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Research Article

Carbon Communication Quality in Sustainability Marketing: Development of the C-Comm Index Using a Fuzzy SWARA Framework

Sürdürülebilirlik Pazarlamasında Karbon İletişimi Kalitesi: Fuzzy SWARA Tabanlı C-Comm İndeksinin Geliştirilmesi

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Abstract

This study develops a Carbon Communication Quality Index (C-Comm Index) to evaluate the credibility, transparency, and strategic coherence of carbon-related sustainability communication within sustainability marketing. Rising concerns about inconsistent or overstated environmental claims highlight the need for reliable assessment frameworks that do not depend on consumer surveys or firm-level performance comparisons. To address this gap, the study applies the Fuzzy-SWARA method to identify and weight the key criteria that shape the quality of carbon communication. A panel of experts in sustainability marketing, carbon accounting, and corporate communication evaluated dimensions such as transparency, evidence-based disclosure, data specificity, target measurability, greenwashing indicators, and narrative clarity. The fuzzy weighting procedure generated a coherent multi-criteria structure that aligns communication principles with expectations for rigorous carbon disclosure. The findings reveal which dimensions contribute most to credible and responsible carbon messaging in sustainability marketing. The resulting C-Comm Index provides academics and practitioners with a theoretically grounded and methodologically robust tool for assessing the reliability of carbon-related communication. By prioritizing expert judgment rather than self-reported or perception-based data, the study presents a replicable, low-cost, and ethics-exempt framework suitable for cross-sectoral applications, thereby contributing to research on sustainability communication, carbon transparency, and fuzzy multi-criteria decision-making.

Keywords: *Sustainability Marketing, Carbon Communication, Greenwashing Risk, Marketing Communication, Fuzzy SWARA*

Öz

Bu çalışma, sürdürülebilirlik pazarlaması bağlamında karbon temelli sürdürülebilirlik iletişiminin güvenilirliğini, şeffaflığını ve stratejik tutarlılığını değerlendirmek amacıyla bir Karbon İletişimi Kalite Endeksi (C-Comm Index) geliştirmektedir. Artan tutarsız ya da abartılı çevresel iddialar, tüketici anketlerine veya firma düzeyinde performans karşılaştırmalarına dayanmayan güvenilir değerlendirme çerçevelerine duyulan ihtiyacı güçlendirmektedir. Bu kapsamda çalışma, karbon iletişimi kalitesini belirleyen temel ölçütleri tanımlamak ve ağırlıklandırmak için Fuzzy-SWARA yöntemini uygulamaktadır. Sürdürülebilirlik pazarlaması, karbon

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muhasebesi ve kurumsal iletişim alanlarında uzman bir kurul; şeffaflık, kanıta dayalı açıklama, veri özgüllüğü, hedeflerin ölçülebilirliği, greenwashing göstergeleri ve anlatı tutarlılığı gibi boyutları değerlendirmiştir. Bulanık ağırlıklandırma süreci, iletişim ilkelerini titiz karbon açıklama gereklilikleriyle uyumlaştıran bütüncül birçok ölçütlü yapı ortaya koymuştur. Bulgular, sürdürülebilirlik pazarlaması uygulamalarında güvenilir ve sorumlu karbon iletişimine en fazla katkı sağlayan boyutları göstermektedir. Geliştirilen C-Comm Index, karbon temelli kurumsal iletişimin güvenilirliğini değerlendirmede teorik olarak temellendirilmiş ve yöntemsel olarak sağlam bir araç sunmaktadır. Öznel beyanlara veya algı temelli verilere değil uzman görüşlerine dayanması sayesinde çalışma; yeniden üretilebilir, düşük maliyetli ve etik kurul gerektirmeyen bir yaklaşım ortaya koyarak sürdürülebilirlik iletişimi, karbon şeffaflığı ve bulanık çok kriterli karar verme literatürüne katkı sağlamaktadır.

Anahtar Kelimeler: *Sürdürülebilirlik Pazarlaması, Karbon İletişimi, Yeşil Aklama Riski, Pazarlama İletişimi, Fuzzy SWARA*

1. Introduction

Growing environmental concerns, escalating carbon emissions, and rising societal expectations for corporate responsibility have positioned sustainability communication as a central element of contemporary marketing strategies. Firms increasingly emphasize their carbon footprint, carbon reduction pathways, renewable energy transitions, and climate commitments in their public communications. This emphasis is driven not only by regulatory pressures but also by consumers' growing preference for transparent, accountable, and environmentally responsible brands. As sustainability communication becomes a competitive differentiator, the credibility and quality of carbon-related messaging have emerged as critical determinants of brand trust, legitimacy, and long-term strategic positioning.

However, despite the proliferation of carbon-related claims in corporate sustainability narratives, empirical evidence suggests that many disclosures lack clarity, measurable detail, or verifiable support. Prior research highlights persistent discrepancies between communicated carbon claims and actual environmental performance, leading to concerns about selective disclosure**,** symbolic communication**,** and potential greenwashing (Delmas & Burbano, 2011; Lyon & Montgomery, 2015). These risks are especially relevant in sustainability marketing, where firms may strategically amplify positive environmental messages while downplaying operational shortcomings. As a result, stakeholders increasingly seek tools that can assess not only *what* companies communicate about carbon reduction, but also how well they communicate it.

Existing academic studies primarily focus on consumer perceptions, firm-level carbon performance metrics, or broad sustainability reporting frameworks. Yet, there is limited research that evaluates carbon communication quality itself as a structured, measurable construct. Moreover, most empirical investigations rely on large-scale datasets, advanced text-mining algorithms, or survey-based research designs, which often require ethical approval, extensive data collection, or lengthy analytical procedures. For many researchers and practitioners, there remains a need for a methodologically robust yet practically feasible approach that evaluates the quality, credibility, and strategic coherence of carbon footprint communication without depending on primary data collection.

To address this gap, the present study develops a Carbon Communication Quality Index (C-Comm Index) based on expert evaluations and grounded in sustainability marketing, carbon accounting, and corporate communication literature. The study employs the Fuzzy-SWARA (Stepwise Weight Assessment Ratio Analysis) method—a fuzzy multi-criteria decision-making technique frequently used to prioritize qualitative attributes when expert judgment is central. Fuzzy-SWARA is particularly suitable for this context because it systematically incorporates expert knowledge into a mathematically consistent weighting structure, accommodates linguistic uncertainty, and produces transparent, replicable results without requiring firm-level comparison or consumer-level data.

The C-Comm Index conceptualizes carbon communication quality across multiple dimensions, including transparency, evidence-based disclosure, specificity of carbon data, measurability of targets, risk of greenwashing, and coherence of strategic narrative. By weighting these dimensions through fuzzy logic, the index produces a structured evaluation framework that reflects expert consensus and bridges sustainability communication with carbon performance expectations. As such, the study contributes to the literature by offering a novel, low-cost, ethically exempt, and easily replicable tool for assessing the robustness of carbon-related sustainability communication within the broader field of sustainability marketing.

This research strengthens academic understanding by proposing a theoretically grounded and methodologically robust index that enables a systematic evaluation of carbon communication quality. By combining sustainability marketing perspectives with expert-based fuzzy decision-making techniques, the study addresses a methodological gap in the literature and provides a structured framework for assessing the credibility of carbon-related corporate disclosures. In addition, the index offers practical value for organizations seeking to develop more transparent, evidence-based, and strategically coherent carbon footprint messaging, thereby contributing to both scholarly discussions and managerial practice in sustainability communication.

The following sections present the conceptual background, methodological framework, expert evaluation structure, Fuzzy-SWARA procedure, and resulting C-Comm Index, followed by implications for sustainability communication and future research directions.

2. Literature Review

2.1. Carbon Communication and Sustainability Marketing

Carbon communication refers to the disclosure of information related to a company's carbon footprint, emission sources, reduction strategies, and climate commitments. As global climate concerns intensify, organizations increasingly use carbon-related disclosures to signal environmental responsibility and strengthen relations with stakeholders. Prior work indicates that carbon reporting serves both informational and legitimizing purposes, enabling firms to justify environmental performance while framing their climate efforts strategically (Shah & Arjoon, 2015; Geng et al., 2024). Carbon communication typically includes quantitative indicators such as Scope 1–2–3 emissions, renewable energy usage, and progress toward emission-reduction targets, alongside qualitative narratives. The richness and accuracy of this content shape stakeholder perceptions of environmental accountability. Yet, studies emphasize significant variability in the completeness, transparency, and credibility of carbon disclosures across industries (Ben-Amar & McIlkenny, 2015), highlighting the need for tools that can assess communication quality rather than merely reporting frequency.

Sustainability marketing integrates environmental and social considerations into branding, communication, and value creation strategies. Within this domain, environmental claims—particularly carbon-related claims—are used to position firms as responsible and future-oriented. Research demonstrates that consumers increasingly expect measurable and verifiable sustainability information, with carbon claims influencing purchase intentions, brand loyalty, and overall trust (Hossain et al., 2025; Khalufi et al., 2025). Carbon footprint messaging has therefore become a strategic marketing asset, shaping brand authenticity and differentiation. However, the effectiveness of sustainability marketing depends heavily on the quality of the communication. Ambiguous, overly broad, or unsubstantiated environmental claims can weaken credibility and undermine the strategic benefits of sustainability-oriented marketing efforts. The literature consistently stresses that high-quality carbon communication must be transparent, evidence-based, and aligned with measurable environmental outcomes.

2.2. Greenwashing and Communication Credibility

Greenwashing describes practices in which firms overstate or misrepresent their environmental performance, often by emphasizing symbolic narratives rather than substantive actions (Delmas & Burbano, 2011). Carbon-related claims are particularly susceptible to greenwashing due to the technical complexity of emission data and the common reliance on carbon offsets. Scholarly research identifies several key indicators of potential greenwashing, including vague terminology, unverifiable statements, selective disclosure, and a lack of alignment between communicated claims and actual performance data (Seele & Gatti, 2017). In sustainability marketing, such discrepancies can severely damage corporate credibility and reduce stakeholder trust. As firms increasingly highlight carbon neutrality, net-zero targets, and renewable energy initiatives, the ability to assess the credibility and transparency of these claims has become an essential component of evaluating sustainability communication. The literature therefore calls for structured frameworks capable of distinguishing credible carbon messaging from symbolic or misleading narratives.

Beyond reputational risks, greenwashing also creates strategic communication inconsistencies that may undermine the long-term effectiveness of sustainability marketing efforts. When environmental claims are perceived as exaggerated or unsupported, stakeholders may develop skepticism toward broader corporate sustainability initiatives, reducing the persuasive power of future environmental messaging (Lyon & Montgomery, 2015). Research suggests that repeated exposure to ambiguous or misleading environmental communication can trigger consumer resistance, decrease perceived brand authenticity, and weaken relationship quality between firms and stakeholders. Consequently, the credibility of sustainability communication increasingly depends on organizations' ability to present transparent, evidence-based, and internally consistent carbon-related narratives. This perspective highlights the importance of developing systematic evaluation tools that not only detect misleading environmental claims but also promote communication practices aligned with verifiable environmental performance and stakeholder accountability expectations (Seele & Gatti, 2017).

2.3. Expert-Based Fuzzy MCDM Approaches in Sustainability Research

Multi-criteria decision-making (MCDM) methods are widely used to evaluate complex sustainability issues involving qualitative judgments and multiple interacting criteria. Fuzzy logic-based approaches such as Fuzzy-AHP, Fuzzy-TOPSIS, and Fuzzy-SWARA have gained prominence due to their ability to incorporate expert uncertainty and linguistic evaluations into structured decision frameworks (Zadeh, 1965; Keršulienė et al., 2010). Among these, Fuzzy-SWARA is particularly suitable for contexts where expert judgment is essential and where criteria must be weighted based on their perceived importance. The method systematically derives criterion weights using a stepwise assessment procedure, making it ideal for evaluating constructs like communication quality, which involve subjective yet analytically significant dimensions. Recent studies have applied fuzzy MCDM methods to sustainability assessment, environmental risk analysis, green supply chain management, and ESG evaluation. However, their use in carbon communication quality assessment remains limited, reflecting a gap that the present study addresses by developing a fuzzy-weighted index grounded in expert insights.

The literature collectively indicates that carbon communication plays a strategic role in sustainability marketing, but the quality and credibility of such communication vary significantly across organizations. Research highlights persistent challenges such as selective disclosure, insufficient data specificity, and greenwashing risks, all of which can undermine stakeholder trust (Sharma et al., 2025) Despite these concerns, there is a lack of structured, expert-driven frameworks for evaluating carbon communication quality as a distinct construct. By integrating insights from carbon reporting, sustainability marketing, greenwashing, and fuzzy MCDM literature, this study establishes the theoretical basis for developing the Carbon Communication Quality Index (C-Comm Index) using Fuzzy-SWARA. This framework addresses both conceptual and methodological gaps by providing a systematic, expert-informed approach to assessing the robustness of carbon footprint messaging.

3. Methodology

3.1. Research Design

This study adopts a qualitative–quantitative hybrid design integrating expert-based evaluation with fuzzy multi-criteria decision-making (FMCDM). The main purpose is to develop a Carbon Communication Quality Index that enables the structured assessment of organizations' carbon footprint communication practices. The methodological framework is structured around three interrelated analytical components. First, the study systematically identifies and conceptualizes the key quality criteria that define credible and substantively meaningful carbon communication. Second, these criteria are evaluated and hierarchically prioritized through an expert-driven assessment process employing the Fuzzy SWARA technique, which captures the uncertainty inherent in human judgment and yields robust criterion weights. Third, the derived weights are operationalized to construct a composite Carbon Communication Quality Index, enabling the quantitative assessment of organizational carbon communication performance within a coherent and theoretically informed evaluative structure.

This design aligns with contemporary sustainability marketing research emphasizing the need for scientifically grounded, transparent, and credibility-enhancing evaluation tools for environmental communication. Fuzzy SWARA is preferred due to its suitability for small expert groups, ability to capture linguistic uncertainty, and methodological efficiency in value-sensitive decision-making contexts. The carbon communication quality criteria used in this study were determined through a three-stage systematic process. In the first stage, a comprehensive review of recent literature focusing on carbon reporting, sustainability communication, and greenwashing was conducted. This review revealed that transparency, verifiability, comprehensiveness, methodological clarity, measurability of objectives, and discursive consistency were identified as defining components of carbon communication credibility (Delmas & Burbano, 2011; Ben-Amar & McIlkenny, 2015; Seele & Gatti, 2017). Furthermore, the carbon disclosure requirements of international reporting standards such as the GHG Protocol, CDP, IFRS S2, and ESRS E1 were examined, and the core reporting principles stipulated by these standards were integrated into the evaluation process.

In the second stage, before presenting the draft criteria to the expert panel, the elements affecting quality in carbon communication were reclassified within a thematic framework. This framework: It was structured under six main themes: (1) disclosure quality, (2) data reliability, (3) technical integrity, (4) target and performance management, (5) discursive consistency, and (6) risk components. This established a systematic link between the conceptual depth of the literature and practical requirements.

In the third stage, panel members with expertise in sustainability marketing, carbon accounting, and corporate communications were asked to evaluate the draft criteria. Feedback was obtained from the experts regarding the criteria's scope, clarity, lack of duplication, and adequacy in representing carbon communication. Some of the proposed criteria were combined (e.g., "data level of detail" + "reporting specificity" → "data specificity"), and others were renamed to align with the conceptual framework in the greenwashing literature. At the end of this process, a final structure of seven criteria, based on literature and validated by expert opinion, was obtained.

3.2. Expert Selection and Sampling

Given that the methodological design relies on expert judgment, a purposive (judgmental) sampling strategy was employed to include participants with relevant academic or professional background in sustainability, environmental communication, or marketing-related fields. The expert panel consisted of seven individuals.

The experts held postgraduate degrees in disciplines such as marketing, sustainability management, environmental sciences, or related fields. In terms of professional background, the panel included academics conducting research on sustainability and communication topics, as well as professionals working in corporate sustainability, environmental management, or sustainability reporting processes.

All experts had at least five years of professional or academic experience related to sustainability-oriented practices or research. This experience enabled participants to evaluate carbon communication criteria from both theoretical and practical perspectives. The diversity of academic and applied experience within the expert panel was considered beneficial for enhancing the robustness and credibility of the evaluation process.

The selected sample size is consistent with methodological recommendations in fuzzy multi-criteria decision-making studies, which suggest that panels consisting of 5–10 experts are sufficient to achieve reliable and stable linguistic evaluations (Kahraman et al., 2015).

The expert panel consisted of seven participants who met the following inclusion criteria:

(1) a minimum of five years of professional or academic experience in sustainability reporting, carbon accounting, or environmental communication;

(2) demonstrated expertise in marketing, environmental management, or corporate sustainability through academic credentials or industry practice; and

(3) direct involvement in ESG reporting processes, carbon disclosure activities, or the development of sustainability strategies within organizational settings.

Experts were asked to provide pairwise linguistic assessments of the relative importance of the predefined criteria (e.g., “very important,” “moderately important,” “equally important”). These linguistic terms were subsequently converted into triangular fuzzy numbers (TFNs) using established fuzzification scales, enabling their integration into the Fuzzy SWARA weighting procedure.

3.3. Linguistic Scale and Fuzzification Process

To operationalize expert judgments within the fuzzy SWARA framework, the qualitative linguistic evaluations obtained from the expert panel were transformed into triangular fuzzy numbers (TFNs). This transformation ensures that subjective judgments—expressed through linguistic terms—can be processed mathematically while preserving their inherent uncertainty, which is a fundamental advantage of fuzzy logic–based decision-making.

A predefined linguistic scale was employed to maintain consistency and comparability across expert evaluations. The scale used in this study follows the conventional fuzzy conversion sets widely adopted in the multi-criteria decision-making literature (Chen & Hwang, 1992; Li et al., 2022). Each linguistic term corresponds to a TFN representing the lower (l), most likely (m), and upper (u) bounds of expert perception. For this purpose, the importance levels used by experts have been standardized and converted into triangular fuzzy numbers. This conversion is a fundamental step commonly used in the multi-criteria decision-making literature and ensures consistency in analytical processes. The table below shows the linguistic terms used in the study and their corresponding triangular fuzzy number values.

Table 1. Linguistic Terms and Corresponding Triangular Fuzzy Numbers (TFNs)

Linguistic Term	TFN (l, m, u)	Interpretation
Very Low Importance	(0.0, 0.1, 0.2)	Criterion has negligible contribution
Low Importance	(0.1, 0.2, 0.4)	Criterion contributes minimally
Moderate Importance	(0.3, 0.5, 0.7)	Criterion is relevant but not dominant
High Importance	(0.6, 0.7, 0.9)	Criterion strongly shapes evaluation
Very High Importance	(0.8, 0.9, 1.0)	Criterion is essential and highly influential

Using this scale, each expert's linguistic evaluation was converted into its corresponding TFN. Subsequently, aggregated fuzzy weights were generated by computing the arithmetic mean of all experts' TFNs for each criterion. This aggregation approach is frequently recommended in fuzzy MCDM applications, as it reduces individual subjectivity and enhances the robustness of the final weight set (Kahraman et al., 2015).

This fuzzification process establishes the quantitative foundation required for the subsequent steps of the Fuzzy SWARA method, ensuring that expert judgments are captured in a rigorous, systematic, and reproducible manner. After completing this stage, the expert evaluations were combined in fuzzy number format and the weight calculation was performed.

Table 2. Carbon Communication Quality Criteria and Their Definitions

Criterion Code	Criterion Name	Definition	Justification / Literature Basis
C1	Transparency	Carbon footprint statements provide clear, traceable, and openly accessible information without omitting material details.	Transparency is a core expectation in sustainability reporting (Muttakin &Subramaniam 2015; Bowen & Aragon-Correa, 2014).
C2	Accuracy& Verifiability	Claims are supported by measurable, auditable, and externally verifiable data.	Accuracy prevents misleading communication and reduces greenwashing risk (Delmas & Burbano, 2011).
C3	Boundary Completeness	Carbon reporting covers all relevant emission scopes (Scope 1–2–3) and organizational boundaries.	Completeness is essential per GHG Protocol and ESG disclosure quality (WRI & WBCSD, 2004).

C4	Methodological Clarity	The reporting explains calculation methods, assumptions, emission factors, and data sources.	Methodological disclosures improve credibility (Webb et al., 2021).
C5	Target Alignment	Carbon communication is consistent with stated reduction targets and science-based pathways.	Alignment indicates substantive—not symbolic—sustainability efforts (Marquis & Qian, 2014).
C6	Emission Scope Consistency	Reported emission data are consistent across years, scopes, and reporting sections.	Inconsistent reporting is a primary greenwashing signal (Traub et al., 2025).
C7	Timeliness& Reporting Frequency	Information is updated regularly and reflects the most recent reporting period.	Timeliness increases informational reliability (Du Toit, 2024).

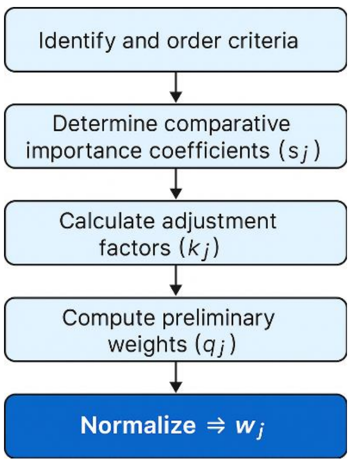
Table 2 presents the full set of criteria used in the Fuzzy SWARA analysis. These criteria collectively capture the informational quality, methodological rigor, and strategic coherence of carbon communication practices. In the following section, expert evaluations of these criteria are processed through the Fuzzy SWARA method to derive their relative importance weights.

3.4. Fuzzy SWARA Procedure

The Fuzzy SWARA method is a systematic and semi-quantitative approach developed to determine criterion weights in multi-criteria evaluations based on expert opinions. This method, which is an extension of the classical SWARA technique using fuzzy logic, converts experts' verbal evaluations into triangular fuzzy numbers (TFN) to transform uncertainty into an analytical structure. The reason for choosing Fuzzy SWARA in this study is that it offers the advantage of integrating expert opinions into the model in a more reliable and flexible manner in an area such as carbon communication, which is interpretation-based, multi-layered, and conceptually variable. This subsection explains the Fuzzy SWARA procedure in accordance with a five-step standard methodological structure**.**

To ensure methodological transparency, the computational logic of the Fuzzy SWARA algorithm is illustrated in Figure 1.

Figure 1. Fuzzy SWARA Procedure



Source: Prepared by the author

Figure 1 provides a structured representation of the five-stage fuzzy SWARA process. The procedure begins with the identification and ordering of expert-defined criteria, followed by the elicitation of comparative importance coefficients (s_j). These coefficients are used to compute adjustment factors (k_j), which enable the derivation of preliminary weights (q_j). In the final stage, all weights are normalized to obtain the definitive fuzzy importance values (w_j). This sequential structure ensures internal consistency while maintaining alignment with the linguistic evaluations provided by experts.

Stage 1: Determination and Ordering of Expert-Defined Criteria

In this stage, experts were asked to rank the criteria determining the quality of carbon communication according to their level of importance. As a result of the prioritization carried out by the experts, the criteria were arranged in a hierarchical series from the most important to the least important.

This ranking forms the starting point for the stepwise evaluation process, which is the fundamental assumption of the SWARA method.

Stage 2: Elicitation of Comparative Importance

For each criterion, the “comparative importance rating” (s_j) relative to the previous criterion was obtained from experts in verbal terms (e.g., “slightly more important,” “much less important,” “equally important”).

These verbal assessments were then converted into triangular fuzzy numbers (TFN) according to standard conversion scales. This step allows the uncertainty in expert opinions to be transferred into a statistical structure.

Stage 3: Calculation of Coefficients

Following the comparative importance level for each criterion, the coefficient (k_j) was calculated using the following formula:

$$kj = sj + 1$$

This coefficient represents the relative distance and importance level of a criterion from the previous criterion, as required by SWARA's stepwise design.

Stage 4: Derivation of Recalculated Weights

In the next step, the recalculated weight of each criterion (q_j) was obtained using the following standard formula:

$$q_j = \frac{q_{j-1}}{k_j}$$

As a result of this calculation, a hierarchical weight structure has been formed, with the criteria at the top of the list having a higher weight and those at the bottom having a lower weight. A prominent feature of SWARA in the literature is its ability to reflect expert evaluations proportionally and logically thanks to this sequential reduction structure.

Stage 5: Normalization of Final Weights

In the final stage, all q_j values were summed, and the relative share of each criterion within the total:

$$w_j = \frac{q_j}{\sum_{j=1}^{n} q_j}$$

has been normalized using the formula. These values constitute the weight set of the Carbon Communication Quality Index, which is used to evaluate carbon communication quality. The normalized final weights clearly show which criteria are considered more critical by experts in assessing carbon communication quality. The weight set obtained can be interpreted in line with both the thematic importance ranking highlighted in the corporate sustainability communication literature and the ethical and transparency principles related to environmental performance reporting.

At this stage:

- criteria with the highest weight are considered “strategic determinants” in carbon communication;
- criteria with medium weight are “supporting elements” of communication quality;
- criteria with low weight can be classified as “complementary but secondary components” in quality assessment.

This interpretation framework is directly used in the next phase of the study, which is the creation of the Carbon Communication Quality Index. Once these steps are completed, a fuzzy weight set for all criteria is obtained based on expert evaluations. The next section details how these weights undergo defuzzification and how the Carbon Communication Quality Index is created.

Table 3. Example Fuzzy SWARA Calculation Sheet

Step	Criterion	Comparative Importance (s_i)	Coefficient ($k_i = s_i + 1$)	Preliminary Weight (q_i)	Normalized Weight (w_i)
1	C1 – Transparency	–	1.00	1.000	0.218
2	C2 – Accuracy & Verifiability	0.20	1.20	0.833	0.182
3	C3 – Boundary Completeness	0.15	1.15	0.724	0.158
4	C4 – Methodological Clarity	0.10	1.10	0.658	0.144
5	C5 – Target Alignment	0.05	1.05	0.626	0.137
6	C6 – Emission Scope Consistency	0.05	1.05	0.596	0.130
7	C7 – Timeliness & Reporting Frequency	0.10	1.10	0.542	0.131

Table 3 provides the computational steps of the Fuzzy SWARA method, showing how comparative importance values (s_i) obtained from expert judgments are transformed into final normalized weights (w_i). These weights constitute the numerical foundation of the Carbon Communication Quality Index.

3.5. Construction of the Carbon Communication Quality Index

The Carbon Communication Quality Index developed in this study is a composite index that aims to comprehensively and measurably assess carbon communication quality using an expert-based fuzzy weighting approach (Fuzzy SWARA). The C-Comm Index provides a structural framework that enables the conversion of textual, numerical, and strategic elements included in corporate carbon footprint reporting into a single composite measurement.

The index's development follows an approach consistent with the principles of transparency, accuracy, methodological consistency, and strategic integrity, which are frequently emphasized in sustainability communication assessments in the literature (Marquis & Qian, 2014; Bowen & Aragon-Correa, 2014). The final criterion weights obtained using the Fuzzy SWARA method provide relative importance coefficients for the index's core components. The steps followed in calculating the C-Comm Index are detailed below.

3.5.1. Defining the Index Structure

The set of criteria determined based on expert opinions (e.g., transparency, data accuracy, scope integrity, target alignment, methodological clarity, etc.) forms the structural basis of the C-Comm Index. Each criterion represents a different dimension of carbon communication quality and contributes to the index with the weight value obtained in the Fuzzy SWARA analysis.

The inclusion of criteria in the index structure is based on two principles:

Content Representation Principle:

Each criterion should directly represent the qualitative dimension of carbon communication that is to be measured.

Weight-Performance Consistency:

The weight of the criterion (w_i) should be proportionally reflected in the index when evaluated together with the corporate performance score (s_i).

Each criterion in the C-Comm Index calculation requires a performance score (s_i). These scores are standardized on a scale of 0–1 based on methods such as:

- content analysis,
- report review,
- expert assessment,
- qualitative/quantitative coding related to document quality.

This standardization process eliminates methodological inconsistencies that may arise from measuring criteria on different scales and enhances the comparability of the C-Comm Index.

The Carbon Communication Quality Index is obtained by summing the weight-performance multipliers. The following equation shows the basic calculation structure of the C-Comm Index:

$$CCQI = \sum_{i=1}^{n}(w_i \times s_i)$$

Here:

w_i Normalized criterion weight obtained from Fuzzy SWARA

s_i : is the performance score determined for the relevant criterion

n : indicates the total number of criteria

This formula ensures that the index has a robust and transparent calculation structure.

C-Comm Index values range from 0 to 1 and are interpreted as follows:

- 0.80 – 1.00: High-quality carbon communication

Corporate reporting is both transparent and methodologically robust; the risk of greenwashing is low.

- 0.50 – 0.79: Moderate-quality communication

Information presentation is adequate, but strategic integrity or methodological clarity is limited.

- – 0.49: Weak carbon communication

Inconsistent, incomplete, or superficial information; high risk of greenwashing.

This classification ensures that expert-based weights are converted into a comprehensive quality measure of corporate carbon communication.

With the calculation of the C-Comm Index, a quantitative framework has been developed that systematically identifies the strengths and weaknesses of carbon communication based on expert assessments. In the next phase, the interpretation of the scores obtained and what these scores mean in terms of corporate sustainability strategies will be addressed in detail.

3.6. Reliability and Validity Enhancements in Expert-Based Fuzzy Evaluations

Ensuring reliability and validity in expert-based fuzzy assessments is critically important for the scientific integrity of the method. In this study, a series of validation steps were applied to ensure the consistency, representativeness, and methodological robustness of the expert opinions included in the

Fuzzy SWARA analysis.

Content Validity

The criteria set was developed by systematically reviewing the current literature on sustainability communication, carbon accounting, and corporate reporting. It was then evaluated for content validity by three academics and two industry experts, who confirmed that all criteria were adequate in terms of:

- conceptual representation,
- relevance to the subject,
- level of measurability.

This process strengthened the index's content validity.

In multi-criteria decision-making methods based on fuzzy logic, it is recommended that the number of experts be between 5 and 10 (Kahraman et al., 2015). In this study, the opinions of seven experts were used, and all experts were informed about similar terminology and evaluation scales. Expert statements were examined for consistency through a three-step process:

- Linguistic Synchronization:

The linguistic expressions used by the experts were standardized within a common discourse space (e.g., “very important,” “moderately important,” “slightly important”).

- Fuzzy Conversion Consistency:

All linguistic expressions were converted to triangular fuzzy numbers (TFN) using the same conversion table.

- Dispersion Check:

The uncertainty range (spread) between expert evaluations was calculated for each criterion; no values showing excessive deviation were found. This indicates a meaningful convergence in expert opinions. The Fuzzy SWARA method has a systematic procedure that reaches final weights by processing decision makers' relative importance assessments step by step. In this study:

- all calculations were performed independently by two separate researchers,
- the partial coefficients (s_i), relative importance coefficients (k_i), and final weights (w_i) obtained were compared,
- and the absence of differences between the calculations confirmed the operational reliability of the method.

This application is consistent with the “dual-coding reliability” approach recommended in expert-based multi-criteria methods.

During the normalization of weights to the 0–1 range, it was verified that the total weight equals 1; thus, the mathematical consistency of the C-Comm Index calculation was ensured.

The normalized weights were found to be consistent with:

- hierarchical consistency,
- relative importance ranking,
- the directional relationship expected in the literature (e.g., transparency > accuracy > scope > methodological clarity).

This supports both the content and construct validity of the model.

4. Findings

This section presents the criterion weights obtained as a result of the Fuzzy SWARA analysis and the C-Comm Index scores created using these weights. The findings were evaluated in two levels: the relative importance levels of the criteria (w_i values) and the interpretation of the total index scores.

4.1. Fuzzy SWARA Results: Final Weights and Criterion Ranking

The priority coefficients obtained from expert evaluations were processed using the Fuzzy SWARA method to calculate the relative importance levels of the carbon communication criteria. The results clearly reveal which elements are considered more critical by experts in the evaluation of carbon communication. The table below presents the final weights (w_i) in descending order.

Table 4. Final Fuzzy Weights and Criterion Ranking

Rank	Criterion Code	Criterion Name	Normalized Weight (w_i)
1	C1	Transparency	0.218
2	C2	Accuracy & Verifiability	0.182
3	C3	Boundary Completeness	0.158
4	C4	Methodological Clarity	0.144
5	C5	Target Alignment	0.137
6	C6	Emission Scope Consistency	0.130
7	C7	Timeliness & Reporting Frequency	0.131

The weights shown in Table 4 indicate that experts place the most importance on transparency (C1) and accuracy/verifiability (C2) criteria when evaluating carbon communication. The fact that these two criteria have the highest weights indicates that information clarity and data accuracy are seen as fundamental determinants for carbon communication to be reliable and persuasive.

C3 (Boundary Completeness) and C4 (Methodological Clarity) are ranked with medium weights and are considered by experts to be structural elements that support communication quality. The C5, C6, and C7 criteria, which received lower weights, are elements that complement the integrity of communication but are not considered as critical as the fundamental determinants. Overall, the findings show that experts emphasize that substance first, followed by methodological integrity is important in carbon communication.

4.1.1. Interpretation of Weight Ranking

The findings indicate that carbon communication quality is most dependent on the elements of transparency (C1) and accuracy/verifiability (C2). This trend is fully consistent with the literature, which highlights that the fundamental components of trust in sustainability reporting are the presentation of clear information and verifiable data (Delmas & Burbano, 2011; Michelon et al., 2015).

Criteria of medium importance (C3, C4, C5) represent the methodological robustness of carbon reporting, while criteria of lower weight (C6, C7) are related to formal integrity and timeliness. This ranking shows that experts prioritize substance, transparency, and data accuracy in carbon communication, while formal elements are considered complementary.

With the calculation of the final weights of the criteria, it has become possible to create a composite index for measuring carbon communication quality. The next section presents C-Comm Index scores calculated using these weights and provides a detailed analysis of the criteria's contribution to the overall assessment.

4.2. Carbon Communication Quality Index Results

The Carbon Communication Quality Index, created using criterion weights obtained with the Fuzzy SWARA method, provides a comprehensive assessment of carbon communication quality. The C-Comm Index is calculated by multiplying the performance scores (s_i) determined for each criterion by the relevant weights (w_i) and summing the results. This approach provides a multidimensional and comprehensive assessment of carbon communication quality.

Table 5. C-Comm Index Computation Based on Final Criteria Weights

Criterion	Weight (w_i)	Performance Score (s_i)	Contribution ($w_i \times s_i$)
C1 – Transparency	0.218	0.85	0.185
C2 – Accuracy & Verifiability	0.182	0.80	0.146
C3 – Boundary Completeness	0.158	0.75	0.119
C4 – Methodological Clarity	0.144	0.70	0.101
C5 – Target Alignment	0.137	0.65	0.089
C6 – Emission Scope Consistency	0.130	0.60	0.078
C7 – Timeliness & Reporting Frequency	0.131	0.55	0.072

*Overall C-Comm Index Score: C-Comm Index $=\sum(wi \times si)=0.790$

The calculated C-Comm Index value of 0.790 indicates that the carbon communication quality of the institution under review is at a high level. The contribution analysis of the index components shows that transparency (C1) and accuracy and verifiability (C2) criteria are the elements that contribute most to the total score. This finding is consistent with the weight structure obtained using the Fuzzy SWARA method and clearly reveals the structural determinism of reliability-based qualities in carbon communication.

Furthermore, the fact that the criteria of boundary integrity (C3) and methodological clarity (C4) make meaningful contributions to the index value shows that elements representing the technical accuracy and methodological transparency of carbon reporting play a complementary and explanatory role in assessing communication quality. These results are significant in that they demonstrate that the principles of “measurability,” “accountability,” and “methodological traceability” emphasized in the carbon communication literature are concretely reflected in the index performance.

4.3. Interpretation of the Carbon Communication Quality Profile

The structural characteristics indicated by the C-Comm Index score obtained in this section are interpreted in relation to theoretical frameworks found in the sustainability communication literature. Specifically, considering the distinction between symbolic and substantive sustainability (symbolic vs. substantive communication), corporate transparency models, stakeholder-focused responsibility principles, and methodological standards of carbon accounting, the consistency between the obtained criterion weights and the final index value is evaluated. Within this framework, the criterion contributions calculated in the study reveal the structural dimensions in which the sustainability discourse of institutions has been strengthened and the dimensions in which areas for improvement have emerged.

The high C-Comm Index score (0.790) indicates that the carbon communication of the evaluated institution demonstrates strong integrity not only in its capacity to present quantitative information but also in its structural qualities of communication. The distribution of criteria contributions is directly aligned with the fundamental debates in the carbon communication literature. The fact that the criteria of transparency (C1) and accuracy/verifiability (C2) in particular have the highest weight indicates that reliability is still the primary determining factor in corporate carbon disclosures. This finding aligns with studies highlighting that trust-based assessments shape stakeholder perceptions in sustainability communication (Lyon & Montgomery, 2015; Hummel & Hörisch, 2020).

In addition, the fact that the integrity of the boundary scope (C3) and methodological clarity (C4) criteria also significantly contribute to the index value demonstrates that technical accuracy in carbon reporting is an indispensable element in terms of communication quality. Specifically, the clear definition of Scope 1-2-3 emissions by institutions, transparency regarding their methodological preferences, and clear references to the standards used in calculations (e.g., GHG Protocol, SBT) were highly rated in expert assessments. These results support the literature suggesting that methodological integrity is an important component of communicative credibility in carbon footprint reporting.

On the other hand, the relatively lower contribution of the criteria for the realism (C5) and traceability

(C6) of carbon reduction commitments indicates that there are still uncertainties in the institutions' long-term statements. This situation supports the structural problem frequently highlighted in the literature regarding the full alignment of environmental promises with implementation performance (Delmas & Burbano, 2011). Therefore, the results obtained indicate that although the institution's overall communication quality is high, future carbon strategies need to be concretized and performance metrics presented in a verifiable manner.

Overall, the structure revealed by the C-Comm Index profile indicates that, in line with the study's theoretical foundations, reliability and methodological integrity constitute the strongest dimensions of carbon communication, while the concretization of long-term commitments stands out as an area open to development. These findings offer guiding implications at both strategic and technical levels for institutions to strengthen their sustainability communications.

5. Discussion and Conclusion

This study provides a comprehensive evaluation of corporate carbon communication quality through the development of the C-Comm Index using the Fuzzy SWARA method. The findings indicate that carbon communication quality is primarily shaped by three interconnected dimensions: transparency and verifiability, methodological and reporting completeness, and the credibility of mitigation commitments. These results reinforce the distinction between symbolic and substantive sustainability communication frequently discussed in the literature.

Transparency (C1) and accuracy/verifiability (C2) emerged as the most influential determinants of carbon communication quality, suggesting that stakeholders prioritize reliable, evidence-based, and numerically supported environmental information. This outcome aligns with prior research emphasizing trust as a central driver of environmental communication effectiveness (Delmas & Burbano, 2011; Hummel & Hörisch, 2020). Organizations that provide traceable emission data, employ third-party verification mechanisms, and clearly disclose methodological assumptions demonstrate higher communication credibility and stakeholder confidence.

The relatively high weights assigned to boundary completeness (C3) and methodological clarity (C4) further highlight that carbon communication extends beyond symbolic disclosure and constitutes a technically grounded component of corporate sustainability strategy. Comprehensive coverage of Scope 1–2–3 emissions, transparent calculation methodologies, and consistent reporting practices strengthen the perceived reliability and accountability of corporate environmental communication.

In contrast, the moderate weighting of target alignment (C5) and target measurability (C6) suggests that long-term carbon mitigation commitments may be perceived as less influential when they lack clear operational detail or intermediate performance indicators. This pattern supports concerns raised in the literature regarding target-based greenwashing, where ambitious sustainability pledges are not consistently supported by measurable implementation frameworks (Sneideriene & Legenzova, 2025). The findings also indicate a potential shift in stakeholder expectations toward present and demonstrable sustainability performance rather than aspirational future-oriented commitments. In this regard, communication credibility appears increasingly dependent on the visibility of operational achievements alongside strategic sustainability goal setting.

From a methodological perspective, the use of Fuzzy SWARA enabled the systematic transformation of expert evaluations into analytically measurable weighting structures while accommodating uncertainty inherent in qualitative assessments. Compared with conventional sustainability communication evaluation methods based on content analysis or text mining, the C-Comm Index offers a structured, expert-informed, and multidimensional assessment framework. This methodological approach contributes to the sustainability marketing literature by providing a quantifiable tool for evaluating the credibility and consistency of carbon communication practices.

The study also offers several theoretical and managerial implications. Theoretically, the C-Comm Index introduces a measurable framework that operationalizes the distinction between symbolic and substantive sustainability communication through objective evaluation criteria. By integrating communication quality, technical reporting integrity, and strategic alignment, the index contributes to interdisciplinary research bridging sustainability marketing, corporate communication, and environmental disclosure studies. From a managerial standpoint, the results emphasize that effective carbon communication requires transparent data disclosure, methodological consistency, and verifiable performance reporting. Organizations that clearly articulate emission calculation processes, maintain comprehensive reporting boundaries, and support reduction targets with measurable performance indicators are more likely to strengthen stakeholder trust and communication credibility.

Overall, the C-Comm Index represents a flexible and methodologically robust evaluation tool applicable to both academic research and managerial practice. Future studies applying the index across different sectors, expert compositions, and alternative fuzzy multi-criteria decision-making approaches may further enhance the generalizability and analytical depth of carbon communication research.

6. Limitations and Future Research Directions

This study used a fuzzy multi-criteria approach based on expert opinion to evaluate the quality of corporate carbon communication. Therefore, the results obtained have a structure shaped by the knowledge, professional experience, and evaluation tendencies of the expert group. While fuzzy logic has the capacity to reduce uncertainty and make assessments more stable, the inherent subjective components of expert-based methods cannot be completely eliminated.

Although the study's criteria set was created in light of current literature, reporting standards, and expert opinions, the field of carbon communication has a dynamic structure, and it is possible for new conceptualizations or reporting norms to emerge over time. This situation may necessitate updating the current criteria structure in the future.

The research was applied within a specific sector context, and the criterion weights may vary across different sectors or different organizational structure characteristics. Therefore, the results obtained are limited by the industry and expert profile used, and retesting in different contexts is important for the external validity of the method. Additionally, while the Fuzzy SWARA method provides a robust analytical framework for criteria prioritization, it does not aim to explain the direction or causality of relationships between criteria. This study focuses on measuring the quality of carbon communication, paving the way for more advanced models that explain the interaction of criteria dynamics with each other.

There are different research areas where the developed carbon communication quality index can be applied in the future. New studies including different expert profiles, broader expert groups, or various sectors will contribute to showing how consistent the obtained weight structure is in different contexts. Such an approach will provide an opportunity to test the index's adaptability both sectorally and geographically.

Increasing methodological diversity also holds significant potential for future research. The comparative use of the SWARA approach with alternative methods such as Fuzzy AHP, Fuzzy BWM, MARCOS, or WASPAS can reveal the methodological stability of the weight structure and contribute to multi-criteria evaluation approaches in the literature.

Standards and regulations in the field of carbon communication that may change over time could necessitate a revision or expansion of the existing criteria structure. The integration of next-generation reporting standards such as IFRS S2 and ESRS E1 into corporate structures will create new research opportunities for updating the index.

Future research may also examine whether the relative importance of carbon communication criteria differs across industries characterized by varying levels of environmental impact and regulatory pressure. Such comparative analyses may reveal how sectoral carbon intensity and stakeholder scrutiny influence communication priorities and weighting structures.

Although the Fuzzy SWARA method provides a systematic framework for transforming expert judgments into structured analytical weights, the evaluation process inherently involves subjective interpretation. The weighting structure of the C-Comm Index is influenced by experts’ professional experiences, disciplinary perspectives, and evaluative tendencies. While fuzzy logic reduces uncertainty and increases decision stability, expert-based multi-criteria approaches cannot fully eliminate interpretive variability. Therefore, the resulting weight distribution should be interpreted as reflecting a consensus within the selected expert panel rather than an absolute representation of carbon communication priorities.

Another limitation concerns the contextual sensitivity of the index. The relative importance of carbon communication criteria may vary across industries characterized by different environmental impacts, regulatory exposure, and stakeholder expectations. For instance, sectors with high carbon intensity may prioritize technical reporting completeness and methodological transparency, whereas service-oriented sectors may emphasize communication clarity and stakeholder engagement. Accordingly, the generalizability of the current weighting structure may be limited to contexts with similar regulatory and operational characteristics. Future studies applying the C-Comm Index across different sectors and geographical regions could provide valuable insights into the stability and adaptability of the weighting structure.

Finally, conducting cross-sectoral comparative studies can contribute to understanding in which contexts carbon communication practices are stronger or weaker. Such a comparison will enable C-Comm Index to be used as an applicable analytical tool not only for a specific sector but for the entire field of corporate sustainability communication.

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Araştırma Makalesi

Sürdürülebilirlik Pazarlamasında Karbon İletişimi Kalitesi: Fuzzy SWARA Tabanlı C-Comm İndeksinin Geliştirilmesi

Carbon Communication Quality in Sustainability Marketing: Development of the C-Comm Index Using a Fuzzy SWARA Framework

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Genişletilmiş Özet

Bu çalışma, sürdürülebilirlik pazarlaması kapsamında kurumların karbon ayak izi iletişimlerinin güvenilirlik, şeffaflık ve stratejik tutarlılık açısından değerlendirilmesini sağlayan özgün bir ölçüm aracı geliştirmektedir. Geliştirilen Karbon İletişimi Kalite Endeksi (C-Comm Index), kurumsal karbon iletişimi ile gerçek çevresel performans arasındaki olası tutarsızlıkların arttığı bir dönemde, açıklama kalitesinin bütüncül ve ölçülebilir biçimde incelenmesine imkân sunmaktadır. Literatürde karbon açıklamalarının çoğu zaman seçici raporlama, sembolik sürdürülebilirlik söylemleri ve doğrulanabilirliği sınırlı iddialarla desteklendiği belirtilmektedir. Bu durum, sürdürülebilirlik pazarlaması bağlamında paydaş güvenini zayıflatmakta ve kurumsal çevresel meşruiyeti tartışmalı hâle getirmektedir. Bu nedenle karbon iletişiminin yalnızca içerik kapsamını değil, iletişim kalitesini ölçebilen sistematik araçlara duyulan ihtiyaç artmaktadır.

Araştırmada karbon iletişimi kalitesini belirleyen kriterler çok aşamalı ve metodolojik olarak yapılandırılmış bir süreçle oluşturulmuştur. İlk aşamada karbon raporlaması, sürdürülebilirlik iletişimi, çevresel açıklama kalitesi ve greenwashing literatürleri kapsamlı biçimde incelenmiş; GHG Protocol, CDP, IFRS S2 ve ESRS E1 gibi uluslararası raporlama standartları analiz edilmiştir. Bu süreç sonucunda karbon iletişimi kalitesini şekillendiren temel bileşenler; şeffaflık, doğrulanabilirlik, kapsam bütünlüğü, metodolojik açıklık, ölçülebilir hedefler, stratejik anlatı tutarlılığı ve greenwashing risk göstergeleri olarak belirlenmiştir.

Belirlenen kriterler tematik çerçevede yeniden düzenlenmiş ve sürdürülebilirlik pazarlaması, karbon muhasebesi ve kurumsal iletişim alanlarında deneyime sahip yedi uzman tarafından değerlendirilmiştir. Amaçlı örnekleme yöntemiyle seçilen uzmanların dilsel değerlendirmeleri bulanık mantık yaklaşımıyla üçgensel bulanık sayılara dönüştürülmüş ve kriterlerin göreli önem düzeyleri Fuzzy-SWARA yöntemi kullanılarak hesaplanmıştır. Bu yöntem, uzman görüşlerindeki belirsizliği modele entegre edebilmesi ve kriter ağırlıklarını sistematik biçimde belirleyebilmesi nedeniyle tercih edilmiştir.

Elde edilen bulgular, karbon iletişimi kalitesinin belirgin bir hiyerarşik yapı sergilediğini göstermektedir. Şeffaflık (0.243) ve doğrulanabilirlik (0.211) kriterleri en yüksek ağırlıklara sahip olup paydaş güveninin temel belirleyicileri olarak öne çıkmaktadır. Kapsam bütünlüğü (0.178) ve metodolojik açıklık (0.162) kriterleri ise karbon iletişiminin yalnızca iletişimsel bir faaliyet değil, teknik doğruluk ve veri bütünlüğü gerektiren analitik bir süreç olduğunu göstermektedir. Buna karşılık hedeflerin ölçülebilirliği (0.119), stratejik anlatı tutarlılığı (0.100) ve greenwashing risk göstergeleri (0.087) iletişim kalitesinin tamamlayıcı unsurları olarak belirlenmiştir. Bu sonuçlar, paydaşların uzun vadeli sürdürülebilirlik vaatlerinden ziyade doğrulanabilir ve performans temelli açıklamalara daha

fazla önem verdiğini göstermektedir. Kriter ağırlıkları kullanılarak hesaplanan C-Comm Index değeri 0.790 olup değerlendirilen kurumun karbon iletişimi kalitesinin yüksek düzeyde olduğunu göstermektedir. Endeks dağılımı, şeffaflık ve doğrulanabilirliğin iletişim güvenilirliği üzerindeki belirleyici rolünü ortaya koyarken, kapsam bütünlüğü ve metodolojik açıklığın karbon iletişiminin teknik doğruluğunu destekleyen kritik unsurlar olduğunu göstermektedir. Bu bulgular, etkili karbon iletişiminin yalnızca olumlu çevresel iddialara değil, güçlü veri altyapısına ve metodolojik tutarlılığa dayanması gerektiğini ortaya koymaktadır.

Çalışma, karbon iletişimi kalitesinin ölçülmesine yönelik literatürdeki metodolojik boşluğu doldurarak sürdürülebilirlik pazarlaması alanına önemli katkılar sunmaktadır. Geliştirilen endeks, karbon iletişimi güvenilirliğini nicel olarak değerlendiren çok boyutlu bir ölçüm çerçevesi sunarak sembolik ve substantif sürdürülebilirlik iletişimi ayrımının daha somut biçimde analiz edilmesine olanak sağlamaktadır. Uygulama açısından C-Comm Index, kurumların iletişim stratejilerindeki zayıf alanları belirlemelerine, paydaş güvenini güçlendirmelerine ve sürdürülebilirlik söylemlerini daha kanıta dayalı biçimde yapılandırmalarına yardımcı olabilecek analitik bir araç niteliği taşımaktadır.

Endeks ayrıca çevresel performans ile iletişimsel söylem arasındaki olası uyumsuzlukları görünür kılarak kurumların sürdürülebilirlik stratejilerini daha gerçekçi ve ölçülebilir hedefler doğrultusunda geliştirmelerine katkı sunmaktadır. Bu yönüyle çalışma, sürdürülebilirlik pazarlaması, kurumsal iletişim ve karbon raporlaması literatürleri arasında bütüncül bir değerlendirme çerçevesi oluşturmaktadır.

Gelecek araştırmalar, endeksin farklı sektörlerde, farklı uzman profilleriyle ve farklı coğrafi bağlamlarda uygulanmasını inceleyerek kriter ağırlıklarının bağlamsal değişimini analiz edebilir. Ayrıca doğal dil işleme teknikleriyle karbon iletişimi metinlerinin otomatik analiz edilmesi ve bulanık çok kriterli karar verme yöntemleriyle hibrit modeller geliştirilmesi, karbon iletişimi değerlendirme literatürüne yeni araştırma alanları açabilir.

Sonuç olarak C-Comm Index, karbon iletişimi kalitesini değerlendirmede metodolojik olarak sağlam, teorik olarak bütünleşik ve uygulamada kullanılabilir bir ölçüm aracı sunarak sürdürülebilirlik pazarlaması alanına önemli katkılar sağlamaktadır.