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Communicating Sustainability in Ecuadorian Public Universities: A Content Analysis of Digital Media and a Framework of Educommunicational Strategies

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Abstract

Universities play a pivotal role in fostering sustainable practices, yet limited evidence is available on how this commitment is translated into digital communication within Latin American higher education. To address this gap, this study examines how Ecuadorian public universities communicate sustainability through digital media, using a mixed-methods design that integrates content analysis, correlational analysis, and expert-judgment validation to develop educommunicational strategies for university communication offices, sustainability units, and higher-education policymakers. Content analysis was conducted on 733 sustainability-related publications (102 on institutional websites and 631 on social media—Facebook, Instagram, X, YouTube, and TikTok) from 34 Ecuadorian public universities. Publications were classified into internal and external institutional-performance categories and assessed in terms of publication frequency and engagement rate; Spearman correlations were used to examine associations between audience size and posting activity. The findings reveal limited visibility of sustainability topics, fragmented communication strategies, and a predominance of Facebook and Instagram; only three universities maintain a dedicated sustainability section on their website. Four educommunicational strategies, validated through expert judgment, are proposed as a framework for transforming university digital communication and aligning it more closely with institutional sustainability commitments.

Keywords: educommunication; education for sustainability; higher education; sustainability communication

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1. Introduction

Against the backdrop of an increasingly complex global ecological crisis, one of the most pressing challenges facing universities is to transform their institutional practices in ways that help embed sustainability within society. Worldwide, higher education institutions have undertaken initiatives to improve their environmental performance while seeking to serve as models and catalysts for broader societal change [1,2]. In response to this challenge, a growing number of universities have incorporated sustainability into their core functions, including environmentally responsible campus management [3], the integration of sustainability into curricula across programs and academic levels [4], and

the strengthening of research and community engagement to generate relevant knowledge and respond to social needs and demands [5].

The dissemination of sustainability-related information can foster a culture of sustainability within the university community and encourage students, faculty, and staff to extend sustainable practices into their homes and everyday lives. Growing institutional interest in sustainability has led Higher Education Institutions to adopt multiple channels for communicating their commitments and engaging stakeholders, particularly in digital environments [6]. Universities therefore not only educate their students but also contribute to informing the wider community about contemporary environmental challenges and potential responses. Among these approaches, communication mediated by Information and Communication Technologies has become increasingly important because of its broad reach across population groups [7]. For many young people in the twenty-first century, social networks have also become prominent spaces for knowledge construction [8], further underscoring the relevance of educommunication.

In Ibero-America, the term has been used in research addressing the intersection of education and communication as a means of transmitting knowledge and values in contemporary society [9]. In Latin America, social movements during the 1970s and 1980s helped consolidate this field through the work of educators and popular communicators such as Paulo Freire, Mario Kaplún, Jesús Martín-Barbero, and Daniel Prieto Castillo [10]. These pioneers conceptualized educommunication not as a conventional sender-message-receiver model, but as a dialogical process capable of contributing to social transformation through media [11,12]. In this sense, educommunication integrates education and communication to promote critical thinking, media literacy, and active community participation in social issues [13], including sustainability-related concerns.

This study adopts Kaplún's educommunication approach, which distinguishes between an informational model of institutional communication—exogenous and unidirectional—and a genuinely dialogic (participatory) and critical-liberatory (transformative, in Freirean terms) form of educommunication [11]. The latter is operationalized through two complementary dimensions: the directionality of communication—distinguishing between unidirectional information transmission and dialogic exchange—and the degree of audience agency—distinguishing between passive reception and active participation. Furthermore, transformative communication requires an explicit appeal to critical consciousness or social change.

Within educommunication theory, Kaplún's three-tier model (informational, participatory, transformative) is not merely a descriptive taxonomy for classifying communicative artifacts; it constitutes a normative continuum rooted in Freirean pedagogy, in which movement toward the dialogic pole is understood as an expansion of audience agency and critical consciousness rather than a change in topic or format. Consequently, a strategic model grounded in this framework is not a menu of tactical recommendations for improving reach, but a set of interventions explicitly designed to shift institutional communication practices along this continuum—from unidirectional information transfer toward genuine dialogic and transformative engagement. This theoretical commitment shapes both the diagnostic reading of the empirical findings and the logic underlying each proposed strategy.

The pedagogical approach of educommunication [14] considers education, communication, media, and technologies as tools for understanding and changing global thinking, promoting dialog and reflection in interactions with the media, and is in tune with Freire's pedagogical principles, contributing to the formation of a more informed and reflective student body [15]. Regarding the power it grants to audiences, the rise of digital communication has allowed them not to be limited to being passive recipients of information, but to also actively participate in the process, contributing content in the manner and

time they choose to interact [16]. However, it is not possible to carry out an education in communication without considering digital technology [17], and similarly, an education in informatics is only viable through the correlation of media, driven by communication and content creation [18].

Social media have become important platforms for knowledge exchange and the development of communication skills, extending the reach of traditional education and responding to the demands of digital environments [19]. These spaces enable users to create profiles, produce, modify, and distribute content, and interact with others [20]. They encompass diverse formats and services, including forums, blogs, image- and video-sharing platforms, and messaging applications such as WhatsApp. In the context of sustainability, social media have likewise been identified as widely used channels for disseminating related information [21]. Consequently, educommunication assumes particular relevance in digitally connected contexts by enabling interactive media to be incorporated into educational processes. Positive educommunicational experiences have been reported on social media in areas including cultural heritage [9], self-esteem development, and improvements in academic performance [22].

The promotion of active, informed, and responsible participation in society—a central principle of educommunication—is particularly relevant to sustainability. This approach supports not only the critical interpretation of messages concerning the environment and sustainable development but also the strategic use of communication platforms to foster changes in ecological awareness and sustainable practices [23,24]. Developing these competencies can contribute to a more informed and engaged citizenry committed to environmental protection and to the construction of a more sustainable future.

Previous research has examined how higher education institutions communicate sustainability commitments through digital channels. Studies have documented sustainability communication on social media among Italian universities [6], analyzed how universities report their contributions to the Sustainable Development Goals on institutional websites [23], evaluated the technical and communicative quality of web-based sustainability content [25], and identified global challenges associated with embedding sustainability into higher education institutions' digital strategic communication [26,27]. In Ecuadorian public universities, research has begun to characterize environmental educommunication in regional digital media [28]; however, no study has systematically examined, across the national public university system, how institutional websites and the full range of major social media platforms are used to communicate sustainability. Nor has such evidence been translated into a validated framework of educommunicational strategies. This gap is important because isolated, platform-specific analyses cannot determine whether university digital communication constitutes a coherent educommunicational strategy or merely a fragmented set of disconnected practices—an essential distinction for designing interventions that strengthen environmental awareness within university communities. This study addresses this gap by jointly analyzing institutional websites and five social media platforms across all 34 Ecuadorian public universities and translating the resulting evidence into an expert-validated framework of educommunicational strategies.

The objective of this research was to analyze sustainability content disseminated through the digital media of Ecuadorian public universities and, on that basis, propose educommunicational strategies. The study makes three main contributions. First, it provides the first systematic diagnosis of sustainability-related digital communication across Ecuadorian higher education institutions by jointly examining institutional websites and five social media platforms—Facebook, Instagram, X, YouTube, and TikTok—rather than focusing on a single channel. This offers relevant evidence for researchers working at the intersection of communication and higher-education sustainability. Second, the study proposes a framework

of four educommunicational strategies, validated through expert judgment, that university communication offices and sustainability units can adopt or adapt to align digital media practices with institutional sustainability commitments. Third, it provides empirical evidence on audience engagement and the association between audience size and posting activity, which can support institutional decision-making regarding formats and platforms with greater educommunicational potential. Taken together, these contributions establish an empirical and practical baseline for strengthening university digital media as spaces for participation, environmental awareness, and commitment to sustainability.

2. Materials and Methods

This study adopted a mixed-methods approach integrating qualitative and quantitative components [29]. The research procedure was organized into four stages: data collection, content coding, statistical analysis, and strategy development (Figure 1).



Figure 1. Study workflow: from data collection to validated strategies.

2.1. Data Collection

The units of analysis addressed were the digital media (websites and social networks) of all 34 public Higher Education Institutions registered with the Higher Education Council [30]. Public universities were selected because they concentrate on the largest student population in the country and their representativeness across the entire national territory. All publications made in these digital media during the period from 1 January to 31 December 2023 were analyzed. Table 1 presents the institutions, details the URL of the website, and indicates the number of social media followers they had in January 2024.

For the selection of the units of analysis, publications were classified as sustainability-related when they met at least one of the following criteria:

- The title or body text included terms such as sustainable, sustainable development, SDGs, water, waste, or energy. Reliance on predefined terms can bias publication identification by excluding content that addresses sustainability without using the exact terminology, while also capturing superficial mentions. To mitigate this limitation, each publication in every digital medium was reviewed in detail for the study period.
- The publication included a hashtag associated with any of the terms listed above.

Table 1. Websites and social media follower counts (Facebook, Instagram, X, YouTube and TikTok) of the 34 Ecuadorian public universities studied, as of January 2024.

Institution	Website *	Facebook	Instagram	X	YouTube	TikTok
Universidad de Cuenca	www.ucuenca.edu.ec	165,000	38,800	31,100	1500	-
Escuela Politécnica del Litoral	www.espol.edu.ec	132,000	49,900	72,200	63,300	6609
Universidad Estatal de Milagro	www.unemi.edu.ec	419,000	74,200	22,108	16,200	-
Universidad de Guayaquil	www.ug.edu.ec	364,000	148,000	-	10,900	48,300
Universidad de las Artes	www.uartes.edu.ec	54,000	-	10,339	3500	3313
Universidad Nacional de Loja	www.unl.edu.ec	69,000	25,600	7316	8045	7437
Universidad Técnica de Machala	www.utmachala.edu.ec	104,000	23,000	-	5072	-
Universidad Amawtay Wasi	www.uaw.edu.ec	21,000	1954	936	595	-
Universidad Agraria del Ecuador	www.uagraria.edu.ec	50,000	889	17	922	-
Universidad Técnica Luis Vargas Torres de Esmeraldas	www.utelvt.edu.ec	117,000	742	498	337	-
Universidad Estatal Amazónica	www.uea.edu.ec	40,000	2805	1877	336	1868
Universidad Estatal Península de Santa Elena	www.upse.edu.ec	74,000	11,800	4885	2005	-
Universidad Técnica de Ambato	www.uta.edu.ec	102,000	29,800	11,217	298	-
Universidad Yachay Tech	www.yachaytech.edu.ec	58,000	6397	28,314	1085	600
Universidad Técnica del Norte	www.utn.edu.ec	73,000	3931	6762	1089	3753
Universidad Técnica de Babahoyo	www.utb.edu.ec	71,000	-	517	668	-
Universidad Técnica Estatal de Quevedo	www.uteq.edu.ec	66,000	7144	3390	1130	16,440
Universidad Regional Amazónica Ikiam	www.ikiam.edu.ec	48,000	7565	17,732	1500	-
Escuela Superior Politécnica Agropecuaria de Manabí	www.espam.edu.ec	18,000	1139	2147	1580	2283
Universidad Estatal del Sur de Manabi	www.unesum.edu.ec	10,000	5488	973	2650	-
Universidad Laica Eloy Alfaro de Manabí	www.uleam.edu.ec	98,000	-	8487	3340	-
Universidad Técnica de Manabí	www.utm.edu.ec	143,000	24,200	8374	-	7692
Universidad Nacional de Educación	www.unae.edu.ec	74,000	8553	16,800	1947	2155
Universidad Estatal de Bolívar	www.ueb.edu.ec	5500	1534	2914	796	11,400
Universidad Politécnica Estatal del Carchi	www.upec.edu.ec	30,600	5110	478	1400	2317
Escuela Superior Politécnica de Chimborazo	www.espoch.edu.ec	106,000	-	15,204	106	-
Universidad Nacional de Chimborazo	www.unach.edu.ec	109,000	18,500	5764	3093	-
Universidad Técnica de Cotopaxi	www.utc.edu.ec	69,000	9430	4907	121	4192
Escuela Politécnica del Ejercito	www.espe.edu.ec	147,000	22,300	22,393	5002	8613
Escuela Politécnica Nacional	www.epn.edu.ec	96,000	13,600	22,754	7061	3467
Facultad Latinoamericana de Ciencias Sociales	www.flacso.edu.ec	131,000	15,005	44,333	5081	8722

Table 1. *Cont.*

Institution	Website *	Facebook	Instagram	X	YouTube	TikTok
Instituto de Altos Estudios Nacionales	www.iaen.edu.ec	70,000	6009	21,143	2007	-
Universidad Andina Simón Bolívar	www.uasb.edu.ec	94,000	15,300	3600	44,300	1763
Universidad Central del Ecuador	www.uce.edu.ec	271,000	36,000	33,800	10,900	-

* All websites listed in this table were checked and verified to be accessible on 10 September 2026.

2.2. Content Coding: Procedure and Reliability

Content coding was performed by four coders trained in a workshop where the procedure, operational definitions of preliminary categories, and practical examples for each category were agreed upon. Prior to large-scale coding, the coding scheme was pilot-tested on a random subsample of three universities (n = 103) (38 in web sites and 65 in social media), representing approximately 14.05% of the corpus. This pilot test allowed the refinement of categories, subcategories, and definitions (Table 2). Two categories were established to group the various types of content: institutional performance and external factors. The first category encompasses internal factors related to the organization's sustainability performance, with subcategories derived from the dimensions used in the UI GreenMetric ranking [23]. External factors referred to information on global aspects related to the SDGs, environmental issues, and anniversaries.

Table 2. Categories and subcategories used to classify sustainability-related content (internal institutional-performance factors and external factors).

Category	Subcategory	Definition
Institutional performance	Policies on sustainability issues	Policies, regulations, or guidelines of the institution to consolidate sustainability in university management. This also includes the recognitions obtained
	Environment and Infrastructure	Activities for the conservation and recovery of infrastructure and green areas on university campuses
	Water	Activities for saving and responsibly utilizing water on the university campus
	Energy and Climate Change	Energy-saving activities, generation of alternative energies, or measures to promote mitigation and adaptation to climate change on campus
	Solid Waste	Solid waste management activities (disposal, sorting, recycling, and reuse) on campus
	Transportation	Activities carried out on campus to promote sustainable mobility, both within it and toward and from the institution.
	Teaching	Teaching activities and offerings of undergraduate and graduate courses and programs that the institution provides related to environmental or sustainability topics
	Research	Events, publications, projects, and scientific outreach activities resulting from environmental and sustainability research conducted at the institution.
	Outreach	Events, exchanges, and activities with environmental or sustainability themes carried out to engage with various social actors and institutions
External factors	Information about SDGs	Publications about SDGs
	Environmental issues	News about various current environmental issues occurring at the regional, national, or global level
	Environmental anniversaries	Celebrations or commemorations of notable sustainability events that have occurred at the national or international level

To analyze the publications, meetings were held with the research team—attended by at least three of the researchers—to reinforce the rigor of the coding process and resolve any disagreements that might arise. From the institutional websites, the presentation structure and the sustainability content present in those media were diagnosed. Regarding social media, information was searched on X, Facebook, Instagram, YouTube, and TikTok. In each of these media, the number of communication pieces on sustainability and the type of content were registered.

To distinguish communication mode informational sustainability communication from genuinely participatory and transformative educommunication, each publication was coded by the orientation of its message, following Kaplún's model of communication and education [11]. Three hierarchically ordered categories were used: Informational communication (the default category) reflects an exogenous, unidirectional (sender-to-receiver) model: the publication announces, reports, or describes institutional facts, achievements, events, or figures—including sustainability-related topics mentioned only descriptively without an explicit invitation to audience interaction or an explicit appeal to critical reflection or change. Participatory educommunication reflects a dialogic model in which the publication explicitly invites the audience to interact—to attend, register, comment, share, apply, vote, or take part in an activity with the emphasis placed on interaction and dialogue as such, independent of any appeal to a change in values, attitudes, or structures. Transformative educommunication reflects a critical-liberating, change-oriented model: the message goes beyond informing or inviting to explicitly appeal to critical consciousness, to a change in attitudes or habits, to commitment to an environmental, social, or equity-related cause, or frames the action as part of a collective transformation.

To assess intercoder reliability, two trained coders independently—and without consulting each other—coded representative random subsamples: 12 units (11.76%) from the institutional website corpus, covering 9 of the 21 universities in the sample, and 59 posts (9.35%) from the social media corpus, corresponding to 5 universities. Krippendorff's alpha was calculated for each coded variable—general content category, thematic (sub)category, and communicative modality—using the Hayes and Krippendorff [31] coincidence matrix procedure for nominal data, with $\alpha \geq 0.800$ treated as reliable, 0.667–0.799 as tentative, and values below 0.667 as unacceptable. The results of this double coding are presented in Table 3.

Table 3. Intercoder reliability for all coded variables across the two validation subsamples (institutional websites and social media).

Corpus	Coded Variable	Categories Used (*n*)	% Agreement	Krippendorff's α	Reliability	Subsample
Website	Broad content category	3 of 3	100%	1.000	Reliable ($\alpha \geq 0.800$)	12/102 (11.76%)
Website	Thematic subcategory	11 of 13	85.8%	0.834	Reliable ($\alpha \geq 0.800$)	12/102 (11.76%)
Website	Communicative mode	3 of 3	83.3%	0.499	Not reliable	12/102 (11.76%)
Social media	Broad content category	4 of 4	96.6%	0.937	Reliable ($\alpha \geq 0.800$)	59/631 (9.35%)
Social media	Thematic subcategory	8 of 13	94.9%	0.938	Reliable ($\alpha \geq 0.800$)	59/631 (9.35%)
Social media	Communicative mode	3 of 3	96.6%	0.834	Reliable ($\alpha \geq 0.800$)	59/631 (9.35%)

The classification of the communicative mode (informative/participatory/transformative) on the websites did not meet the established reliability threshold ($\alpha = 0.499$), despite a raw agreement of 92.5% among the coders. Consistency for this variable was ensured through calibration meetings and team consensus.

2.3. Statistical Analysis

To identify posts that elicited stronger audience responses, content engagement was assessed [32], acknowledging that cognitive, affective, and behavioral dimensions may shape users' interactions with a post. Because the calculation of this metric varies across social networks [33,34], the present study operationalized interactions consistently as the combined number of reactions and comments per post, thereby facilitating cross-platform comparison.

$$Engagement\ Rate\ (ER) = \frac{Interactions}{\text{Number of Followers}} \times 100\%$$

Equation: Engagement Rate (ER).

Note: This metric has several limitations. There is no universally accepted benchmark for an ideal engagement rate [33], and the ratio is highly sensitive to follower count; consequently, accounts with larger audiences may systematically yield lower values without necessarily having lower communicational reach. The indicator was nevertheless selected because it can help institutions identify editorial priorities—that is, the formats and topics that generate the strongest resonance within their existing audiences.

Associations between institutional audience size and sustainability communication activity were assessed using Spearman's rank-order correlation coefficient (ρ) [35]. For each university, the number of sustainability-related posts was correlated with follower counts on Facebook, Instagram, X/Twitter, TikTok, and YouTube, as well as with the cumulative follower count across all platforms. Correlation coefficients (ρ), sample sizes (n), and two-tailed p-values were calculated separately for each platform, with statistical significance set at $p < 0.05$. Effect sizes were interpreted using conventional benchmarks ($|\rho| \approx 0.10$, 0.30, and 0.50 for small, medium, and large associations, respectively). Given the observational, cross-sectional design, the analyses were intended to identify associations rather than infer causality. Spearman's coefficient was selected because it enables assessment of whether institutional audience size and sustainability-related communication activity are associated, providing evidence relevant to communication policy and investment decisions beyond the short-term editorial perspective captured by engagement rate.

2.4. Educommunicational Strategies Development

Based on the content-analysis findings, educommunicational strategies were developed with reference to principles of dialogical educommunication [14,15], the concept of active audiences in digital environments [17], and scholarship on sustainability communication and the SDGs on higher education institution websites [23]. The relevance and internal coherence of the proposed strategies were subsequently assessed through expert-judgment validation [36].

The proposed strategies were sent to four professionals with recognized training and experience in institutional communication, sustainability and digital communication. The characteristics of the experts consulted are presented in Table 4. Each expert's evaluation was recorded in a matrix addressing five qualitative aspects.: (1) relevance to university institutional policies; (2) quality of the document's writing; (3) suitability for the target groups; (4) coherence between activities and strategic objectives; and (5) feasibility of implementation. The review was conducted individually, and the validators submitted their assessments by mail. The research team analyzed the responses and suggestions for improvement in order to incorporate them into the final version of the strategies.

Table 4. Characteristics of the expert validators of the educommunicational strategies.

Characteristics	Number of Experts
Gender	Female (2); Male (2)
Roles	University lecturers (4)
Academic degree	Doctorate (4)
Areas of professional expertise	Educommunication (1); Sustainability (1); Digital Communication (1); Organizational communication (1)
Number of years of professional experience (average)	22.7
Number of articles published in the field (average)	11.75
Experience in the design, and/or validation of educational and communication programs.	Yes (4)

3. Results

The results are organized around three questions derived from the study objective of understanding how Ecuadorian public universities communicate sustainability through digital channels. The analysis first examines the visibility of sustainability by considering the structure of institutional websites and the volume of sustainability-related content published on social media. It then characterizes the thematic categories represented across platforms. Finally, audience response is assessed through post-level interaction and the broader association between institutional audience size and sustainability-related posting activity.

3.1. Websites of Ecuadorian Public Universities

3.1.1. How Much Visibility Does Sustainability Have on the Website?

All public universities in Ecuador have a website to present institutional information. However, the majority of these digital spaces did not have a dedicated site to present sustainability information, which limits communicative coherence and the visibility of their environmental commitment. These contents are often scattered across various sections or linked to general academic activities, without a defined digital positioning strategy on sustainability (Table 5).

Table 5. Structure for presenting sustainability content on the website (architecture).

Category	Frequency	Percentage (%)
Does not have a website for sustainability	3	8.82
Scattered information	17	50
Does not publish information about sustainability	14	41.18

3.1.2. Sustainability Content—What Is Communicated?

Of the 102 publications related to sustainability topics identified on the websites during the study period, 50.98% refer to activities of the substantive research function (Table 6), particularly the development and dissemination of results from projects implemented in the institutions. Other content disseminated in these digital spaces included institutional sustainability policies (13.72%) and the implementation of outreach activities (13.72%). It is noteworthy the absence of content on water management (no records), energy and climate change (no records), and solid waste (0.98%), despite these being aspects directly linked to the daily management of the campus.

Table 6. Sustainability content present on the websites of Ecuadorian public universities.

Category	Subcategory	Frequency	Percentage (%)
Institutional performance	Policies on sustainability issues	14	13.72
	Environment and infrastructure	2	1.96
	Water	-	-
	Energy and climate change	-	-
	Waste	1	0.98
	Transportation	3	2.94
	Teaching	4	3.92
	Research	52	50.98
	Outreach	14	13.72
External factors	Information about the SDGs	1	0.98
	Environmental issues	10	9.80
	Environmental anniversaries	1	0.98

3.2. Social Media of Ecuadorian Public Universities

During the studied period, Ecuadorian public universities published 631 posts on sustainability topics (Table 7; Figure 2), with Facebook being the most used platform (48.97%), followed by Instagram (24.56%) and X (21.71%). The platforms YouTube and TikTok had a lower participation (3.49% and 1.27%, respectively). However, the number of publications varies among the universities. In this regard, a categorization of these institutions was made based on the number of annual publications (Table 8), resulting in 3 groups, in addition to two universities that did not publish any sustainability-related content on their social media during the study period. The first group, with a low annual publication range (between 1 and 30 posts), comprised 26 of the 34 universities (76.47%) and accounted for 50.71% of the total posts. The second group, with a medium range of publications (between 31 and 60 posts), comprised 4 universities (11.76%) and accounted for 26.15% of the total posts. Finally, the high-range group (between 61 and 90 annual posts) comprised only 2 universities (5.88%), accounting for 23.14% of the total posts.

Table 7. Number of publications on sustainability on the social media of Ecuadorian public universities during the study period.

Social Media	Number of Publications	Percentage (%)
Facebook	309	48.97%
Instagram	155	24.56%
X (Twitter)	137	21.71%
YouTube	22	3.49%
TikTok	8	1.27%

No clear temporal pattern was identified in the dissemination of sustainability content across these social networks during the study period (Figure 3).

The median value was 0, indicating a strong concentration of low publication frequencies. Approximately half of the cells in the heat map recorded no publications, suggesting limited activity across most universities throughout the year. Nevertheless, two pronounced peaks (22 and 21 publications) occurred at the same institution, which also recorded the highest annual total (84 publications). At the monthly level, March, October, and November showed the highest publication activity, whereas January showed the lowest, with a modest increase in the second semester compared with the first.

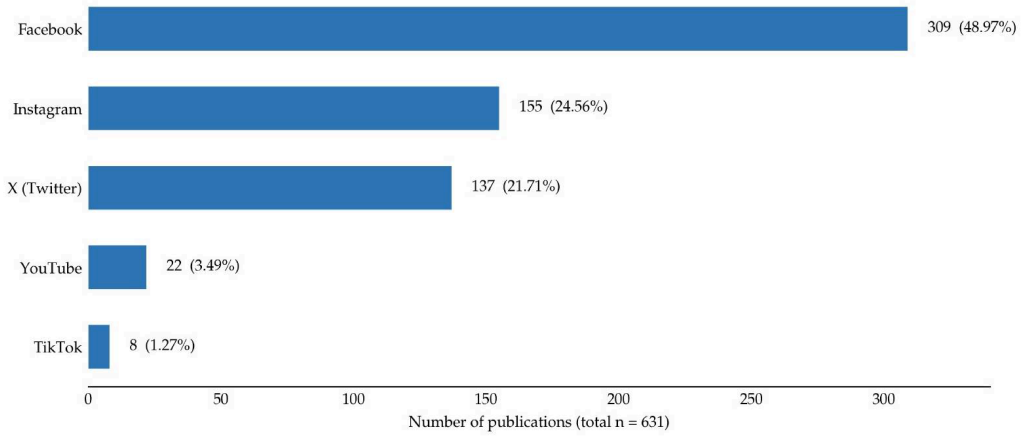

Figure 2. Number of publications on sustainability on the social media of Ecuadorian public universities during the study period.

Table 8. Frequency of posts about sustainability on the social media of Ecuadorian public universities during the study period.

Range of the Number of Posts	Number of Universities	Numbers of Posts in Social Media	Total Percentage of Posts (%)
No posts	2	0	0
Low (Entre 1 y 30)	26	320	50.71
Medium (Entre 31 y 60)	4	165	26.15
High (Entre 61 y 90)	2	146	23.14

University	J	F	M	A	M	J	J	A	S	O	N	D	Total Posts
U1	1	7	3	2	1	7	4	11	22	21	2	3	84
U2	2	5	3	8	2	6	11	3	4	8	3	7	62
U3	1	1	4	0	5	3	1	6	2	0	14	10	47
U4	7	1	4	1	4	6	6	2	1	4	6	3	45
U5	1	4	8	1	1	2	3	1	8	1	3	4	37
U6	0	0	3	4	0	1	3	2	4	7	2	10	36
U7	1	3	5	0	1	3	1	0	5	4	5	2	30
U8	4	0	11	5	3	1	2	2	0	0	1	0	29
U9	4	1	3	2	6	0	3	4	3	1	0	0	27
U10	0	0	3	0	4	10	3	0	1	2	2	0	25
U11	0	2	2	0	0	3	1	1	2	1	7	4	23
U12	0	4	0	0	2	2	10	0	0	0	2	0	20
U13	0	0	0	1	0	0	0	0	2	11	5	0	19
U14	0	1	1	0	3	1	4	3	0	4	0	1	18
U15	3	0	8	3	1	1	0	1	0	0	0	0	17
U16	1	0	3	0	3	3	0	0	0	1	1	0	12
U17	0	6	2	0	1	0	0	0	0	0	3	0	12
U18	0	1	0	4	3	0	1	0	0	0	1	1	11
U19	2	0	1	0	0	0	0	0	0	0	6	1	10
U20	1	1	0	4	1	0	0	2	0	0	1	0	10
U21	0	0	0	0	5	0	1	0	1	2	0	0	9
U22	1	1	1	2	0	1	0	0	0	0	0	2	8
U23	0	0	0	0	1	1	1	0	0	1	1	2	7
U24	0	0	1	0	0	2	0	2	1	0	0	1	7
U25	0	0	1	0	0	1	0	0	1	1	0	1	5
U26	0	0	0	0	2	2	0	0	0	0	0	0	4
U27	0	0	1	0	0	1	0	0	1	0	1	0	4
U28	0	0	1	0	0	0	0	1	0	0	1	0	3
U29	0	0	0	0	0	1	0	0	0	0	1	1	3
U30	2	0	0	0	0	1	0	0	0	0	0	0	3
U31	0	0	0	1	1	0	0	0	0	0	0	0	2
U32	0	0	0	0	1	0	0	0	0	0	1	0	2
U33	0	0	0	0	0	0	0	0	0	0	0	0	0
U34	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 3. Heat map of the monthly frequency of social media posts by Ecuadorian universities.

3.2.1. Sustainability Content on University Social Media

Beyond volume, the specific content shared on these platforms was also examined, following the same categories used for the website. The most frequent publications correspond

to research (29.64%), followed by community engagement (22.50%) and teaching (16.64%) (Table 9). The least addressed topics were energy and climate change (0.48%) and water (no records), which reflects limited thematic coverage in specific environmental aspects. Among the internal factors, content about institutional achievements, scientific projects, and academic events predominates. In the external factors, environmental ephemerides were found (12.36% of the publications).

Table 9. Content on sustainability presented on the social media of Ecuadorian public universities.

Category	Subcategory	Social Media					Total	Percentage (%)
		X	Facebook	Instagram	YouTube	TikTok		
Institutional performance	Institutional policies	2	14	7	1	1	25	3.96
	Environment and infrastructure	4	17	6	2	1	30	4.75
	Water	-	-	-	-	-	-	-
	Energy and climate change	1	-	1	1	-	3	0.48
	Waste	1	9	18	5	1	34	5.39
	Mobility and transportation	1	4	10	2	-	17	2.69
	Teaching	36	52	15	-	2	105	16.64
	Research	41	95	42	8	1	187	29.64
	Outreach	30	76	33	1	2	142	22.50
External elements	Information about the SDGs	-	2	1	-	-	3	0.48
	Environmental issues	1	5	1	-	-	7	1.11
	Environmental anniversaries	20	35	21	2	-	78	12.36
	TOTAL	137	309	155	22	8	631	100

Publications were further classified according to their communicative mode (Table 10). Among the 631 sustainability-related posts analyzed, 83.5% (n = 527) were classified as informational, 11.7% (n = 74) incorporated participatory elements, and 4.8% (n = 30) exhibited a transformative, educationally oriented approach. This distribution was highly uneven across institutions: 19 of the 32 universities with sustainability-related content produced exclusively informational publications, whereas participatory and transformative content was concentrated in a limited subset of institutions. Participatory publications were particularly concentrated in U1, U3, U7, and U9, which collectively accounted for 66 of the 74 participatory-coded publications (89.2%). In relative terms, U20 exhibited the highest proportion of transformative content, accounting for 40.0% of its total output (4 of 10 posts), followed by U18 (27.3%; 3 of 11 posts), U13 (26.3%; 5 of 19 posts), and U3 (17.0%; 8 of 47 posts).

Table 10. Distribution of communicative modes (Informative, Participatory, and Transformative Approaches) by university.

	Communicative Mode			
University	Informative	Participatory	Transformative	Total
U1	59	22	3	84
U2	61	1	0	62
U3	25	14	8	47
U4	45	0	0	45
U5	37	0	0	37
U6	36	0	0	36
U7	11	17	2	30
U8	27	0	2	29
U9	14	13	0	27

Table 10. *Cont.*

Communicative Mode				
University	**Informative**	**Participatory**	**Transformative**	**Total**
U10	24	0	1	25
U11	23	0	0	23
U12	18	1	1	20
U13	14	0	5	19
U14	18	0	0	18
U15	17	0	0	17
U16	12	0	0	12
U17	12	0	0	12
U18	6	2	3	11
U19	10	0	0	10
U20	5	1	4	10
U21	9	0	0	9
U22	8	0	0	8
U23	4	3	0	7
U24	7	0	0	7
U25	4	0	1	5
U26	4	0	0	4
U27	4	0	0	4
U28	3	0	0	3
U29	3	0	0	3
U30	3	0	0	3
U31	2	0	0	2
U32	2	0	0	2
TOTAL	527	74	30	631

3.2.2. Engagement Rate—How Does the Audience Respond?

Beyond what is communicated, it is also relevant to establish how these publications resonate with their audiences. Of the 631 publications, seven were identified that had an engagement rate higher than 10% (Table 11). The 10% engagement-rate threshold was established as a conservative, round-number cut-off criterion designed to identify posts whose engagement rates substantially exceeded the range typically observed across the dataset. This threshold is consistent with recent empirical evidence on institutional and university social media accounts, where average engagement rates have been shown to range roughly between 8% and 13% even among well-performing organizational accounts [37], and where only a small subset of posts—typically those with distinctive narrative or emotional content—substantially outperform the rest of the corpus [38,39]. This criterion was applied to delimit a discrete subset of clearly exceptional posts suitable for qualitative characterization.

These posts concerned institutional activities and achievements, research findings, and scientific events involving community participation. The highest engagement rates were observed on TikTok: 40.15% for a video on the campus natural environment and infrastructure, and 27.49% for a video reporting the institution's position in the UI GreenMetric Ranking during the study year.

Table 11. Posts on social media from Ecuadorian public universities with an engagement rate above 10%.

Content	Format	Engagement Rate (%)	Social Media	University
Natural environment and campus infrastructure	Video	40.15	Tik Tok	UEA
Position in the UI Green Metric Ranking	Video	27.49	Tik Tok	UPEC
Scientific finding (Biodiversity)	Video	13.59	Tik Tok	UEA
Linkage project on circular economy	Photo/text	13.41	X	ESPAM
Event on Governance and Sustainable Production	Photo/text	11.46	X	ESPAM

Table 11. *Cont.*

Content	Format	Engagement Rate (%)	Social Media	University
Organization of the National Forestry Symposium	Photo/text	10.89	X	UNESUM
International Dog Day—Adoption Campaign	Photo/text	10.08	Instagram	U Cuenca

3.2.3. Relation Between Audience Size and Sustainability Post Frequency

In addition to engagement at the post level, it is also relevant to examine whether audience size is associated with institutions' overall posting activity. Spearman's rank-order correlation coefficients were calculated between the number of sustainability posts published by each institution and the number of followers on each social media platform, as well as the aggregated total follower count across all channels. No statistically significant correlations were found for any of the platforms analyzed (Table 12, Figure 4). Correlation coefficients were consistently weak and effect sizes small across all channels: X/Twitter ($\rho = 0.258$, $p = 0.153$, $n = 32$), Facebook ($\rho = -0.148$, $p = 0.404$, $n = 34$), Instagram ($\rho = 0.048$, $p = 0.802$, $n = 30$), YouTube ($\rho = -0.136$, $p = 0.451$, $n = 33$), TikTok ($\rho = -0.107$, $p = 0.674$, $n = 18$), and the total follower count across all platforms ($\rho = 0.040$, $p = 0.824$, $n = 34$). These results indicate that, unlike the platform-level engagement patterns reported in the previous section, audience size is not a meaningful predictor of institutions' sustainability posting frequency.

Table 12. Spearman's rank-order correlation (ρ) between social media audience size and sustainability post frequency per institution (Ecuadorian public universities, 2023).

Platform	*n*	ρ	*p*-Value	Sig.	Effect Size
X/Twitter	32	0.258	0.153	ns	Small
Facebook	34	−0.148	0.404	ns	Small
Instagram	30	0.048	0.802	ns	Small
YouTube	33	−0.136	0.451	ns	Small
TikTok	18	−0.107	0.674	ns	Small
Total followers (all platforms)	34	0.040	0.824	ns	Small

Note: ρ = Spearman's rank-order correlation. Effect size benchmarks: small $|\rho| < 0.30$, medium $|\rho| = 0.30$–0.50, large $|\rho| > 0.50$. *n* varies by platform due to missing institutional accounts. ns = not statistically significant ($p \geq 0.05$).

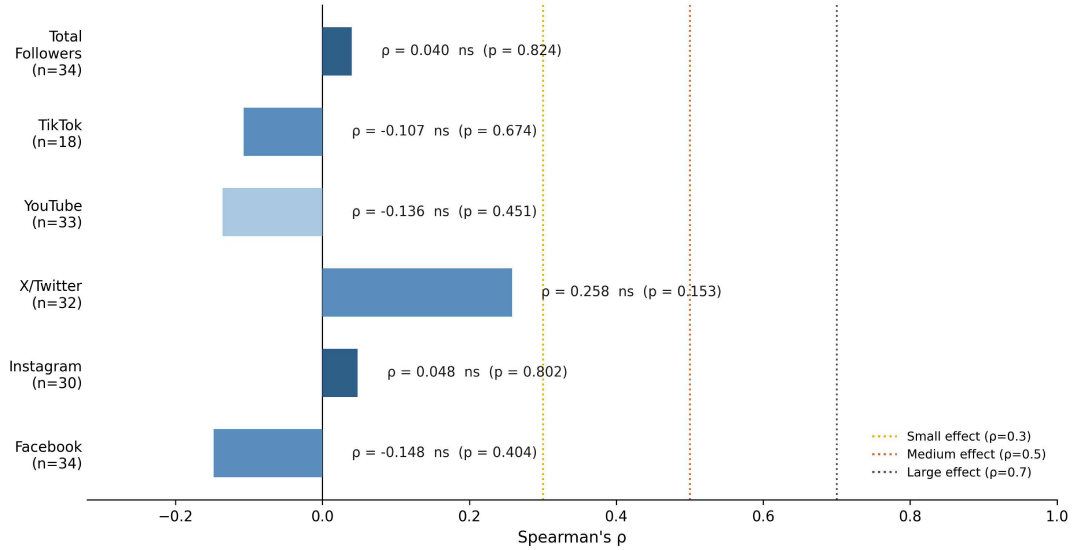

Figure 4. Spearman's ρ coefficients between audience size and sustainability post frequency, by social media platform.

4. Discussion

4.1. Website Visibility and Content

Although university websites can serve as important spaces for communicating institutional progress and achievements in sustainability, the findings indicate that most Ecuadorian public universities either did not publish sustainability content on their websites or did so in a fragmented manner, without dedicated sections for this purpose. This pattern contrasts with more institutionalized models elsewhere in the region, such as the Spanish university system and its "Fair Trade Universities" program, where sustainability commitments are articulated through a specific inter-institutional structure rather than isolated web content [24]. The absence of comparable dedicated spaces among the Ecuadorian public universities examined suggests that sustainability communication remains at a comparatively early and less institutionalized stage.

The predominance of research- and outreach-related publications may reflect the priority that Ecuadorian university governance structures assign to these substantive functions. Institutional communication largely emphasizes achievements and academic activities, whereas messages or resources intended to stimulate environmental action or critical reflection remain limited, despite the educational mission of universities. The scarcity of content on waste management, energy, and water is also noteworthy, revealing the need to incorporate a more comprehensive environmental perspective into university communication. These issues are directly connected to campus operations and provide opportunities to make pro-environmental practices visible and transferable to everyday life [5]. Similarly, the limited communication of the SDGs deserves attention, given their increasing visibility in digital society [40], and points to the need for institutions to integrate the SDGs more explicitly into their sustainability narratives.

4.2. Social Media and Communication Patterns

The predominance of Facebook as a platform for sustainability communication is consistent with the strong institutional preference for this network and with its comparatively large audiences, whereas Instagram and X appear to be used more selectively for audiovisual content or timely updates. This distribution is consistent with differentiated patterns of use reported for Facebook, Instagram, and X [20], as well as with evidence concerning the role of social media in communicating institutional sustainability commitments [6]. Reliance on a limited number of established platforms also aligns with broader findings on how universities use social media to foster interaction and build community. Institutions tend to prioritize platforms on which they already have substantial audiences in order to reinforce community ties rather than diversify across less established channels, even when those channels may offer particular communicative advantages [41].

With respect to the volume and frequency of sustainability-related publications, only two universities exhibited a high level of communication activity. Most institutions maintained a more limited and sporadic presence. These findings point to the absence of a consistent strategy or shared guidelines governing publication frequency, suggesting that sustainability visibility may often be pursued without a clearly defined strategic rationale and thereby risk reducing message impact. The results therefore underscore the need for social-media communication guidelines that Ecuadorian public universities can use to ensure that sustainability content is not only regular but strategically planned [42]. Establishing a coherent publication pattern could reinforce institutional environmental commitments and provide audiences with a more consistent flow of information, making social responsibility and sustainability more visible in university communication [25].

The findings showed a greater volume of sustainability content on social media than on institutional websites. Nevertheless, the thematic emphasis was similar across both

environments, with a strong focus on research results and outreach and comparatively little attention to sustainability practices in campus management. This limited visibility of operational environmental issues is consistent with the broader difficulties universities face in incorporating sustainability into strategic communication [26,27]. In Ecuador, the results point to a marked disconnect among educommunication, environmental policy, and digital media, reinforcing the need to address consumption practices, everyday environmental impacts, and university social responsibility more explicitly across institutional websites and social networks [23].

Regarding modes of communication, Ecuadorian public universities' digital sustainability communication is predominantly exogenous and unidirectional rather than dialogic or critical-liberating: a majority of the institutions studied engage with sustainability topics only informationally—announcing events, achievements, or data without inviting dialogue or appealing to attitudinal or structural change—and would not qualify as educommunicative practice under the Kaplunian framework [11], regardless of how frequently they post about sustainability. Only a small number of universities combine informational output with a meaningful volume of participatory and transformative communication, suggesting that genuinely transformative educommunication remains an institutional exception rather than the norm within the Ecuadorian public university system.

4.3. Engagement and Audience Dynamics

Engagement-rate results suggest that the highest interaction levels occurred on platforms with the lowest posting volumes, whereas Facebook—the most frequently used platform—was absent from the highest-performing posts. This apparent discrepancy should be interpreted cautiously because no universally accepted ideal value exists for this metric [34]. Engagement rate is also highly dependent on follower count, meaning that accounts with larger audiences may produce lower ratios without necessarily achieving lower reach. In addition, each social network has distinct interaction dynamics; therefore, cross-platform comparisons should be made cautiously [33].

The correlational analysis indicates that, across all platforms included in the study, audience size was not associated with the frequency with which universities published sustainability-related content. Spearman's rho coefficients were consistently weak and non-significant ($p \geq 0.05$) for Instagram, Facebook, X/Twitter, YouTube, TikTok, and the total follower count, suggesting that institutions with larger digital audiences do not necessarily publish sustainability content more often than those with smaller followings. This finding indicates that the volume of sustainability communication is likely driven by factors other than audience size—such as institutional priorities, communication strategy, or the resources allocated to sustainability-related content—rather than by the reach or popularity of the account itself. This result is consistent with the broader pattern observed in this study, in which sustainability communication appears to follow an informational rather than a strategically audience-driven logic.

Digital sustainability communication on the social media accounts of Ecuadorian public universities is predominantly informational and centered on disseminating institutional activities rather than sustaining interaction with audiences. Similar patterns have been reported in digital media in Imbabura Province [28] and in previous studies of university communication in digital environments [6,23,25,27]. A comparable informational logic has also been documented in other Ecuadorian digital communication contexts: even in highly strategic political communication on Instagram and TikTok, message dissemination tends to take precedence over sustained audience interaction [43]. This convergence suggests that the informational orientation identified here may reflect a broader pattern of institutional digital communication rather than a limitation specific to university sustainability content.

Overall, the findings are consistent with previous studies [26,27] showing that universities worldwide face persistent challenges in integrating sustainability into strategic digital communication. The Ecuadorian case, however, reveals a particularly pronounced disconnect among educommunication, environmental policies, and digital media, indicating a need to strengthen institutional capacity in media literacy and sustainable content management. To address the weaknesses identified, four educommunicational strategies are proposed for the two digital environments in which the universities have the strongest institutional presence—websites and social media—with the aim of developing them into spaces that support cultural transformation and the adoption of more sustainable practices in everyday university life.

The strategic model presented was derived through a systematic mapping process: each empirical finding from the content analysis was first interpreted through the lens of Kaplún's continuum to identify which dimension of educommunicative practice it revealed as underdeveloped, and only then translated into an actionable strategy statement. Table 13 summarizes this derivation chain, tracing each strategy back to its supporting empirical finding and theoretical rationale. This sequencing—finding → theoretical dimension → strategy—was subsequently corroborated, but not originated, through expert-judgment validation.

Table 13. Derivation chain from empirical findings to Kaplún's theoretical dimensions and the resulting educommunicational strategies.

Empirical Finding	Kaplún Dimension Activated	Gap Identified	Derived Strategy
83.5% informational/11.7% participatory/4.8% transformative content	Predominance of the exogenous, unidirectional model	Low audience agency across the corpus	Strategy 2—formats that activate interaction and reflection rather than one-way dissemination
Only 3 of 34 universities have a dedicated sustainability website section	Absence of an institutionalized space for dialogic exchange	Lack of dedicated communicational infrastructure	Strategy 1—creation/strengthening of dedicated web sections
Higher engagement on audiovisual formats of smaller platforms, e.g., TikTok	Untapped audience-agency potential on higher-reach platforms	Mismatch between where receptive audiences are and where institutional effort concentrates	Strategies 2 and 3—prioritize audiovisual/interactive formats regardless of current audience size
Participatory content concentrated in a few institutions; transformative content even scarcer	Uneven concentration of the dialogic pole; most institutions have not begun the transition	No replicable model for institutions not yet producing participatory/transformative content	Strategy 3—standardized, transferable participation tools and formats
Limited thematic depth on water/energy/waste	Gap in the everyday sustainable-behavior dimension of the continuum	Existing content rarely links sustainability to concrete user action	Strategy 4—behavior-oriented thematic content, not only general awareness
No correlation between audience size and posting frequency	Transition toward the dialogic pole depends on editorial intentionality, not reach	Risk of evaluating strategies solely by reach metrics	Cross-cutting evaluation criterion—assess Strategy 2 by interaction quality, not reach alone

4.4. Theory-Driven Model Grounded in the Empirical Findings

These findings show that sustainability communication at Ecuadorian public universities remains predominantly informational, as it disseminates institutional activities without inviting audience participation or co-construction. The following four strategies are proposed to transition from this informational mode toward genuinely participatory and transformative educommunication.

4.4.1. Strategy 1. Strengthen the Use of the Institutional Web Platform

The creation of a dedicated sustainability section within the institutional website is proposed, with a design that moves beyond a purely informational logic and adopts a pedagogical approach linking consumption practices, environmental impacts, and university social responsibility [23]. The section would combine contextualized information relevant

to the HEI, visibility of institutional sustainability actions, downloadable educational resources, interactive tools, and spaces for community participation, including deliberative forums and the co-construction of sustainability proposals. Evaluation of this strategy would draw on two complementary dimensions: university-ranking indicators and digital interaction metrics.

4.4.2. Strategy 2. Informative-Educational Digital Campaigns on Social Media

Social media constitute the digital spaces with the greatest reach and publication frequency among the universities analyzed. Accordingly, educommunicational campaigns should employ differentiated narrative formats tailored to each platform, including informational posts, expert interviews, environmental storytelling, practical tutorials, and viral challenges supported by live broadcasts. Each format would serve a specific communicative function—to inform, raise awareness, motivate, or activate behavior [26]. Regular formats could be published up to three times per week, while challenges and live broadcasts developed with external organizations could be scheduled monthly. Evaluation would consider engagement, reach, participation in activities, and qualitative audience feedback.

4.4.3. Strategy 3. Interactive Tools for Environmental Self-Reflection

The strategy proposes incorporating digital tools that enable users to assess their water footprint, carbon footprint, consumption patterns, and waste-management practices within the university context. These instruments would be integrated into both institutional websites and social media, serving a dual purpose: pedagogical, by promoting individual awareness and reflection; and scientific, by generating aggregated data that could support citizen-science initiatives and institutional decision-making [44]. Evaluation would focus on user participation, measured through indicators such as visits, completions, and downloads.

4.4.4. Strategy 4. Virtual Training and Strengthening of Sustainable Practices

This component involves implementing virtual training programs and workshops designed to deepen understanding of the relationship between sustainability and the activities of the university community [45]. Content would be organized around both campus operational management [5] and key dates in the global sustainability agenda [46]. Evaluation would be based on participant responses and evidence of engagement with each training activity.

Expert validation of the educommunicational strategies supported their coherence with institutional sustainability policies and their potential to promote sustainable practices within the university community. The evaluators highlighted the alignment of the proposals with the SDGs, the clarity of the document, and the suitability of the proposed activities for different target groups. They also identified areas for improvement, including stronger integration with internal institutional policies, deeper treatment of concepts such as transmedia, storytelling, and strategic communication, and the inclusion of differentiated activities for distinct audiences. Regarding feasibility, implementation was considered viable provided that institutions ensure adequate funding, technological infrastructure, and trained personnel.

5. Conclusions

The communication of sustainability in Ecuadorian HEIs during the period under study was scarce, fragmented over time, and informational in nature. The most published content refers to the dissemination of achievements in research and outreach rather than action-oriented environmental education. Most of the publications are concentrated in a few institutions and on Facebook. The frequency lacks a strategic pattern, and the highest interaction occurs in audiovisual formats on platforms with smaller audiences. Overall, the discussion

shows that Ecuadorian public universities are making progress in highlighting sustainability through digital media, but they still face the challenge of turning that informational presence into an effective, sustained, and transformative educommunicational practice. On a practical level, the results offer guidance to improve the coherence of institutional digital strategies, promoting more transparent and inclusive communication for sustainability.

Study limitations include the focus on a single year and the exclusive analysis of institutional publications. Regarding coding reliability, independent double coding was performed using Krippendorff's alpha for the general content category and thematic subcategories, yielding a reliable level of agreement for both corpora; however, the classification of communication modalities on the websites was coded through team calibration and consensus rather than independent double coding, so the reliability of these results should be interpreted with due caution.

These considerations open lines for future research, such as extending the analysis to a longer period, incorporating communications from student associations, faculty associations, and research groups, and applying independent double coding and quantitative reliability estimates to the classification of website communication modalities. The proposed educommunicational framework should be implemented at one or more institutions and their effectiveness evaluated before it can be considered fully validated. Finally, the proposed framework should be read as a preliminary, evidence-informed starting point rather than a fully validated model.

Digital media enable universities to project a professional institutional image while enhancing visibility and reputation. They also provide interactive communication spaces through which institutions can maintain relationships with students, faculty, alumni, and the wider community. By extending geographical reach and facilitating connections with other institutions, companies, and organizations, digital media can also support collaboration and the development of professional and institutional networks.

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Abbreviations

The following abbreviations are used in this manuscript:

HEI	Higher Education Institutions
SDG	Sustainable Development Goals

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