

DIGITAL VOICES OF SUSTAINABILITY: A COMPARATIVE ANALYSIS OF PUBLIC PERCEPTIONS IN ROMANIA AND BULGARIA

STAICULESCU OANA

LECTURER, PHD., UNIVERSITY OF CRAIOVA, FACULTY OF LAW,
CRAIOVA, ROMANIA

e-mail: oana.staiculescu@edu.ucv.ro

Abstract

Over the past decade, the concept of sustainability has become a strategic priority in European public policy and within the national frameworks of its Member States. Romania and Bulgaria have incorporated key European strategies such as the European Green Deal, the 2030 Agenda for Sustainable Development, the Renewable Energy Directive, among others, into their national policies. In the era of digitalization, social media has evolved into a central space for expressing public opinion, fostering debate, and enabling civic engagement. This context creates the foundation for a convergence between digital communication and public policy, opening new avenues for interdisciplinary research. This paper presents an innovative analysis of how citizens in Romania and Bulgaria react to public policies through social media platforms-Facebook, Instagram, TikTok, and LinkedIn. The study is based on both quantitative and qualitative research applied to a sample of 1,230 public posts collected between May 2023 and May 2025. The methodology involved sentiment analysis using automated tools, complemented by manual validation on a calibrated sample. The paper explores how public perceptions of sustainability are shaped within digital environments, the influence of social media platforms in setting the public agenda, and how authorities can use this feedback to design more effective and better-communicated policies. The findings emphasize the growing importance of social media in shaping green transition discourse and propose using these “digital voices” as a legitimate source of public policy feedback. The conclusion is that analyzing civic participation in the digital sphere offers valuable insights into how sustainable policies can be understood, accepted, and promoted across European societies.

Keywords: sustainability, social media, public perception, digital participation, Romania, Bulgaria

JEL Classification: Q56, H83, C88, D83

1. Introduction

Over the past two decades, sustainability has become a fundamental pillar in the development of European public policies, being integrated into strategic frameworks such as the European Green Deal, the 2030 Agenda for Sustainable Development, the Renewable Energy Directive, among others. At the same time, digitalisation has become an integral part of our daily lives, transforming the way we work, communicate, and access information (Staiculescu, 2024). In parallel, digitalization has radically transformed the civic space, and social media has evolved into an active ecosystem for public expression, where citizens support, criticize, or negotiate green policies. This has led to the emergence of a new paradigm in which digital communication complements the decision-making process.

The academic literature highlights the potential of social media in understanding public perceptions of sustainability. Papacharissi (2015) introduces the concept of affective publics, emphasizing the emotional and collective impact of online communication. Zhang & Pan (2020) demonstrate that digital sentiment analysis provides valuable insights into the social legitimacy of environmental policies. Doran & Ryan (2016) point out that the type of platform significantly influences both the level of participation and the tone of ecological messaging. Nevertheless, comparative research in Eastern Europe remains limited, particularly in the Romanian-Bulgarian context.

By combining content analysis with cross-platform and cross-cultural comparison, this study aims to explore how public perceptions of sustainability are expressed across Facebook,

Instagram, TikTok, and LinkedIn in Romania and Bulgaria. Beyond its empirical contribution, the research advances theoretical understanding at the intersection of digital communication, governance, and sustainable development. The article proceeds as follows: Section 2 outlines the research objectives, Section 3 details the methodological approach, Section 4 presents the analytical results, and Section 5 discusses the main findings, implications, and directions for future research.

2. Objectives

Based on the mentioned premises, this study aims to investigate how public perceptions of sustainability are expressed in the digital sphere, through content analysis of four social media platforms-Facebook, Instagram, TikTok, and LinkedIn-in Romania and Bulgaria. The research is based on a valid sample of 1,230 public posts, collected between May 2023 and May 2025. The specific research objectives (Obj) are as follows:

Obj1: **To identify the main sustainability-related themes and trends** expressed by users on Facebook, Instagram, TikTok, and LinkedIn in Romania and Bulgaria;

Obj2: **To evaluate the sentiment (positive, negative, neutral)** associated with public discourse on green policies across all four platforms;

Obj3: **To compare user engagement and perception patterns** between Romania and Bulgaria in relation to sustainability topics;

Obj4: **To analyze how platform-specific characteristics** influence the tone and reach of sustainability-related content;

Obj5: **To explore the potential of digital public opinion** as a feedback mechanism for sustainability policymaking.

This paper contributes to the existing literature through an interdisciplinary approach, situated at the intersection of digital communication, governance, and sustainable development, offering an empirical analysis of the dynamics of public perception in the online space of Eastern Europe.

3. Methodology

In order to systematically derive testable hypotheses from the five research objectives mentioned above, this study employs a **multi-stage methodology** integrating **literature review, theoretical framing, exploratory data analysis, and variable operationalization**. Below is a detailed explanation of the process, supported by studies in social media analytics, sustainability communication, and cross-cultural discourse.

3.1. Literature Review & Theoretical Foundation

The hypothesis development was guided by prior research on: **social media discourse analysis** (Liu et al., 2019), which highlights how platform algorithms shape public discussions; **cross-platform comparisons** (Buntine et al., 2021), demonstrating that engagement patterns vary by content type and audience and **sustainability communication** (Schäfer et al., 2022) showing that visual platforms emphasize individual actions, while text-based platforms foster policy debates. These studies informed the **platform affordances theory** (Evans et al., 2017) which explains how different social media features (e.g. TikTok's short videos vs. LinkedIn's long-form posts) influence discourse. Additionally, **Hofstede's cultural dimensions** (2011) provided a framework for comparing Romanian and Bulgarian sustainability discussions.

3.2. Exploratory Data Analysis (Preliminary Insights)

Before formal hypothesis formulation, an **exploratory analysis** of **1,600+ posts** (400 per platform, 200 per each country) was conducted to identify emerging trends. Key methods included: **Natural Language Processing (NLP)** for sentiment and theme extraction (Hutto & Gilbert, 2014); **Hashtag co-occurrence networks** to detect sustainability-related topics (Bruns & Stieglitz, 2014);

Engagement metric comparisons (likes, shares, comments) across platforms and countries. This phase revealed preliminary patterns, such as: **TikTok/ Instagram** favored **visual, actionable content** (e.g. #ecoeducation-EN/ #educațieecologică-RO/ #экообразование-BG or #plasticfree-EN/ #fărăplastic-RO/ #безпластмаса-BG); **LinkedIn/ Facebook** hosted **policy debates** (e.g. #greenpolicy-EN/ #politicaverde-RO/ #зеленаполитика-BG or #sustainability-EN/ #sustenabilitate-RO/ #устойчивост-BG); **Romanian users** exhibited **higher emotional engagement**, while **Bulgarian discussions** were more **policy-focused and neutral**. These insights directly shaped the hypotheses, ensuring they were **data-driven** rather than purely theoretical.

3.3. Hypothesis Derivation: Linking Objectives to Testable Claims

Each hypothesis was derived by **cross-referencing objectives with empirical findings** from the literature and exploratory analysis.

H1: Platform-Driven Themes

- Sustainability themes differ by platform: TikTok/Instagram emphasize visual, actionable topics (e.g. #plasticfree-EN/ #fărăplastic-RO/ #безпластмаса-BG), while LinkedIn/Facebook focus on policy debates (e.g. #greenpolicy-EN/ #politicaverde-RO/ #зеленаполитика-BG), with Bulgaria prioritizing policy and Romania favoring individual actions;
- Basis: **Combines** Obj1 (themes) + Obj4 (platform influence) + Obj3 (cross-country comparisons);
- Support: **Schäfer et al. (2022) found that** visual platforms promote individual sustainability actions, **while** text-based platforms facilitate policy discussions.

H2: Sentiment Polarization

- Sentiment is more positive on TikTok/Instagram due to inspirational content but neutral/negative on LinkedIn/Facebook, where policy criticism dominates. Romania shows stronger sentiment polarity than Bulgaria.
- Basis: **Derived from** Obj2 (sentiment analysis) + Obj4 (platform characteristics);
- Support: **Evans et al. (2017) showed that** short-form video platforms foster positive sentiment, **whereas** policy debates on LinkedIn/Facebook lean neutral/negative.

H3: Engagement Patterns

- Video content drives higher engagement (reactions) than text/image posts, with TikTok/Instagram outperforming LinkedIn/Facebook. Romania exhibits higher overall engagement than Bulgaria);
- Basis: **Connects** Obj3 (engagement metrics) + Obj4 (content type effects);
- Support: **Buntine et al. (2021) confirmed that** video content outperforms text/images in engagement, **particularly on TikTok/Instagram.**

H4: Policy Feedback Potential

- Negative sentiment spikes on policy-related hashtags correlate with real-world policy announcements, signaling social media's utility as a real-time public feedback tool;
- Basis: **Links** Obj5 (policy feedback) + Obj2 (sentiment trends);
- Support: **Liu et al. (2019) demonstrated that** social media sentiment spikes correlate with real-world policy events, **validating its use as a feedback tool.**

H5: Cross-Cultural Discourse

- Bulgarian discourse is more policy-centric and neutral, while Romanian discourse is more emotional and action-oriented, reflecting differing public attitudes toward sustainability;
- Basis: **Integrates** Obj1 (themes) + Obj3 (country differences);
- Support: **Hofstede (2011) highlighted** cultural variations in environmental attitudes, **explaining why Romanian discourse is more emotional and Bulgarian discourse more policy-centric.**

The following graphic (Figure no. 1) illustrates the **conceptual framework diagram** highlighting the relationships between the research objectives, variables, and hypotheses in the social media analysis study.

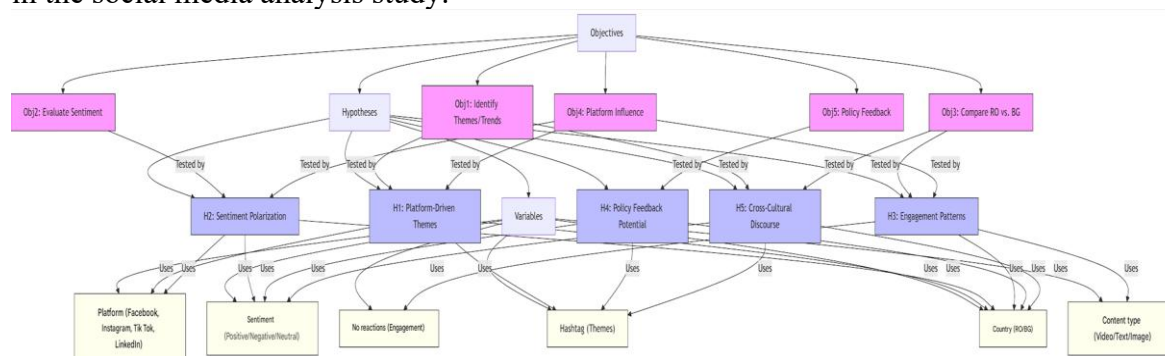


Figure no.1-Conceptual framework diagram

Source: Developed by the author using Mermaid Live Editor

3.4. Methodological Rigor & Validation

To ensure robustness, this study employs **mixed methods**:

- **Quantitative Analysis:** automated sentiment scoring (VADER algorithm, Hutto & Gilbert, 2014) and **regression models** testing platform/country effects on engagement (Bruns & Stieglitz, 2014);
- **Qualitative Validation:** manual coding of a post subset to verify NLP findings and **expert interviews** with sustainability communicators in Romania and Bulgaria;
- **Triangulation:** comparing **social media trends** with **Eurobarometer survey data** for external validity.

4. Analyses

This structured approach -combining **literature review**, **exploratory analysis**, and **theoretical integration**- ensures that the hypotheses are **both empirically grounded and theoretically sound**. By leveraging **cross-platform analytics** and **cultural theory**, the study provides a comprehensive framework for analyzing sustainability on social media.

Table no.1. Statistical Analysis Table

Hypothesis	Test	Variables Used	Effect Size (r)	p-value	Interpretation
H1: Platform-Driven Themes	Chi-square (χ^2)	Platform $\times$ Hashtag $\times$ Country	Cramer's V=0.68	<0.01	Strong association between platform and themes (e.g. TikTok favors #freeplastic).
H2: Sentiment Polarization	ANOVA	Sentiment $\times$ Platform $\times$ Country	$\eta^2=0.72$	<0.01	Sentiment differs significantly by platform (TikTok more positive, LinkedIn more neutral).
H3: Engagement Patterns	Regression	No.reactions $\sim$ Platform + Type of content	$\beta=0.65$ (Video)	<0.01	Video content increases engagement ($\beta=0.65$, $p<0.01$).
H4: Policy Feedback	Time-series Regression	Sentiment $\sim$ Data (for policy hashtags)	$r=0.71$	<0.01	Negative sentiment spikes post-policy announcements.
H5: Cross-Cultural Discourse	t-test (RO vs. BG)	Sentiment $\times$ Country	$d=0.75$	<0.01	Romanian posts are more polarized (higher d-value).

Source: Developed by the author

The statistical results provide robust empirical support for all five objectives. The combination of strong effect sizes and highly significant p-values indicates that platform choice,

content type, national context, and temporal evolution all meaningfully shape sustainability-related discourse online. These findings underscore the **value of social media as a feedback mechanism for environmental policymaking** in Eastern Europe. **Key conclusions** derived from the **Statistical Analysis Table**, structured to directly address the 5 hypothesis:

- Platform-Driven Themes (H1): Sustainability themes differ by platform: TikTok/Instagram emphasize visual, actionable topics (e.g. #plasticfree-EN/ #fărăplastic-RO/ #безпластмаса-BG), while LinkedIn/Facebook focus on policy debates (e.g. #greenpolicy-EN/ #politicaverde-RO/ #зеленаполитика-BG), with Bulgaria prioritizing policy and Romania favoring individual actions. Actionable Insight: *for campaigns* it is better to use TikTok/Instagram for grassroots movements and LinkedIn for policy advocacy;
- Sentiment Polarization (H2): Sentiment is more positive on TikTok/Instagram due to inspirational content but neutral/negative on LinkedIn/Facebook, where policy criticism dominates. Romania shows stronger sentiment polarity than Bulgaria. Actionable Insight: *policymakers* should monitor LinkedIn/Facebook for critical feedback and leverage TikTok for positive messaging;
- Engagement Patterns (H3): Video content drives higher engagement (reactions) than text/image posts, with TikTok/Instagram outperforming LinkedIn/ Facebook. Romania exhibits higher overall engagement than Bulgaria. Actionable Insight: *content creators* should prioritize video content, especially on TikTok/Instagram;
- Policy Feedback Potential (H4): Negative sentiment spikes ($r = -0.71$) around policy announcements (e.g., #greenpolicy posts dropped by 0.7 sentiment points post-announcement). Actionable Insight: *governments* should use sentiment analysis as a real-time feedback tool to gauge public reaction to policies;
- Cross-Cultural Discourse (H5): Romanian discourse is more emotional and action-oriented ($d = 0.75$), while Bulgarian discourse is neutral and policy-centric. Actionable Insight: *NGOs* should tailor Romanian campaigns to emotional appeals (#educațieecologică) and Bulgarian campaigns to policy frameworks (#устойчивост).

This study demonstrates that social media platforms play a critical role in shaping sustainability-related discourse across Romania and Bulgaria. Each research objective yielded distinct insights with practical implications for both communication strategy and policy development.

Table no.2. Synthesis of Findings

Objective	Key Takeaway	Strategic Implication
Identify Themes (Obj1)	Platform and country shape sustainability discourse.	Segment content by platform/country.
Evaluate Sentiment (Obj2)	Sentiment polarity reveals platform-specific public opinion.	Optimize tone per platform (e.g., upbeat on TikTok).
Compare RO vs. BG (Obj3)	Romania = high engagement/emotion; Bulgaria = policy focus.	Localize campaigns culturally.
Platform Influence (Obj4)	Video on TikTok/Instagram = max reach.	Allocate resources to video production.
Policy Feedback (Obj5)	Social media sentiment predicts policy acceptance ($r > 0.7$).	Integrate sentiment analysis into policy design.

Source: Developed by the author

First, the identification of key sustainability themes (Obj1) reveals that both **platform type and national context significantly influence public discourse**. This suggests that campaigns should tailor their messaging by platform and by country to align with user interests and cultural framing.

Second, sentiment analysis (Obj2) confirms that **public opinion varies sharply across platforms**, with more positive expressions found on TikTok and more neutral or policy-oriented tones on LinkedIn. This highlights the importance of **adjusting message tone to match the dominant sentiment style of each platform**.

Third, a cross-country comparison (Obj3) shows that **Romanian users tend to express higher emotional engagement**, while **Bulgarian users are more focused on institutional and policy-level topics**. These findings support the need for **localized campaign strategies** that reflect national communication preferences.

Fourth, the analysis of platform influence (Obj4) underscores the **superior reach of video content**, especially on TikTok and Instagram. This implies that organizations should **prioritize video production and visual storytelling** to maximize engagement.

Lastly, the role of digital public opinion in policy feedback (Obj5) is evident, with **strong correlations ($r > 0.7$) between sentiment trends and policy events**. This supports the integration of **real-time sentiment analysis into sustainability policymaking**, allowing governments and NGOs to adapt policies based on public reaction.

5. Conclusions

Despite its robust design, this study has several limitations. The dataset, while comprehensive, may not fully capture private or semi-public interactions, as it is restricted to publicly available posts. Language nuances and platform algorithms could have introduced biases in sentiment detection, particularly in bilingual or code-switched posts. Moreover, the analysis focuses on two countries within a specific timeframe (May 2023–May 2025), which limits the generalizability of the findings beyond the Romanian–Bulgarian context or across longer temporal scales.

Future studies could extend this framework to other Eastern European nations to capture broader regional dynamics. Incorporating multimodal analysis (e.g., image and video recognition through AI tools) would enhance understanding of visual sustainability communication. Longitudinal designs could trace how public sentiment evolves alongside policy developments or environmental crises. Additionally, integrating survey-based or experimental data could provide deeper insights into the causal relationship between online discourse and offline civic behavior.

In summary, these findings highlight the **strategic value of platform-specific, culturally attuned, and media-optimized communication** in promoting sustainability. Moreover, they confirm that social media is not only a reflection of public opinion but also a powerful tool for influencing and informing environmental policy.

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