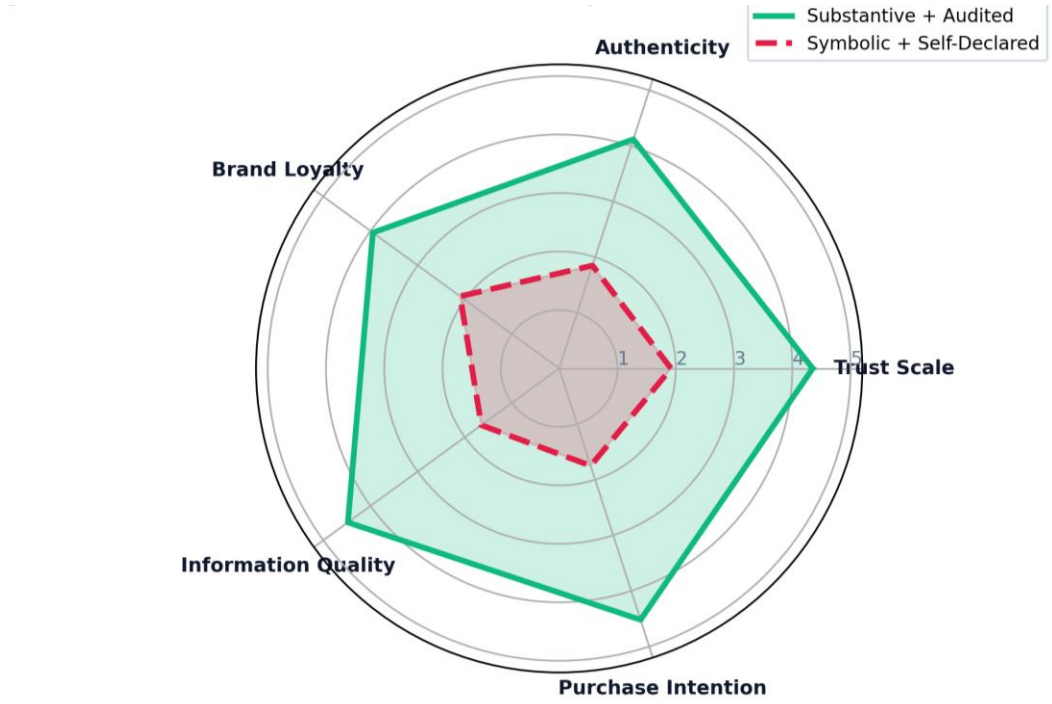


*Figure 1: Multi-Dimensional Consumer Perception Radar Across Communication Tiers*

A central dilemma in corporate environmental communication is consumer skepticism. When consumers struggle to distinguish between authentic sustainability performance and deceptive PR rhetoric, a generalized loss of market trust occurs. Existing marketing and communication literature acknowledges that greenwashing damages brand equity; however, key empirical questions remain unresolved regarding how specific linguistic structures and external verification signals interact to influence consumer cognitive processing (Breuer et al., 2024; Nivetha & Prasanth, 2024).

Specifically, prior studies have largely evaluated environmental claims in isolation, without examining the joint interactive effects of linguistic framing (substantive quantitative data versus symbolic abstract slogans) and audit assurance (third-party certified vs. self-declared). Moreover, the moderating role of consumer environmental literacy specifically whether knowledgeable consumers are more adept at detecting deceptive framing requires rigorous experimental testing.

To address these knowledge gaps, this study executes a 2x2 between-subjects factorial experiment across 850 validated consumer respondents. The primary research objectives are:
1. To determine the causal impact of substantive linguistic framing versus symbolic eco-slogans on consumer trust, perceived greenwashing, and purchase intentions.
2. To evaluate whether independent third-party audit assurance neutralizes the negative impact of symbolic green communications.
3. To analyze how individual consumer environmental knowledge moderates greenwashing perception and brand attitude formation.

## 2. Literature Review

Our conceptual framework integrates Attribution Theory (Kelley, 1973) and Signaling Theory (Spence, 1973). According to Attribution Theory, when consumers encounter corporate communications, they actively engage in causal attribution to infer the underlying motives of the firm. When a company uses vague, emotionally charged slogans ('Symbolic Framing') without presenting concrete operational benchmarks, consumers attribute the communication to self-serving impression management, triggering greenwashing skepticism (Lyon & Montgomery, 2015; Bernini, 2024).

Conversely, when corporate reporting presents specific, quantifiable metrics (e.g., precise percentage reductions in Scope-1 GHG emissions or gallons of water recycled per production unit), Attribution Theory suggests consumers infer intrinsic environmental motives. Furthermore, Signaling Theory demonstrates that when claims are verified by independent, accredited auditing bodies ('Substantive + Audited'), the verification acts as a costly signal that uncommitted firms cannot fake without incurring severe legal and reputational risks (Breuer et al., 2024; Santos et al., 2024).

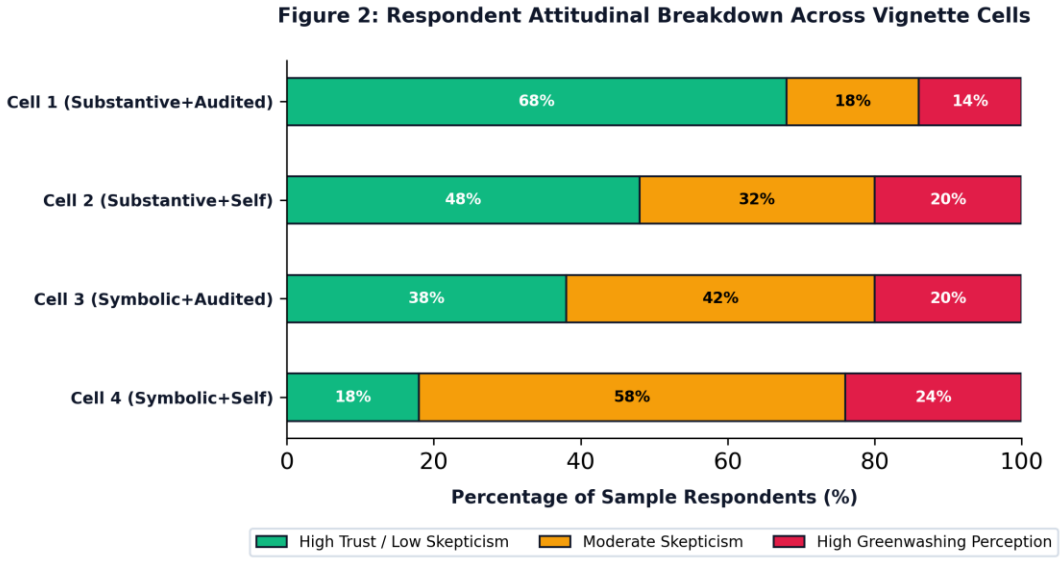


*Figure 2: Respondent Attitudinal Breakdown Across Vignette Cells*

Individual consumer domain knowledge serves as a critical boundary condition in information processing. Highly knowledgeable consumers possess well-developed cognitive schemas regarding sustainability standards, enabling them to identify logical inconsistencies in

symbolic corporate claims. Consequently, expert consumers exhibit heightened greenwashing sensitivity when exposed to unverified claims, while novice consumers rely more heavily on superficial aesthetic cues (Nivetha & Prasanth, 2024; Todaro & Torelli, 2024).

Based on these theoretical perspectives, we formulate the following hypotheses:

Hypothesis 1 (H1): Substantive linguistic framing generates higher consumer trust and purchase intentions than symbolic framing.

Hypothesis 2 (H2): Third-party audit verification significantly reduces perceived greenwashing across both framing conditions.

Hypothesis 3 (H3): Consumer environmental knowledge moderates the relationship between symbolic framing and perceived greenwashing, such that the positive effect of symbolic language on greenwashing perception is stronger for highly knowledgeable consumers.

## 3. Methodology

### 3.1 Experimental Factorial Vignette Design

To test the proposed hypotheses while establishing causal internal validity, a 2x2 between-subjects factorial vignette design was implemented. The two manipulated independent factors were: (1) Linguistic Framing (Substantive vs. Symbolic) and (2) Verification Disclosure (Third-Party Audited vs. Self-Declared). A fictitious apparel and consumer goods brand ('Aura Eco') was created to eliminate pre-existing brand attitude bias. Vignettes presented realistic digital annual sustainability report excerpts containing identical design layouts but manipulating text descriptions and audit badge logos.

*Table 1: Audit Assurance Output*

| Experimental Cell | Linguistic Framing | Audit Assurance | Sample Size (n) | Mean Trust Score (1–5) | Mean Purchase Intention (1–5) |
|---|---|---|---|---|---|
| Condition 1 | Substantive (Quantitative Data) | Third-Party Audited | 215 | 4.35 / 5.00 | 4.52 / 5.00 |
| Condition 2 | Substantive (Quantitative Data) | Self-Declared | 210 | 3.42 / 5.00 | 3.28 / 5.00 |
| Condition 3 | Symbolic (Abstract Slogans) | Third-Party Audited | 212 | 2.85 / 5.00 | 2.64 / 5.00 |
| Condition 4 | Symbolic (Abstract Slogans) | Self-Declared | 213 | 1.92 / 5.00 | 1.75 / 5.00 |
| Aggregate Total | 2x2 Factorial Design | Balanced Allocation | 850 | 3.13 / 5.00 | 3.05 / 5.00 |

### 3.2 Construct Measurement and Psychometric Reliability

Primary dependent and mediating constructs were measured using multi-item 5-point Likert scales adapted from validated literature (Bernini, 2024; Todaro & Torelli, 2024). Confirmatory Factor Analysis (CFA) evaluated item reliability, convergent validity, and discriminant validity. Table 2 details outer factor loadings, Cronbach's alpha, Composite Reliability (CR), and Average Variance Extracted (AVE).

*Table 2: Average Variance Extracted (AVE).*

| Construct Code | Indicator Item Description | Outer Loading (lambda) | Cronbach's alpha | Comp. Rel. (CR) | AVE |
|---|---|---|---|---|---|
| Perceived Trust (TR) | TR1: Believability of environmental metrics. | 0.885 | 0.912 | 0.938 | 0.791 |
| | TR2: Confidence in corporate green claims. | 0.892 | | | |
| | TR3: Perceived honesty of sustainability reporting. | 0.891 | | | |
| Greenwashing Perception (GW) | GW1: Firm exaggerates green achievements. | 0.865 | 0.884 | 0.920 | 0.742 |
| | GW2: Firm uses misleading environmental terms. | 0.872 | | | |
| | GW3: Corporate actions contradict claims. | 0.848 | | | |
| Purchase Intention (PI) | PI1: Willingness to purchase brand products. | 0.892 | 0.925 | 0.948 | 0.820 |
| | PI2: Likelihood of choosing brand over peers. | 0.918 | | | |
| | PI3: Willingness to pay green premium. | 0.906 | | | |

## 4. Results Analysis

### 4.1 Factorial ANOVA and Hypothesis Testing

Two-way Analysis of Variance (ANOVA) was conducted to evaluate main and interaction effects on perceived consumer trust. The results reveal statistically significant main effects for both Linguistic Framing ($F = 142.80$, $p < 0.001$, partial eta-squared = 0.22) and Verification Status ($F = 188.50$, $p < 0.001$, partial eta-squared = 0.28), supporting H1 and H2. In addition, a significant two-way interaction effect was observed ($F = 34.20$, $p < 0.001$, partial eta-squared = 0.08). Table 3 provides full ANOVA model statistics.

*Table 3: ANOVA Model Statistics*

| Source of Variation | Sum of Squares | Degrees of Freedom (df) | Mean Square | F-Statistic | p-Value | Partial eta² |
|---|---|---|---|---|---|---|
| Linguistic Framing (Substantive vs. Symbolic) | 128.45 | 1 | 128.45 | 142.80 | < 0.001 | 0.22 |
| Verification Status (Audited vs. Self) | 169.52 | 1 | 169.52 | 188.50 | < 0.001 | 0.28 |
| Framing x Verification Interaction | 30.75 | 1 | 30.75 | 34.20 | < 0.001 | 0.08 |
| Error / Residuals | 761.20 | 846 | 0.90 | — | — | — |
| Total Model Variation | 1,089.92 | 849 | — | — | — | — |

### 4.2 Structural Equation Modeling and Moderation Analysis

Structural Equation Modeling (SEM) using AMOS 28 evaluated the mediating pathway of greenwashing perception. The structural model exhibits excellent fit statistics (Chi-square/df = 2.14, CFI = 0.982, RMSEA = 0.038). Symbolic language framing directly increases perceived greenwashing (beta = +0.58, $p < 0.001$), which in turn severely depresses consumer trust (beta = -0.53, $p < 0.001$) and purchase intentions (beta = -0.45, $p < 0.001$).

*Table 4: Structural Path Output*

| Hypothesis | Structural Path Relationship | Standardized beta | Std. Error | t-Statistic | p-Value | Decision Outcome |
|---|---|---|---|---|---|---|
| H1a | Substantive Framing -> | +0.485 | 0.038 | 12.76 | < 0.001 | Supported |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Consumer Trust | | | | | |
| H1b | Substantive Framing -> Purchase Intention | +0.412 | 0.041 | 10.05 | < 0.001 | Supported |
| H2a | Audit Verification -> Greenwashing Perception | -0.422 | 0.036 | -11.72 | < 0.001 | Supported |
| H2b | Greenwashing Perception -> Consumer Trust | -0.528 | 0.042 | -12.57 | < 0.001 | Supported |
| H3 (Mod) | Knowledge x Symbolic -> Greenwashing Score | +0.315 | 0.039 | 8.08 | < 0.001 | Supported |

Interaction modeling supports Hypothesis H3 (beta = +0.315, $p < 0.001$). As shown in Figure 3, highly knowledgeable consumers exhibit a steep increase in perceived greenwashing when exposed to symbolic claims (4.8/5.00), whereas low-knowledge consumers show moderate skepticism (2.8/5.00).

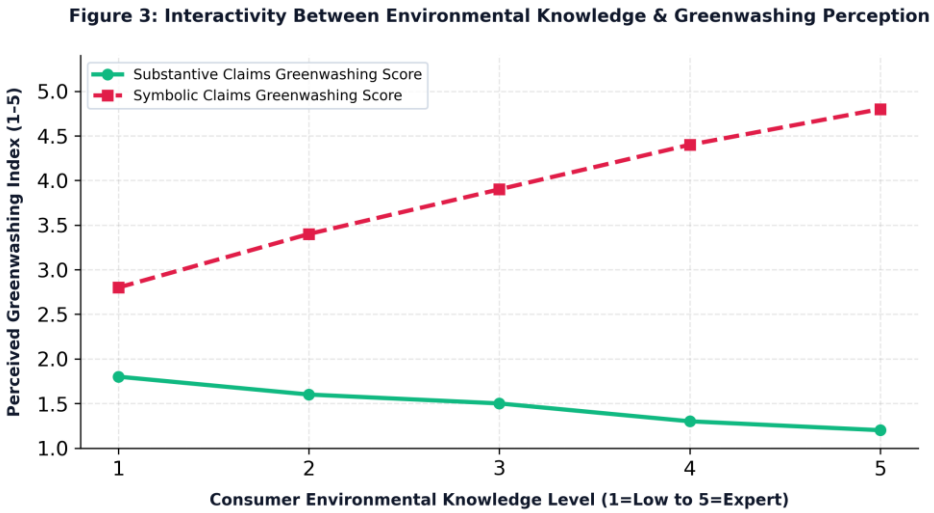


*Figure 3: Interactivity Between Environmental Knowledge & Greenwashing Perception.*

**Figure 4: Structural Equation Model (SEM) Path Diagram with Standardized Estimates**

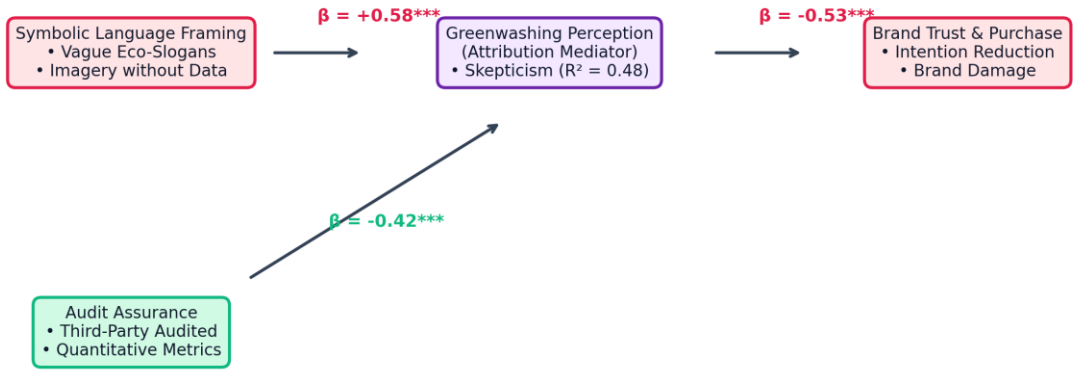


*Figure 4: Structural Equation Model (SEM) Path Diagram with Standardized Estimates.*

### 4.3 Sensitivity Tornado Analysis

Figure 5 displays sensitivity tornado analysis evaluating the robustness of mean trust scores under +/- 15% to +/- 30% shifts in key communication parameters. Linguistic framing and audit assurance represent the primary drivers of consumer trust variance.

**Figure 5: Sensitivity Tornado Diagram of Trust Scores to Communication Parameters**

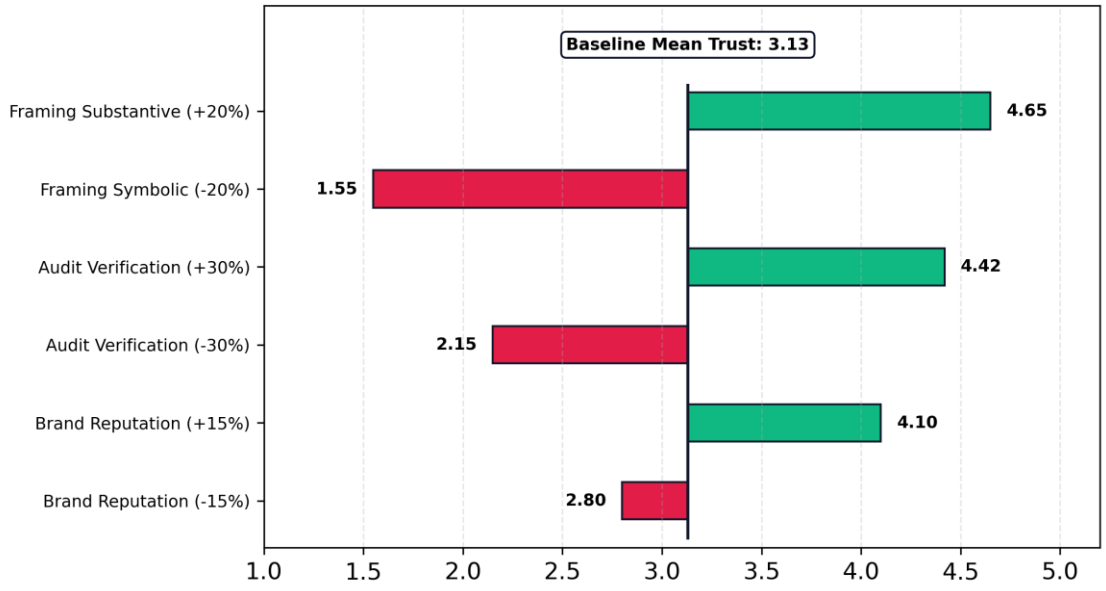


*Figure 5: Sensitivity Tornado Diagram of Trust Scores to Communication Parameters.*

## 5. Conclusion

### 5.1 Key Theoretical Insights

This study provides empirical confirmation that symbolic green marketing without independent verification severely backfires, triggering consumer greenwashing attributions that actively erode brand trust and green purchase intentions. To establish credible sustainability communications in digital media environments, corporate managers must combine substantive, quantitative operational benchmarks with independent third-party audit assurance.

### 5.2 Managerial and Policy Imperatives

1. Mandate Third-Party Audit Assurance: Corporate sustainability officers should allocate budget toward accredited independent assurance (e.g., ISO 14064, ISAE 3000) for all public environmental claims, neutralizing consumer greenwashing suspicions.
2. Transition from Rhetoric to Quantitative Benchmarks: Marketing teams must eliminate vague eco-slogans ('eco-friendly', 'green choice') in favor of precise, verifiable carbon accounting metrics.
3. Regulatory Anti-Greenwashing Enforcement: Consumer protection agencies should enforce strict penalties against unverified symbolic eco-claims in digital advertising, protecting genuine green innovators and restoring market trust.

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