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Public Sentiment Towards Sustainability: A Digital Platforms Analysis of Pakistani Fashion Brands

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Abstract

This research aims to determine public sentiment towards sustainability initiatives by Pakistani fashion brands across the five major social media platforms, including Facebook, Instagram, LinkedIn, TikTok, and YouTube. The study explores platform-dependent engagement patterns, assesses the influence of sustainability-related hashtags, and makes recommendations for optimized sustainable messaging. The research uses 3,427 publicly archived comments posted on social media of Pakistani fashion brands from January 2020 to August 2025 and has been analysed quantitatively with the help of content analysis. For sentiment analysis, lexicon-based scoring approaches (Text Blob) and supervised machine learning models (logistic regression, support vector machines [SVMs], gradient boosting, and random forest) were employed. The findings reveal an overall non-normally distributed sentiment score (mean sentiment score = 0.082), with 36.1% of comments being positive, 23.5% negative, and 40.4% being neutral. Instagram was the medium with the most positive engagement, and TikTok had a negative sentiment bias. Hashtags such as #eco, #consciousfashion, and #sustainabilitygoal triggered the highest number of positive sentiments, whereas #sustainablefabric, #echofashion, and #greenfashion led to the most negative opinions. Brands are suggested to use new-generation and top-performing hashtags, match content with the platform's resonating audience, and give emphasis to authenticity and visual attraction to increase positive engagement. The paper makes a unique contribution to the literature by integrating computational sentiment analysis and cross-platform evaluation in an emerging market setting. It fills an important gap in current research on how to analyse the interaction of social media platform features, hashtag framing, and public sentiment in the Pakistani fashion industry.

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INTRODUCTION

Picture yourself scrolling your favorite social media feed. You come across a post by a leading Pakistani fashion brand promoting its most recent eco-friendly collection. Within minutes, the post starts attracting comments: there are user testimonials praising the brand's ethical initiatives, a few people wondering aloud if the green claims are legitimate, and a handful of people simply commenting on the look of the clothes. Each response, positive, negative, or neutral, is a story. All these stories are taken together as a digital mirror, a real-time reflection of how the public thinks about sustainability activities (Zhao et al., 2022). In the fast-paced digital world where we live today, a simple like, comment, or share can spread across multiple platforms, confirming that these interactions are no longer a choice for brands; they're a necessity. Sustainable

fashion has become a worldwide priority, with environmental and ethical issues relating to the fashion industry today. Especially the production of textiles employs large quantities of water, chemicals, and energy, with waste and overproduction still challenging ecosystems (Niinimäki et al., 2020). Amid this, consumers are more interested in the ethical and environmental issues of brands; in particular, young consumers who view fashion as a symbol for personal values and social responsibility (Armstrong & Park, 2017). Social media increases this awareness, and brands are given a platform to promote sustainable practices, simultaneously opening themselves up to instantaneous scrutiny (Greco et al., 2023). The online conversation can therefore serve as fertile soil to understand public views about sustainability as well as how consumers listen, interpret, and react to sustainability communication.

Different platforms foster different types of engagement. In this context, Instagram, a platform centered around visual storytelling (T. M. Choi et al., 2020), as well as the influencer market, also often puts forward aspirational narratives that can also appeal to ethically conscious consumers (Kapoor et al., 2023). YouTube allows deeper storytelling, which means viewers can gain a strong understanding of environmental supply chain transparency and behind-the-scenes production (Tsironis et al., 2023). In contrast, LinkedIn frames sustainability as a professional and corporate matter of responsibility (Tsironis et al., 2023). Although use of Facebook is decreasing among young users, it is still a valuable platform for community-based discussion (Brydges et al., 2020). For instance, TikTok is a best case in point because of the light-hearted format of the content that contradicts a message of serious sustainability and encourages marketers to look for creative solutions to reach large audiences (Zhang et al., 2023). With such dynamics of the platforms in mind, it is crucial to understand that engagement and sentiment vary across the digital ecosystems.

Hashtags are used as navigational tools and identity markers. Some popular hashtags like #SlowFashion or #EcoFashion build community around common values, while others, more technical or relevant to a specific brand, may also draw skepticism when a gap is perceived between what is being communicated and what is practiced (Sipilä et al., 2024). Hashtag framing and platform affordances also affect engagement sentiment and strength. They are particularly crucial for fashion brands in Pakistan, a culturally diverse and economically divided country. Price-conscious, appearance-oriented, and peer-observable consumers, who bargain over environmental sustainability, add layers to the emotional canvas that needs correct interpretation (Abdelmeguid et al., 2024).

There are now computational tools that enable us to gain an understanding of the comments. By systematically analyzing thousands of comments in different social media channels, brands can discover both the positive and negative and neutral patterns of messages, thus providing practical intelligence to optimize message strategies (Almashaleh et al., 2025; Z. Shen, 2023). Conventional machine learning algorithms, including logistic regression, support vector machines, and gradient boosting, are efficient for sentiment classification on noisy data, and deep learning models, such as long short-term memory (LSTM) and gated recurrent units (GRU), are effective for learning contextual dependencies in sequential text (Minaee et al., 2021). In multilingual domains such as Pakistan, integrating these lexicon-based approaches with machine learning approaches provides robust and context-specific sentiment annotation. Although the importance of sustainable fashion is increasing steadily, research on the perception of such sustainability activities in Pakistani fashion brands is scarce. Most of the literature centres around Western contexts and is based on surveys and

interviews as opposed to social media users' data (Y. Choi et al., 2021; Lang et al., 2025). There is limited understanding of how sentiment levels differ between platforms, how hashtags affect engagement, or what aspects drive consumer sentiment most in this newly established context (Oguntegbe et al., 2023). Such a gap highlights the importance of a data-driven approach that leverages sentiment analysis across all platforms to produce insights for brands to communicate on. This research aims to fill these gaps by examining public sentiment towards sustainable initiatives of textile brands of Pakistan on five prominent social media sites (Facebook, Instagram, LinkedIn, TikTok, and YouTube) from 2020 to 2025. Using a sample of 3,427 publicly available comments, the study explores specific platform engagement patterns, assesses the effectiveness of 19 sustainability-related hashtags, and explains drivers of consumer perception. The study seeks to leverage computational sentiment analysis alongside conventional machine learning approaches to deliver empirically driven guidelines for brands to maximize the value of sustainability-oriented messaging and drive impactful, positive engagement with their audiences.

The findings offer multiple contributions. First, they contribute to the literature by enhancing insight into public attitudes towards sustainability in a nascent market. Second, platform-specific engagement and sentiment differences are demonstrated by the study, offering points for tailored digital communication strategies. Third, the study measures the effectiveness of hashtags, establishing specific guidelines to enhance impact and credibility. Lastly, by applying significant methodological robustness, the study can bridge academic research with industrial practice to demonstrate how knowledge embedded in social media data may be used for strategic brand management in a sustainable way, both ethically and environmentally. In a time when a single social media post can trigger excitement, it is important to understand that the world of social opinion is an essential component of branding. It provides an example of how Pakistani fashion brands can express sustainability in an emotionally impactful, ethical, and aesthetic way with the help of digital tools.

LITERATURE REVIEW

Sustainable Fashion and Consumer Sentiment

Over the past decade, sustainable fashion has moved into the forefront as one of the most pressing themes in academic research and industrial debates. Broadly defined, it encompasses measures that minimize environmental threat, enhance ethical working conditions, and stimulate circular behaviors (Niinimäki et al., 2020). Although awareness is increasing, consumers' reactions to sustainable marketing are diverse and conflicting. Research has shown that a great number of consumers express positive attitudes towards the sustainable products, yet many times their actual buying behaviour doesn't reflect the same, i.e., the "attitude-behavior gap" phenomenon (McNeill et al., 2015).

Sentiment analysis is known as a useful tool to measure such mismatch, and it is mostly used to analyse consumer responses on social media platforms, where they freely provide their opinions (both the negative and the positive sides) (Knowledge, 2021). In the world of fashion, researchers observe that people's attitudes toward sustainability are often built on the authenticity of a brand. When consumers believe a brand is genuinely committed to sustainability, this results in positive reactions towards that brand, whereas negative perceptions are generated in response to "greenwashing" (Balcarová et al., 2025). This twofold behavior requires deeper analysis beneath the

surface to find indications of engagement to the underlying emotional dispositions of the public.

Public Sentiment Toward Fashion Sustainability

Research on sustainable fashion and review has demonstrated that consumers are becoming loud online, using social networking sites as a focal point to complain, endorse, or call companies for accountability. For example, in Western settings sustainability narratives focused on ethical labor and environmental protection are generally well received, whereas those that are considered marketing ploys lead to disappointment (Androniceanu et al., 2020). But in developing contexts, feelings are shaped by cultural, economic, and social circumstances, and it is necessary to explore the local level (Oguntegbe et al., 2023).

Sentiment analysis approaches have also emphasized that sustainability discourse is not universally positive. Negative feelings typically surface when discussing price premiums of sustainable fashion, non-transparency in supply chains, and doubts about whether the efforts of small initiatives can counterbalance the effects of large-scale environmental damage (Loke & Chamlal, 2025). This understanding is important for framing the first research question of this study, which focuses on general sentiment about the sustainability efforts in Pakistani fashion brands.

- **RQ1:** What is the overall public sentiment toward sustainability initiatives by Pakistani fashion brands?

Platform-Specific Engagement Patterns

Specific affordances of diverse social media platforms influence how the public interacts with sustainability content. Instagram, which operates in a very visual and influencer-oriented environment, produces more positive engagement with sustainability messages when they are included in lifestyle narrations (Pereira et al., 2021). TikTok, on the other hand, is built for short-form creative content and often democratizes speech by allowing grassroots movements such as #ThriftFlip and #UpcycledFashion to go viral (Androniceanu et al., 2020). YouTube also offers a continuous format for documentary-style storytelling and elaborate reviews, and on LinkedIn sustainability is interpreted in terms of corporate responsibility and business ethics as the discussion is held in the professional space (Matteson et al., 2025; Sipilä et al., 2024).

While Facebook is decreasing in use among younger people (Pookulangara et al., 2024), it still has a significant impact in the developing world because of its large audience and community-based groups (Brydges et al., 2020). Cross-platform comparisons indicate that the intensity and sentiment of engagement are not only platform-specific but also vary in relation to demographics, content format, and algorithmically determined visibility in the interface (Hassaan et al., 2024). These findings directly address the second research question about which platforms have the highest positive engagement on sustainability content.

- **RQ2:** Which social media platforms generate the most positive engagement for sustainability-related content?

Hashtags and the Digital Articulation of Sustainability

Hashtags are a powerful way to organize and boost sustainability conversations online. The literature suggests that hashtags have both informational and symbolic roles, attaching content to larger bodies of conversation and indicating the values

and identity of users (R. Page, 2012). In sustainable fashion, hashtags (e.g., #SlowFashion and #EcoFashion) serve as common forums where fashion consumers come together to share their inspiration (Joy et al., 2017).

Studies have demonstrated that the effectiveness of hashtags hinges on their clarity, emotional appeal, and perceived authenticity. Extremely technical and brand-specific hashtags generate fewer engagements than those able to target collective movements and shared lifestyle identities (Carah & Shaul, 2016). In addition, sentiment analysis of hashtag campaigns shows how generic sustainability hashtags achieve greater general visibility, while brand-specific hashtags produce more conflicting responses, with consumers examining if a brand's behavior matches its advertising claims (Loke & Chamlal, 2025). This literature serves to underpin the third research question of the most efficient sustainability hashtags that generate desirable sentiment results.

- **RQ3:** Which sustainability hashtags are most effective in driving positive sentiment and engagement?

Factors Influencing Public Perceptions

Research into the determinants of public perceptions of sustainability initiatives in the fashion industry is growing. One important driver is brand transparency: when organizations deliver authentic supply chain and material origins information, they are likely to enable trust (Koberg & Longoni, 2019; B. Shen, 2014). On the other hand, vague or all-encompassing claims cause skepticism of greenwashing and result in unfavorable consumer attitudes (Nyilasy et al., 2014).

Cultural and socioeconomic factors are also important. Price-sensitive markets may view sustainability messages that fail to address value and cost as unsatisfactory (Joy & Li, 2012). Likewise, consumers in collectivist cultures frequently consider sustainability as not only regarding its environmental consequences but also in relation to community health and social justice (Mukendi et al., 2020). The development of social media activism has increased consumer expectations even more, as they can now quickly mobilize against brands that they see as pretentious on platforms (Pons et al., 2022). Other triggers are, of course, the power of influencers that can legitimate or delegitimize sustainability claims by their credibility and the emotional framing of content, although storytelling was winning on fear-based appeals (Y. Choi et al., 2021). This explanation offers theoretical support for the fourth research question of why the public thinks about sustainability initiatives in one way or another.

- **RQ4:** What factors influence public perception of sustainability initiatives communicated by fashion brands?

Synthesis and Research Gap

The literature review reveals that, although sustainable fashion has gained prominence in global fashion discussion, this framework remains under-researched in the context of emerging markets, including Pakistan. Current studies focus on culture-specific and Western-centric contexts, neglecting to explore cultural specificity, digital behaviors, and platforms. Furthermore, although previous research shows that hashtags, platform affordances, and brand authenticity influence sentiment, these variables are rarely looked at within the scope of a single, comprehensive analysis. Considering this gap, the current paper aims to (1) examine public sentiment towards sustainability initiatives of Pakistani fashion brands on five platforms, (2) understand the platform-specific engagement patterns, (3) assess the efficacy of sustainability

hashtags, and (4) make some recommendations about how to optimize messaging. By adopting computational sentiment analysis on a large training corpus of comments, this study contributes to a growing field of sustainable fashion communication at both theoretical and practical levels.

RESEARCH METHODOLOGY

Research design

The current study utilizes a quantitative content analysis approach and combines lexicon-based sentiment scoring with supervised machine learning classifiers to analyse public responses to sustainable initiatives in the Pakistani fashion industry. The analysis is cross-sectional in nature, consisting of observations of the combined data collected during the January 2020 to August 2025 sample period, which covers multiple years. This analysis reported here is not longitudinal and does not make any effort for temporal trends estimation. Sentiment analysis is ideal for dealing with unstructured social data and capturing emotional orientations (Liu et al., 2012). Current research design extends a standard TextBlob baseline with traditional machine learning techniques (logistic regression, SVM, random forest, gradient boosting) and sequence models (LSTM, GRU) to compare the relative merits of various modelling strategies in a linguistically intricate setting (Minaee et al., 2021).

Data Collection

Data were collected for the five largest social media platforms—Facebook, Instagram, LinkedIn, TikTok, and YouTube—utilizing platform-specific methodology for collection, where the API was compliant and accessible. However, collection posed a few practical challenges: automated scraping faced IP blocking and rate limits, and platform-specific anti-scraping defenses demanded adaptive strategies. To overcome these limitations, we employed an industry-level scraping service (Apify) for Facebook, Instagram, LinkedIn, and TikTok, and for YouTube comments, we collected them through the official API provided by YouTube. Structured metadata (anonymized user handle, post or video ID, time-stamp, reaction counts, attached hashtags) for each returned comment was saved for further filtering and analysis. Although several ethical, methodological, and technical constraints were faced throughout the collection process, the study was limited to publicly accessible data (not private/pay-walled) according to the accepted practices and rules of digital research. (Markham & Buchanan, 2021).

Sampling and Adequacy of Data

The brands were chosen according to three parameters: a visible social media presence, clear sustainability communication (through campaigns or statements), and a spread across various market tiers (premium, mid-market, and mass-market). This purposive sampling approach also guaranteed the inclusion of a wide range of consumer groups and industry practices, consistent with Campbell et al.'s (2020) and Ames et al.'s (2019) claim that purposive sampling increases interpretive depth in exploratory digital research. The dataset was also narrowed to include nineteen hashtags with sustainability themes that reduced the possibility of including general discussions about the brand. After screening, the final data set included $N = 3,427$ distinct publicly accessible comments. Although modest in number, this number represents an ethically and methodologically bounded decision, because digital research standards emphasize user privacy and the principle of data minimization (Zimmer, 2022).

Content analysis adequacy is based on extent and relevance, not quantity. Baker & Edwards (2012) and Marshall et al. (2013) point out that adequacy is reached when the data fully cover all phenomena focused on. We know from previous research that a relatively small, specialized dataset generates robust findings when sampled systematically from across different platforms (Marwick, 2013). Likewise, Stieglitz & Mirbaie (2018) demonstrate that cross-platform sentiment analysis refined analysis can carry validity without large-scale datasets if collection is purposeful. Although its volume is modest, the dataset's brand diversity, thematic focus, ethical soundness, and cross-platform coverage establish its fitness to address the study aims (Crouch et al., 2006).

RESULTS AND DISCUSSION

Data cleaning and preprocessing

Prior to modeling, the data was preprocessed (cleaned and normalized) for noise reduction and to increase the robustness of automated classification. Duplicate records were programmatically discarded, incomplete entries were excluded, and the text was normalized by converting to lowercase. Due to the multilingual and code-mixed nature of Pakistani social media (where English, Urdu, and Roman Urdu are commonly mixed together), non-English content was translated to English using machine translation to have a common analysis language; while doing so broadened the analysis, it is acknowledged to potentially introduce errors for idiomatic or dialectal use and is considered a limitation of the study (Chen et al., 2022). Emojis were dealt with based on evidence: if an emoji is known to convey sentiment, we kept it and mapped (sentiment) tokens to it (we removed the non-informative or decorative symbols) (Ljubešić et al., 2016)

Sentiment analysis framework and modelling

Sentiment classification was performed based on a three-point scale in which polarity score was considered as positive (polarity > 0.1), neutral ($-0.1 \leq \text{polarity} \leq 0.1$), and negative (polarity < -0.1) (Taboada et al., 2011). Describing prior distributions over lexicons to estimate the polarity of phrases, we used TextBlob as a transparent lexicon-based baseline for preliminary estimates, and these labels in turn informed the supervised modelling stage (Khoo & Johnkhan, 2018). For traditional machine learning, text features were represented by TF-IDF vectors, known to be effective for moderate-sized data sets.

For deep learning models, tokenization followed by the embedding layers to encapsulate sequential dependencies was employed. The suite of supervised models consisted of logistic regression, support vector machines, random forest (100 estimators), and gradient boosting as classical classifiers, and bidirectional LSTM and GRU recurrent architectures to examine whether recurrence provided a benefit in terms of model performance. Model selection and hyperparameter tuning were conducted by grid search, and model validation was analysed by 5-fold cross-validation to evaluate stability and prevent overfitting (Singh et al., 2018).

Model evaluation and comparative performance

Model performance is based on their accuracy, precision, recall, and F1-score, which simultaneously represent a comprehensive balance between classifier behaviour (Cabot & Surgery, 2023). The results of the conventional machine learning classifiers

are shown in Table 1, where cross-validation was used. Table 1 shows that logistic regression and gradient boosting achieve the highest accuracy and F1-scores (approximately 0.918 and 0.917), while SVM also performs well (approximately 0.905), but random forest does not perform effectively on the corpus. This finding aligns with the intuitive expectation and the conclusions of Barbeito-Caamaño & Chalmeta (2020), which state that simple and well-regularized linear or boosting-based solutions generalize effectively to the test data, while ensemble and margin-based methods perform better on the TF-IDF representation in this study (Naiduet al., 2023; Vakili & Ghamsari, 2020).

Table 1.
Traditional ML performance with cross-validation

Model	Accuracy	Precision	Recall	F1-Score	CV Mean	CV Std
Random Forest	0.829	0.854	0.829	0.828	0.834	0.015
Gradient Boosting	0.917	0.918	0.917	0.917	0.913	0.005
Logistic Regression	0.918	0.919	0.918	0.918	0.898	0.01
SVM	0.905	0.906	0.905	0.905	0.893	0.01

The dataset (Table 2) contains 3,427 comments spanning from January 2020 to August 2025 from ten top Pakistani fashion brands, extracted from five top social media platforms.

Table 2.
Dataset Overview

Metric	Value
Total Comments	3427.0
Positive Comments	1237.0
Negative Comments	805.0
Neutral Comments	1385.0
Average Sentiment Score	0.082
Brands Analyzed	10.0
Platforms Covered	5.0
Hashtags Analyzed	19.0

The distribution of sentiment shows that there was mixed public sentiment toward sustainability-related content, with 36.1% of comments categorized as positive, 23.5% as negative, and 40.4% as neutral. The slight positive leaning (average sentiment score

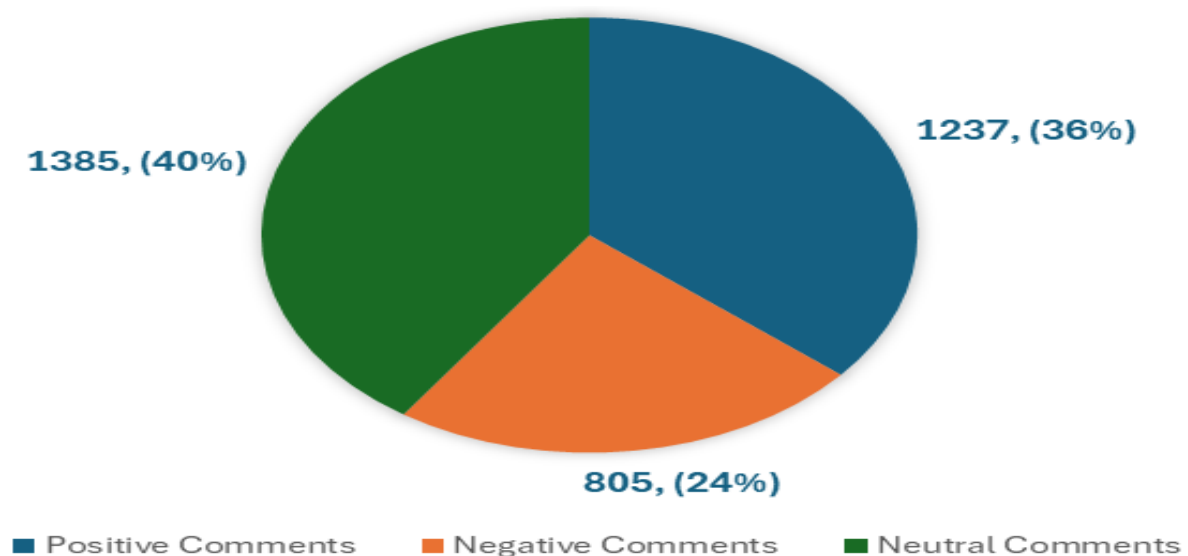


Figure 1.
Overall Sentiment Distribution (created by author)

= 0.082) indicates that there is cautiously positive sentiment towards sustainability efforts, but there is still a prevalence of neutral attitudes. This balance suggests that, on one hand, there is an audience for whom sustainability messaging is successful, but also a sizeable part of the public that is unconvinced or largely indifferent, emphasizing the relevance of platform and hashtag-based studies (RQ1, RQ4)

Lexical Patterns Across Sentiment Categories

As per Table 3, the lexicon analysis of the dataset shows clear language patterns in sentiment about sustainability initiatives. Positive comments are filled with aesthetic and affective terms such as beautiful (n = 262), best (n = 206), and love (n = 169), indicating that messages of sustainability are heard when communicated through visual appeal and affective response.

In contrast, negative comments mostly focus on disappointment with the lack of consumer experience, with usage of the three words "terrible" (n = 259), "horrible" (n = 247), and "disappointing" (n = 237). The popularity of service failure topics, including refund (n = 113), is a clear indication of service failure that is responsible for most negative comments. Neutral comments are characterized by descriptive fashion wordings (outfit, n = 360; shopping, n = 248; look, n = 146) to demonstrate that users do not express a powerful affective judgment. Overall, these findings indicate that the judgment of sustainability is not based only on environmental values but also on aesthetics and service quality. This is suggesting that the influence of sustainable messages is multidimensional on consumer attitude (RQ4).

Table 3.

Most Frequent Words in Positive, Negative & Neutral comments

Positive Words		Negative Word		Neutral Words	
Word	Count	Word	Count	Word	Count
Beautiful	262	Terrible	259	Outfit	360
Best	206	Horrible	247	Shopping	248
Love	169	Disappointing	237	Look	146
Better	153	Nightmare	233	Style	117
Elegant	135	Shocking	173	Design	112
Perfect	134	Poor	134	Quality	109
Amazing	108	Bad	134	Collection	102
Fashion	106	Cheap	125	Suit	98
Captivating	98	Refund	113	Trend	98
Modern	90	Boring	103	Range	95

Average sentiment scores across platforms

Table 4 represents the comparisons of public sentiment and engagement at the platform level; it is clearly established that there is significant heterogeneity across the platforms. Instagram had the highest average sentiment score (+0.137) and the most positive sentiment-weighted engagement (44.89), indicating that visual and influencer-led content receives the most positive engagement from audiences. The polarity scale score was moderate for LinkedIn (+0.101) and YouTube (+0.069); however, LinkedIn showed a relatively high engagement (34.18), and it appears that a professional audience is more open to being a target for sustainability messages.

Facebook had slightly positive and lower engagement (0.079, 31.89), indicating less activity but still a supportive community. On the other hand, TikTok is the only platform with a negative average sentiment (-0.138) and the least engagement (25.26), which suggests that sustainability content in short-form entertainment settings might not

meet audience expectations. Taken together, these findings answer RQ1 and RQ2, as public sentiment towards sustainability is overall positive but strongly dependent on platform, with Instagram the most successful.

Table 4.
Sentiment distribution and engagement across platforms

Platform	Avg Senti- ment Score	Comment Count	Positive Count	Positive Rate
Instagram	0.137	842	378	44.89
LinkedIn	0.101	708	242	34.18
Facebook	0.079	533	170	31.89
YouTube	0.069	1150	398	34.61
TikTok	-0.138	194	49	25.26

Distribution of sentiment (negative, neutral, positive) across platforms

Figure 2 offers an overview of sentiment by platform. On Instagram, we have the highest ratio: 378 positive comments compared with neutral (290) and negative (174), which indicates that Instagram is the most positive engagement platform for promoting sustainability content. The platform to which users posted the most videos and comments was YouTube ($n = 1,150$); it also showed the most homogeneous distribution, with positive ($n = 398$) and neutral ($n = 477$) comments outnumbering negatives ($n = 275$). LinkedIn had the same positive tone but with fewer positives (242) than neutrals (324), presumably due to the more cautious/analytical nature of professional talk. Facebook generated a slightly favorable profile (170 positive; 104 negative) with the largest number of comments neutral (259). In contrast, TikTok showed a significantly negative skew, with over two times as many negative comments (110) as positive (49), with a small neutral portion (35). This further confirms the previous conclusion that TikTok is exceptionally resistant to sustainability messaging when compared to other platforms.

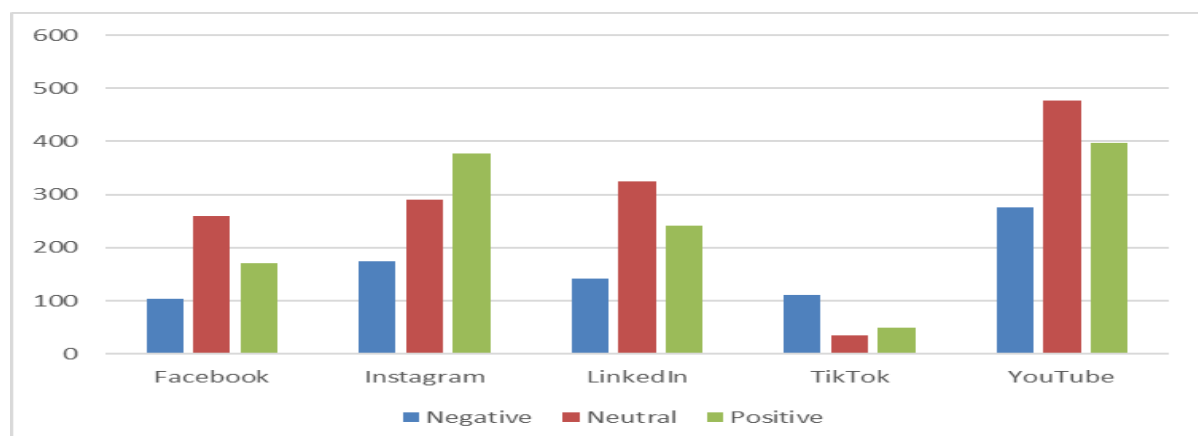


Figure 2.
Platform-Wise Sentiment Breakdown
Hashtag Engagement Patterns

Examination of the use of sustainability-based hashtags suggests a mixed effect on the mood of the audience. According to Table 5, #eco was the most influential hashtag and resulted in 806 comments with a 50.6% rate of positive comments. Similarly, #consciousfashion obtained the highest positive scores (53.7%), but the number of comments was only 95.

- Moderately Effective Hashtags

Hashtags like #circularfashion (44.2% positivity), #slowfashion (41.6%), and #sustainabilitymatters (41.4%) maintained consistently high performance. These words are connected to notions of circular economy and mindful consumption, demonstrating high centrality and very low range for those terms.

- **Mixed or Neutral Performance**

The tags that were rated more as neutral included popular ones such as #sustainability (33.3% positivity), #fashionwithpurpose (33.9%), and #sdg (34.8%). These tags are widely visible, but their influence diminishes due to varying levels of interest and disinterest.

- **Low- or Negative-Performing Hashtags**

Some hashtags raised eyebrows, with a -0.314-sentiment score and a positively scored sentiment of only 11.7 percent of the comments on the hashtag #sustainablefabric, and hashtags such as #echofashion (-0.133) and #greenfashion (-0.152) were negative.

Table 5.
Hashtag Engagement Patterns

Hashtags	Avg_Sentiment	Comment_Count	Positive_Count	Positive_Rate
#consciousfashion	0.123	95	51	53.68
#sustainabilitygoal	0.112	72	37	51.39
#eco	0.262	806	408	50.62
#circularfashion	0.179	165	73	44.24
#slowfashion	0.138	202	84	41.58
#sustainabilitymatters	0.139	140	58	41.43
#Ethicalfashion	-0.006	67	27	40.3
#sdg	0.078	141	49	34.75
#fashionwithpurpose	0.11	127	43	33.86
#sustainability	0.133	198	66	33.33
#echofashion	-0.133	51	17	33.33
#planetoverprofit	0.086	123	40	32.52
#sustainablefashion	0.096	184	56	30.43
#consciousbuying	0.08	140	42	30
#ethicalcloths	0.062	131	38	29.01
#greentextile	0.08	161	46	28.57
#greenfashion	-0.152	42	12	28.57
#ecofashion	0.06	154	40	25.97
#sustainablefabric	-0.314	428	50	11.68

Sentiment Dynamics Across Sustainability Hashtags

Table 6 gives sentiment class distributions across various sustainability-related fashion hashtags. The results reveal a wide range of differentiation in the interaction patterns of individuals with various hashtags. Among the extremely broad and popular hashtags, #eco (n=806), #slowfashion (n=202), and #sustainability (n=198) created the most discussion, with a neutral and even positive tone. In the case of the #eco hashtag, we can see that there are considerably more posts with positive (408) and neutral (345) tags, which means that the outlook on sustainable practices is mostly favorable as it is used to discuss the matter. On the other hand, there are some hashtags with strong negative sentiment. Very interestingly, #sustainablefabric has the most negative posts (287 of 428), which is 67%, suggesting polarized or critical engagement on this issue. Similarly, #echofashion and #greenfashion, even with very low frequency, present a higher percentage of negative sentiment, indicating suspicion or displeasure related to those terms. At the opposite pole of association, we find #consciousfashion, which tends to carry more positive connotations (51 out of 95; ~54%),

concluding that the discourse of conscious fashion is more favorably oriented. Balanced distributions are also seen in the case of #circularfashion and #slowfashion, more evenly spread between negative, neutral, and positive classes, likely indicating the diversity of opinions in these conversations.

Table 6.
Distribution of sentiment classes per hashtag

Hashtags	All	Positive	Negative	Neutral
#eco	806	408	53	345
#sustainablefabric	428	50	287	91
#slowfashion	202	84	27	91
#sustainability	198	66	24	108
#sustainablefashion	184	56	30	98
#circularfashion	165	73	31	61
#greentextile	161	46	33	82
#ecofashion	154	40	27	87
#sdg	141	49	30	62
#consciousbuying	140	42	23	75
#sustainabilitymatters	140	58	26	56
#ethicalcloths	131	38	25	68
#fashionwithpurpose	127	43	23	61
#planetoverprofit	123	40	22	61
#consciousfashion	95	51	27	17
#sustainabilitygoal	72	37	30	05
#ethicalfashion	67	27	31	09
#echofashion	51	17	31	03
#greenfashion	42	12	25	05
All	805	1385	1237	3427

In general, the results indicate that mainstream sustainability-related hashtags tend to receive positive or neutral conversation, while the specific or technical hashtags exhibit stronger negative sentiment, which may reflect the difficulties, the controversies, or the unmet expectations of these domains. This distribution allows us to draw the conclusion that sentiment patterns differ not only in sustainability topics but also in the framing and specificity of the hashtags used.

The results of the current research indicate that the overall perception of sustainability-driven initiatives within the context of Pakistani fashion brands is conditionally favorable. Finally, 36.1% of comments are positive, 23.5% of comments are negative, and 40.4% of comments are neutral, with an average sentiment score of 0.082. This is consistent with previous studies, suggesting that consumers in the EMs are interested in sustainable fashion; however, they are reluctant to fully adopt it—a commonly observed “attitude–behavior gap” (BAWintschnig, 2021; Munro & Kapitan, 2023; Park, 2020). The high proportion of neutral comments implies that audiences are not finding them particularly relevant or trustworthy.

Lexical analysis revealed that words associated with positive sentiment strongly centered around aesthetics and emotions; “beautiful,” “love,” and “elegant” were the dominant words. This result is in line with previous research that has indicated that sustainable fashion can be made appealing when represented aesthetically and aspirationally (BA Wintschnig, 2021; Park, 2020). Meanwhile, negative emotions were more likely to concentrate on product and service shortcomings, with words such as “terri-

ble," "refund," and "poor" coming up most frequently. Other studies have also demonstrated that sustainability claims are insufficient for offsetting poor customer service or product disappointment, as trust in environmental messaging is largely influenced by the holistic brand experience (Munro & Kapitan, 2023).

Significant platform-level variations were observed. Instagram demonstrated the highest positivity and engagement (Milanesi et al., 2022), which supported previous literature for suggesting that visual platforms are an effective way for sustainability storytelling (Budiwarman, 2022). LinkedIn performed well, likely because of its professional user base who may be interested in CSR and sustainability discussions (Alenius, 2021). YouTube received a high number of comments but generated more balanced sentiment, in line with the mixed reactions typical of long-form informative content (Bug et al., 2020). Facebook content showed low positivity and engagement, reflecting Facebook's diminishing importance among younger users (Sarif Ullah Patwary, 2018). Nevertheless, TikTok revealed a net negative sentiment, likely due to challenges in connecting the sustainability message with entertainment-oriented short-form video culture (Zhong et al., 2025).

The hashtag analysis also provides an interpretation of how framing impacts engagement. Broad and more value-based hashtags such as #eco, #consciousfashion, and #sustainabilitygoal received high levels of positivity, which is consistent with research findings on the role of emotional and affective appeal in framing sustainability to consumers (Mahmood & Haider, 2020). On the other hand, technology hashtags like #sustainablefabric showed high negative sentiment, mirroring results that unverifiable or vague environmental claims tend to elicit doubt and an allegation of greenwashing (Williams et al., 2014). This implies that brands must select their hashtags carefully and look for establishing an emotional connection.

Collectively, these findings point out that aesthetics, service quality, and platform culture, as well as hashtag framing, matter for consumers in perceiving sustainability initiatives. Brands in Pakistan too could stand to gain from such tailored sustainability communication, especially in relation to platform-specific expectations (Mujahid & Mubarik, 2021). Aspirational visuals are the key on Instagram, professional dialogue on LinkedIn, and evidence-based messaging where scrutiny is expected. More importantly, sustainability communication should be linked to maintaining a high service or product offering to gain trust and prevent counterproductive side effects.

CONCLUSION

The current study aims to investigate how consumers perceive fashion brands' sustainability practices on social media for a Pakistan sample by performing sentiment and machine learning analysis. The results add to the limited literature on sustainable fashion communication, and they provide evidence based on an emerging market where attitude towards sustainability is developing, but skepticism and disengagement are still substantial.

For **RQ1**, it was found that the overall sentiment related to sustainability initiatives was cautiously positive, with more than a third of comments expressing positive sentiment. But the high percentage of neutral answers points to the fact that while consumers have seen the sustainability messaging, most of them don't believe or care about it (McNeill et al., 2015). This ambivalence mirrors the international "attitude-behavior"

gap in sustainable consumption and implies that Pakistani consumers, along with others elsewhere, subscribe to sustainability in principle but not yet in practice through strong engagement or buying behaviour (McNeill et al., 2015).

As for **RQ2**, the results suggest that platform culture is a key factor in shaping consumer sentiment. Instagram and LinkedIn were the two most suitable platforms for sustainability news and information: Instagram because of its visual culture, driven by influencers (Schorn et al., 2022), and LinkedIn because of its professional network focus, where corporate social responsibility (CSR) is acknowledged. Performance of Facebook was not up to the mark, and YouTube received more mixed responses with both positive and negative feedback (Wee et al., 2023). TikTok generated negative sentiment, which is due to the conflict between the traditional narrative of sustainability and the modern narrative of short-form entertainment-oriented video. This highlights the importance of aligning communications strategies with the standards and expectations of the respective sites rather than employing the same content.

To respond to **RQ3**, the findings revealed that hashtag framing always creates an important impact on consumer responses. General emotional hashtags like #eco or #consciousfashion facilitated a more positive interaction that appears to demonstrate how the consumer will have a more positive relationship with the values and identity-oriented frames (Manetti et al., 2016). On the other hand, technical hashtags like #sustainablefabric generated resistance and negativity, which may indicate that unverifiable claims risk being interpreted as greenwashing (Balcarová et al., 2025). This result confirms the significance of thoughtfully choosing language in sustainability messages because overuse of technical jargon appears to create confusion, while simple and relatable words will yield more engagement (Ballestar et al., 2020).

In response to RQ4, the findings indicate that different parameters such as authenticity, transparency, the compatibility between the message and the platform, etc. played a role in how the public perceived the participation in sustainability (Calcagni et al., 2019). When messages were shown in a manner that is consistent with the nature of the brand and was an actual step, people believed in them, and they welcomed them. Unspecific or too technical claims, on the other hand, were creating ambiguity for consumers about the possibility of greenwashing. As per Ghermandi et al. (2024), understanding the platform culture is very important for fashion brands. LinkedIn is a professional forum, so it will generate more positive sustainability discussions (Cho et al., 2024), while TikTok is considered an entertainment forum for youth, so it leads toward skepticism and avoidance of sustainability content (Lin et al., 2023). These findings highlight that users do not develop perception through content alone but also from trust, clarity, and context relevancy, where credibility does matter to influence a user's sentiment regarding sustainability in the fashion sector.

Overall, this research provides insights that Pakistani consumers are very receptive to sustainability efforts of fashion brands and that their reactions differ by platform culture, style of messaging, and believability of efforts. One major inference from the findings is that effective sustainable fashion communication requires more than symbolic gestures. A sincere brand attitude and message that align with consumer expectations, as well as the strategic use of platforms, will generate positive results. By discovering ways to deal with the above-discussed challenges, new fashion brands in the market will be able to build more trust with their customers and make the world move toward a more sustainable future.

THEORETICAL IMPLICATIONS

The research makes several contributions to the available literature on sustainable fashion marketing, particularly on emerging markets. It provides an empirical contribution to the attitude-behavior gap debate, which is a very common research topic in Western societies (Joyet et al., 2017). This research has also discovered that consumers in Pakistan may theoretically remain positive in regard to sustainability, but practically they tend to behave indifferently. That is indicative of the fact that this disparity is not some form of cultural characteristic of the developed markets but instead more of a global trend, which itself must be a complicated phenomenon.

Second, the research also highlights the important effect of digital platforms on the perception development of fashion consumers to sustainability narratives. In the past, literature largely has understood consumer sentiment as a rather consistent phenomenon, while our findings suggest that platform cultures and values have a considerable impact on the reception towards sustainability. The visual storytelling capabilities of Instagram are said to magnify warm feelings (Carah & Shaul, 2016), whereas TikTok is an entertainment-based environment (Pihkoluoma, 2025), which leaves it more open to criticism. This implies that platform affordances should be included in theories of sustainable communication, rather than thinking of messages alone as self-contained in context.

Third, we see that hashtags play a crucial role in linguistic framing. Whereas the field of sustainable fashion studies has tended to draw attention to the attributes of the product or the practices of the corporation, this study shows how the smallest of linguistic choices, for example, whether a brand uses 'broad'/value-driven hashtags (#eco, #consciousfashion) or technical ones (#sustainablefabric), can contribute to sentiments in a non-trivial manner. This result adds to the literature on framing and greenwashing, in that it reveals that consumers' doubts were not only generated by exaggerated messages but could also occur with overly technical or poorly contextualized communication.

MANAGERIAL IMPLICATIONS

The results also have important implications for eco-fashion brands that aim to further develop their sustainability communication tactics. Firstly, the results demonstrate the need for platform-specific strategies. Following the earlier research works by Testa et al. (2020) and Budiwarman (2022), Instagram must be considered as the primary platform to convey sustainability-related information to consumers, with high levels of engagement and favorable perception. Brands can use visual storytelling, influencer partnerships, and lifestyle narratives as effective tools on Instagram to convey sustainability narratives.

LinkedIn is better to communicate at the corporate level, including any supply chain transparency updates, CSR initiatives, and partnerships, because their professional audience is more susceptible to data-driven sustainability messages. TikTok is currently receiving a fair share of negative attention and engagement, but it should not be overlooked (Castanheira, 2025). Instead, brands should begin experimenting with types of laugh-out-loud funny, relatable, and entertaining content that can easily integrate sustainable initiatives into short-form storytelling. A universal model will never work; to succeed in the long term, sustainability narratives need to adhere to the intrinsic logic of a specific platform.

Secondly, brands should give more consideration to what type of hashtags can be used and what type of linguistic framing is to be employed. The research indicates that the customers in this era are more likely to accept general and clear hashtags, and in most cases, too-technical hashtags will be misperceived. Consequently, this means that brands should avoid excessive use of jargon unless they can provide easily understandable proof to support their actions. This makes it critical that marketing and sales teams should work closely with sustainability officers to make their messages not only persuasive but also believable. Aesthetics and transparency should not be regarded as opposing aspects but as complementary qualities of good message design.

Third, the results highlight the importance of operational legitimacy. The negative comments usually were not due to a disagreement over whether a sustainability initiative should be implemented or not but to an expectation or disappointment of the product or service quality or unmet consumer expectations. This means that all the sustainability communication in the world is not going to compensate for poor brand performance. It implies that managers must make sure that the strategies of a firm related to sustainability should be tied together with quality management, corporate customer relations, and product reworking. Otherwise, sustainability in the true sense can only be discussed or communicated but not achieved.

Fourth, the analysis reveals that it is important to track consumer sentiment in a data-driven market. Through sentiment analysis of monitoring how a large audience is reacting to sustainability initiatives, a brand can track the response of its audiences to sustainability efforts and identify risks (e.g., backlash against some environmental hashtags) and respond appropriately in real time. This shifts sustainability communication to a more dynamic, continually engaging, and learning experience rather than just a static marketing campaign. Such a strategy may prove critical to practitioners in emerging markets where consumer behaviour is shifting rapidly.

Finally, the findings of current research show directions for regional leadership opportunities. Sustainability has become a reality in every corner of the globe, and big international brands have become the first to adopt it. Brands from the domestic arena that approach it honestly and openly are likely to shine in the local and global landscape. This would build great trust with the fashion consumers and further establish Pakistan's fashion industry as a prominent player in the global debate on sustainability.

LIMITATIONS & FUTURE RESEARCH

It is important to acknowledge the limitations of this study. First, five social media platforms (Instagram, Facebook, TikTok, YouTube, and LinkedIn) were analyzed based on their posts with sustainability hashtags. Although these cover a substantial fraction of public discussions, conversations in private groups, in messaging apps, or in offline contexts were not included, and this may have limited representativeness. Furthermore, visibility of content is influenced by platform algorithms, which have an impact on the constitution of the dataset that is not entirely researcher controlled.

Second, linguistic complexity posed challenges. Code-switching is part of the Pakistani users' tendency to switch between the languages English, Urdu, Roman Urdu, and regional languages, often within a comment itself. Machine learning classifiers handled much of this complexity; however, subtleties such as sarcasm, irony, and cultural humor were not guaranteed to be captured, potentially leading to inaccuracies in sentiment (Khoo & Johnkhan, 2018).

Third, the study had a cross-sectional design and described the attitudinal picture at one point. Given that sustainability attitudes are shaped based on the awareness, corporate activities, or outside events, it is difficult to capture the temporal movement of the shift of sentiment and long-term change of emotion over time.

Fourth, the research did not segregate the audience by demographics or psychographics. In Pakistan, other demographic variables such as age, sex, education, and income have significant associations with sustainability perceptions, and to consider the audience as homogeneous may mask these variances.

Subsequent studies should use longitudinal approaches to measure how feelings and changes of behaviour develop over time. Other data sources beyond public social media, such as e-commerce reviews or focus groups, would help enrich and triangulate analysis. More focus is also needed on consumer segmentation. Demographic and psychographic segmentation would also enable researchers to gauge how discrete audiences process sustainability stories. For example, if you're targeting Gen Z, you might want to use comedic marketing materials on TikTok, while using fact-based content on LinkedIn to speak to older or professional audiences. Furthermore, experimental designs would make it possible to try the causal effect of communication strategies; for example, comparing technical vs emotional hashtag framing or the extent to which supply chain transparency helps reduce perceptions of greenwashing.

Finally, sustainability communication should be viewed in broader cultural and institutional contexts in future research. Both regulatory context, cultural contexts, and regional market comparison (e.g., within South Asia) might be of some value to understand how such sustainability narratives resonate differently in societies.

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