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Review Article

Social Media, Society, and Sustainable Development: Identifying Opportunities and Challenges through Bibliometric Analysis and Social Media Review

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Abstract: The term 'social media, society, and sustainable development' is widely used to describe the impact of digital media on the sustainability of living space. The growing use of the internet and mobile devices has highlighted the importance of social media in building new groups and driving social change. It investigates the role of social media in promoting sustainable development. The goal is to identify the scholarly concerns and community behaviours regarding the opportunities and challenges of social media on sustainable development. Therefore, systematic evaluation literature was applied to compare global and local settings using the Preferred Reporting Items for Systematic Reviews (PRISMA). The literature assessment shows a constant increase in scholarly publications, highlighting important links between society, social media, and sustainability. Social media reviews of Facebook, Twitter, Instagram, LinkedIn and YouTube suggest that people understand how to use social networking to support spatial sustainability. Still, better use of social media is required to prevent negative consequences such as gentrification, the digital divide, and the identity crisis. Furthermore, in pursuit of sustainable development goals, the article focuses on micro-initiatives and increasing the productivity of online social media users and platforms.

Keywords: Social media; Society; Sustainable Development; Social Networking; Users and Platforms

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Highlights:

- It investigates the role of virtual media in ensuring sustainability.
- The study is based on synthetic bibliometric analysis using PRISMA.
- Keyword search has shown the relationship between sustainable development with society.
- Social media initiatives are mostly focusing on generalized aspects of SDG.

1. Introduction

There has long been confusion among scholars and administrators regarding the role and scope of online social media. This topic is highly multidimensional, involving various stakeholders (Stevens, Aarts, Termeer, & Dewulf, 2016). Social media, the focus of this study, has significantly transformed communication patterns (Abbas Naqvi, Jiang, Miao, & Naqvi, 2020) and is increasingly used to enhance stakeholder communication for sustainability (Jha & Verma, 2022). Through computer-mediated technologies, social media facilitates virtual networking among individuals (Li et al., 2017), businesses (Al Halbusi, Hassani, & Mosconi, 2022), and organizations, strengthening stakeholder engagement (De Luca, Iaia, Mehmood, & Vrontis, 2022b). Kaplan and Haenlein (2010:61) describe social media as a collection of internet-based applications built on Web 2.0 principles that enable the creation and sharing of user-generated content. Li et al. (2017:1) emphasize the importance of involvement, transparency, dialogue, communal interaction, and interconnection in these digital spaces. Social media platforms provide a unique opportunity for users to create and share content and ideas (Hernandez, Escolano, Juanatas, & Elvambuena, 2022). They serve as an engaging medium for learning and gathering public opinions (Wandhöfer et al., 2012; Olivé, García, Ionescu, Pulido, & Sordé-Martí, 2017). Today, the term "social media" broadly refers to websites and online applications (Mao, 2014; Greenhow & Lewin, 2015; Oxford University Press, 2023). Unlike traditional media, which is subject to editorial control, social media allows individuals and groups to showcase their contributions, making it a powerful tool for advocacy, campaigning, and volunteer recruitment (Killian et al., 2019; Jenkins, Brennan, Molenaar, & McCaffrey, 2022; Słupińska, Wieruszewski, Szczypa, Kożuch, & Adamowicz, 2022). Furthermore, social media has revolutionized public communication, enabling users to voice their opinions directly to decision-makers (Hysa, Karasek, & Zdonek, 2021). Its impact is particularly strong among younger demographics (Knupfer, Neureiter, & Matthes, 2023). It also plays a critical role in monitoring public responses to social issues and human rights (Liu, 2022). A strong presence on social media enhances the credibility and acceptance of organizations (Capello, Cox, & Battalora, 2022), and its potential in advancing Sustainable Development Goals (SDGs) is widely recognized (Loiseau & Nowacka, 2015; Chin & Jacobsson, 2016; Labonte, 2016; Killian et al., 2019). More recently, the

COVID-19 pandemic has accelerated the adoption of internet-based interactions, leading to a surge in online engagement and content creation. As a result, more users are producing video content (Lupşa-Tătaru & Lixăndroiu, 2022) addressing various social and environmental issues, further expanding the influence of social media in public discourse.

The multidimensional challenges of the 21st century have increased the demand for engaging and holistic solutions to their aggregate impact (Varjas, 2022). Consequently, the attainment of Sustainable Development Goals (SDGs) requires a comprehensive approach that considers the environmental, economic, and social dimensions of human life and livelihood (Smaniotto et al., 2022). Since SDGs directly affect human life and influence societal attitudes, any initiative aiming to achieve an SDG must involve all relevant stakeholders. However, meaningful stakeholder engagement is often absent in planning processes that rely on traditional communication methods. In contrast, social media has become an increasingly trusted medium for effective information exchange among stakeholders (De Luca, Iaia, Mehmood, & Vrontis, 2022a). Social media has also transformed the behavior of stakeholders and investors in market-based economies (Al-Sartawi & Hamdan, 2019). Studies highlight the growing reliance of citizens on social media and its interconnectedness, which fosters coordinated network-building (Mawela, 2016; George, 2021). Ultimately, social media nurtures social relationships (Sherlock, 2011), builds trust among partners, and promotes social well-being (Munzel, Meyer-Waarden, & Galan, 2018). Even the energy sector is witnessing improved two-way communication between producers and consumers, as social media accelerates information dissemination and shapes the market based on consumer preferences (Czarnecka, Kinelski, Stefańska, Grzesiak, & Budka, 2022). This development contributes to SDG 7: Affordable and Clean Energy. Moreover, sustainability is a key driver of regional prosperity (Giacomini, Rocca, Zola, & Mazzoleni, 2021). It also fosters employment opportunities and supports steady economic growth (Ali & Zhuang, 2007), thereby advancing SDGs 1, 2, 8, 10, and 12. Today, social media is at the core of sustainable community-building, facilitating societal reorganization to make communities more responsive and adaptable—moving beyond theoretical discussions to tangible action (Moore, 2015). When combined with other facets of Information and Communication Technologies (ICTs), social media is emerging as a powerful force in shaping social practices (Curley & Salmelin, 2018). Additionally, it has the potential to provide digital solutions to various social, economic, and ecological challenges (Curley & Salmelin, 2018). However, these innovations and speculative advancements remain in their infancy, particularly in developing nations, where further research and implementation are needed.

The growing number of internet and smart device users has made social media a crucial platform for communication (Herrada-Lores et al., 2024), idea exchange, and community-building across diverse economic and demographic groups. Platforms such as Facebook, X (formerly Twitter), LinkedIn, YouTube, and Instagram are increasingly relevant in administrative and planning domains, facilitating cross-border citizen interactions on topics ranging from everyday life to global challenges, including sustainability and the Sustainable Development Goals (SDGs). Despite the rising academic interest, research on the role of social media in promoting sustainable development remains incomplete. This study aims to bridge this gap by identifying key themes in sustainability discourse on social media, examining their academic recognition, analyzing community responses, and exploring future opportunities.

Social media enhances global connectivity, providing valuable insights into human behavior and societal dynamics. It has deepened geographical understanding of social roles, relationships, and environmental sustainability, particularly in alignment with SDG 11: Sustainable Cities and Communities. Furthermore, social media fosters equity, inclusivity, and justice (SDGs 10 and 16) by facilitating ethical discussions and raising awareness about critical social and environmental issues. From an academic standpoint, social media plays a pivotal role in tech-savvy community-building, spatial surveillance, and geoinformatics knowledge-sharing, advancing collaborative efforts toward sustainable development (SDG 17). By integrating social physics with geography, scholars can develop data-driven decision-making models to better understand human-environment interactions. The real-time data and open-source insights generated by social media communities enable geographers to address diverse societal needs, offering a powerful blend of technology, human behaviour, and geography to shape a sustainable and equitable future.

Integrating social physics into geography provides a deeper understanding of the causal relationship between human behavior and nature, fostering informed decision-making for a healthier future. Social physics has been instrumental in applying statistical tools to social analysis and identifying spatial regularities (Warntz, 1959). Additionally, it has epistemologically transformed geography by incorporating methodologies from the natural sciences (Barnes & Wilson, 2014), broadening our understanding of regional identities.

While social physics propels human society toward a more sophisticated, technology-driven structure, virtual media ensures the generation and availability of real-time data. In essence, social physics examines societal structures (Miller, 2017) and analyzes the dynamics of various social classes, groups, and associations. From a geographical perspective, this study is critical for understanding the interplay between social media, society, and sustainable development.

Sustainable development, as defined by geographers, is a harmonious balance between environmental, social, and economic factors. Moreover, social media enables researchers to synthesize data across spatial and temporal scales, offering insights into how netizens contribute to and engage with sustainable development initiatives. This study also bridges the gap between qualitative and quantitative research, helping geographers evaluate the effectiveness of social media-driven sustainability efforts and the academic discourse on sustainable development.

This study examines social media's role in promoting sustainability by analyzing published scholarly works and online activities. Given the multifaceted nature of virtual platforms, the research explores their effectiveness in advancing sustainable development and assesses how social media bridges the gap between formal and informal communication.

A bibliometric analysis using the Scopus database was conducted to review academic perspectives on social media, society, and sustainable development. While traditional viewpoints have often dismissed online social media as an ineffective tool for civil society engagement in spatial sustainability (Jaques, Islar, & Lord, 2019), this study advocates for the adoption of hybrid communication channels, blending digital and traditional methods to enhance stakeholder collaboration in sustainability initiatives.

2. Materials & Methods

The subject area of this study is highly interdisciplinary, it requires understanding and synthesis of a wide variety of scholarly materials from social sciences, spatial sciences, technology, regional planning, and material sciences. Therefore, a repository-based review protocol was adopted to address the identified issues primarily. Since this analysis is theoretical in nature, the Scopus database has been used to spot and review the published literature. Accordingly, inclusion and exclusion criteria were set up depending on a thorough review of the abstract of selected literature. An in-depth analysis is also conducted on social media platforms like Facebook, Twitter, Instagram, LinkedIn, and YouTube to explore prevalent activities related to sustainable development and assess public awareness within these networks. This includes identifying initiatives with large

followers/audiences and case studies. The social media platforms were selected based on their user strength. Hence this study follows a synthetic approach to rely on both published scholarly works and virtual evidence (Figure. 1).

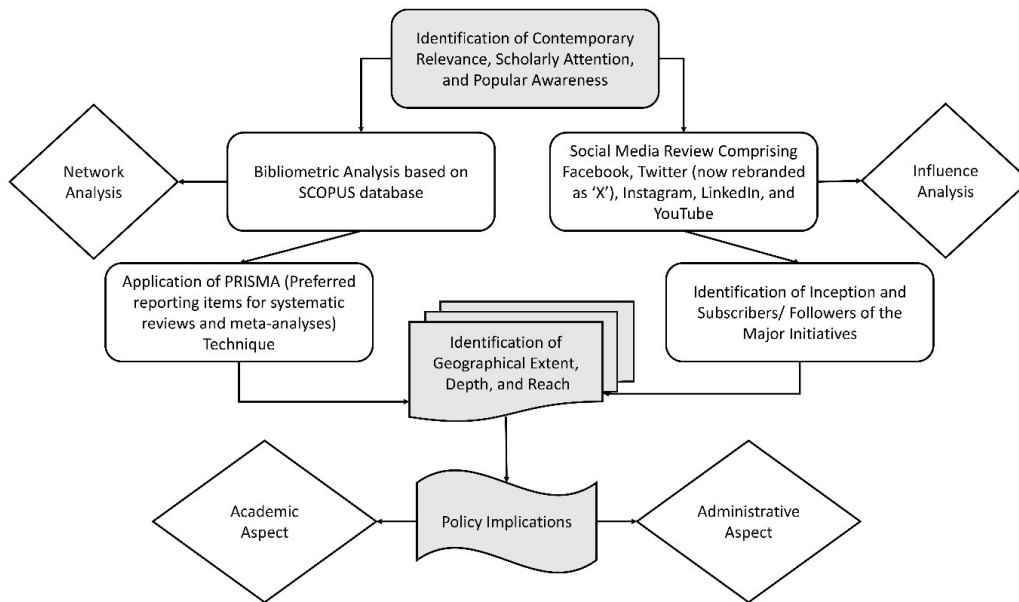
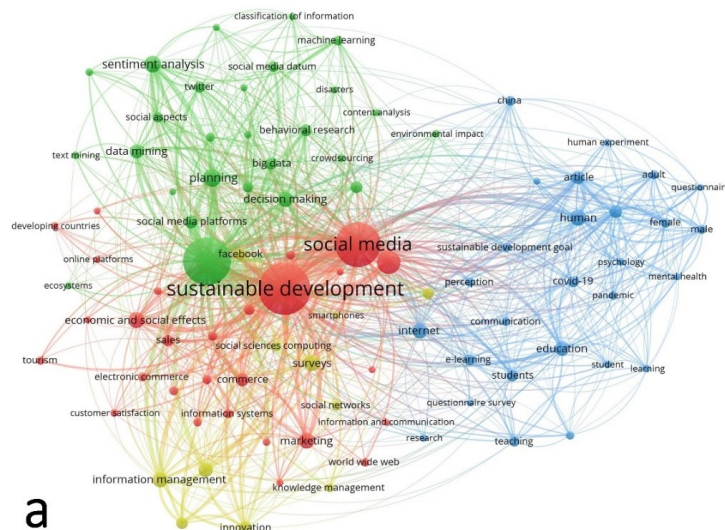


Figure 1. Flowchart of the Primary Concerns and the Methods Followed

The relationship between scholarly publications and social media is symbiotic. Scientific articles provide an evidence-based foundation for informed discussions, while social media platforms amplify their reach to broader audiences, including policymakers and bureaucrats. This interaction enhances knowledge dissemination and promotes public engagement in sustainable development initiatives. Ultimately, this dynamic relationship helps bridge the gap between academia and society, fostering a more informed and participatory discourse.

2.1 Search Strategies

To shortlist the relevant literature a title-abstract-keyword search was done in the Scopus database. Words used for this search were ‘Online AND Social AND Media AND Sustainable AND Development’ and ‘Social AND Media AND Society AND Sustainable AND Development’. This literary search identifies 649 and 895 published literatures respectively. The meta search and review were conducted in May-June 2023. The primary goal of this inquiry was to gain a comprehensive understanding of research on social media, society, and sustainability. This Scopus-generated bibliographic database was then mapped using VOSviewer (version 1.6.18). This analysis has taken into consideration both author-used and indexed keywords, and therefore, identified 227 keywords (93 and 134 respectively) having a minimum ten times co-occurrences (Figure. 2). Some of the major identified keywords reflected in this analysis include sustainable development, sustainability, social media, environmental protection, humans, societies and institutions, planning, decision making, economic development, education, social aspects, information management, public policy, innovation, knowledge management, social networking online), local participation, etc. This offers a preliminary insight into the field of study under consideration.



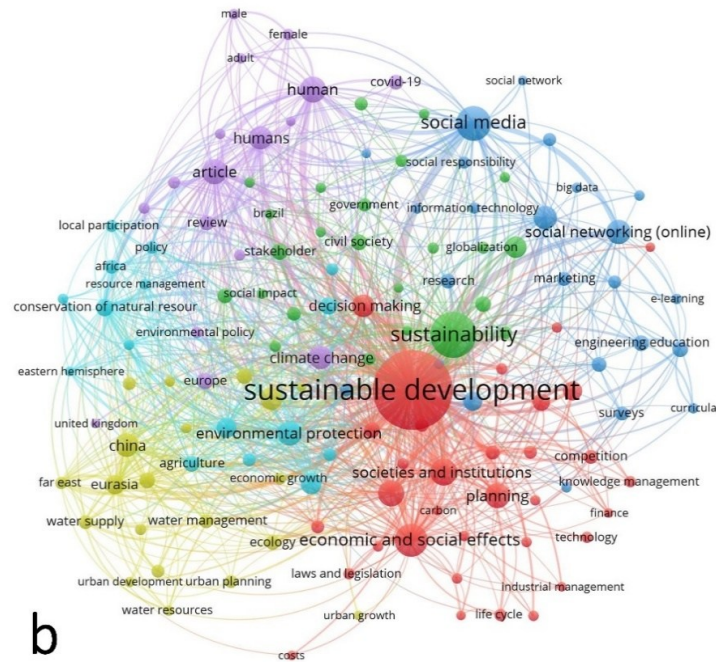


Figure 2. Network analysis of keywords (a) ‘Online AND Social AND Media AND Sustainable AND Development’ having minimum 10 co-occurrences with 93 keywords; (b) ‘Social AND Media AND Society AND Sustainable AND Development’ having minimum 10 co-occurrences with 134 keywords.

Table 1. Strength of Major Network Linkages

Online AND Social AND Media AND Sustainable AND Development				
Cluster Attributes	Cluster 1	Cluster 2	Cluster 3	Cluster 4
No. of Keywords	28	27	27	11
Major Keyword	Sustainable Development	Social Networking	Internet	Surveys
Link	92	91	79	65
Total Link Strength	1929	1667	289	270
Occurrence	416	350	45	49

Social AND Media AND Society AND Sustainable AND Development						
Cluster Attributes	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
No. of Keywords	33	24	24	20	17	16
Major Keyword	Sustainable Development	Sustainability	Social media	China	Article	Environmental Protection
Link	133	126	96	84	103	107
Total Link Strength	2038	713	456	308	501	453
Occurrence	455	164	101	48	54	53

Analysis of keyword clusters revealed four major clusters for the search term ‘Online AND Social AND Media AND Sustainable AND Development’ and six major clusters for ‘Social AND Media AND Society AND Sustainable AND Development.’ In addition to the keywords listed in Table 1, several other notable and recurring keywords emerged from these network linkages. These include climate change, economic and social effects, biodiversity, ecosystems, information technology, planning, societies and institutions, decision-making, Sustainable Development Goals (SDGs), big data, sentiment analysis, and behavioural research.

2.2 Inclusion & Exclusion Strategies

To facilitate a thorough review of scholarly publications relevant to the research questions, an inclusion and exclusion strategy was adopted (Figure 3). This approach helps identify the most relevant literature within the interdisciplinary domain of social media, society, and sustainability. After the primary focus of relevant literature selection, emphasis was given to synthetic approaches. For that purpose, the approach PRISMA (Preferred reporting items for systematic reviews and meta-analyses) was followed (Moher, Liberati, Tetzlaff, & Altman, 2009; Abelha, Fernandes, Mesquita, Seabra, & Ferreira-Oliveira, 2020; Huq, et al., 2021; Lopez-Concepcion, Gil-Lacruz, & Saz-Gil, 2022; De, 2023 a; De, 2023 b). It is a tool for direct and systematic analysis of academic literature that includes four consecutive phases namely identification, screening, eligibility, and included (Huq, et al., 2021).

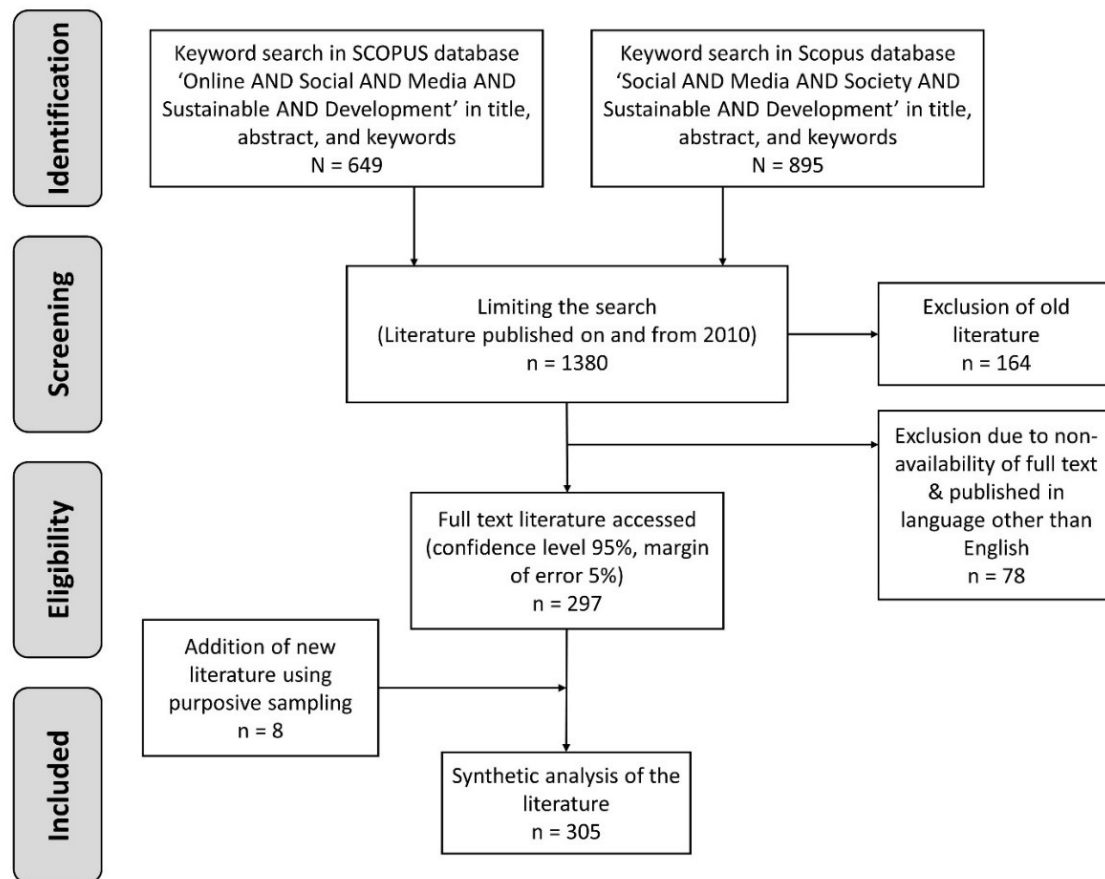


Figure 3. Schematic representation of the literature selected for the systematic synthesis of the scholarly publications using PRISMA

This meta-analysis included a total of 305 published research works on the subject from various regions worldwide. The dataset primarily consists of journal articles, along with a few purposively selected book chapters and government publications that were considered relevant for this synthetic study. During the Identification phase, an initial pool of 1,544 published works was shortlisted. Given the focus on recent trends and the contemporary relevance of the subject, 164 publications released before 2010 were excluded, marking the Screening phase. Additionally, 78 publications were excluded due to the non-availability of full text or non-English language constraints. In the Eligibility phase, a sample of 297 publications was selected based on a 95% confidence level with a $\pm 5\%$ margin of error. Subsequently, eight book chapters and government publications were added using purposive sampling for their thematic relevance. Thus, in the Included phase, a final total of 305 scholarly works ($n = 305$) were analysed (Figure 2).

The rationale behind adopting a dual approach—combining a Scopus database search with a PRISMA-based literature review—is to ensure comprehensive and systematic research. Scopus, as a leading academic database, provides access to high-quality publications, offering a reliable foundation for analysis. The PRISMA approach complements this by providing a structured framework to systematically map, evaluate, and synthesize literature. By integrating these methods, the study achieves robust and diverse data collection, effectively addressing the limitations of each approach when used independently. This dual strategy ensures a balanced and methodologically sound review, facilitating a thorough exploration of scholarly publications.

2.3 Reviewing Social Media Platforms

In addition to the meta-analysis, this research includes a systematic examination of major social media platforms, specifically social networking sites such as Facebook, Twitter (X), Instagram, LinkedIn, and YouTube (Table 2). This provides an in-depth overview of prevalent activities on social media and their role in promoting Sustainable Development Goals (SDGs). In reality, social media provides more comprehensive, quantitative, complex, and dynamic information to assist researchers in space and society (Boy & Uitermark, 2016).

Table 2. Global users of some leading social media: Facebook (Statista, 2023 a), Twitter (Blacklinko, 2023; Statista, 2022), Instagram (Statista, 2023 b; Statista, 2023 c; Zdnet, 2012), LinkedIn (Business of Apps, 2023 b), and YouTube (Business of Apps, 2023 a; GMI, 2023).

Year	Online Social Media Platform				
	Facebook (million)	Twitter (million)	Instagram (million)	LinkedIn (million)	YouTube (million)
2010	608	54	1	90	200
2015	1591	305	400	414	1200
2022	2963	368	1280	875	2600

3. Results

The major findings of this study are concerned with the recognition of the concept in published literature, and impressions on social media, as discussed in the following parts of this study.

3.1 Conceptualizing the Ideas

The concept and approaches for achieving sustainable development are inherently complex and dynamic. Scholars and researchers world-wide have proposed various strategies to attain this overarching goal. Across different studies, all 17 Sustainable Development Goals (SDGs) have been addressed in some capacity (Table 3). To provide a structured overview, this study adopts a systematic approach to summarize key findings from notable research works published since 2016, following the launch of the SDGs in 2015.

Table 3. Highlights of the research work done concerning online social media and sustainable development

Year of Publication	Citation	Highlights of the Research Work	Nature of Work
2022	Afolaranmi & Amodu (2022)	This study has recognized the importance of social media in conflict resolution through relationship building and the establishment of peace across boundaries. This is directly addressing the issues of peace, justice, and strong institutions (goal 16).	Opportunities
2022	De Luca, Iaia, Mehmood, & Vrontis (2022: a)	Global initiatives to enhance stakeholders' engagement to meet the SDGs in different dimensions with special reference to social media platform Twitter. A greater impact has been observed in developed worlds. Among the 17 SDGs, goals like partnerships for the goals (goal 17), climate action (goal 13), reduced inequalities (goal 10), life below water (goal 14), life on land (goal 15), and gender equality (goal 05) are found to be noteworthy.	Opportunities
2022	De Luca, Iaia, Mehmood, & Vrontis, (2022; b)	Focusing on stakeholder engagement through social media, particularly Twitter (X), this study highlights its role in enhancing the attainment of Sustainable Development Goals (SDGs). Online platforms can significantly contribute to advancing gender equality (Goal 5), reducing inequalities (Goal 10), climate action (Goal 13), life below water (Goal 14), life on land (Goal 15), and partnerships for the goals (Goal 17). While this study primarily examines the impact on firm activities, its findings are equally relevant in social and environmental contexts.	Opportunities
2022	Singh, et al. (2022)	The significance of tweets in climate change discussions highlights public concerns regarding the challenges of adopting sustainable consumption patterns and lifestyles. This aligns with Sustainable Development Goal (SDG) 13: Climate Action. Additionally, this research observes the interconnectedness of people's actions in addressing other SDGs, including No Poverty (Goal 1), Good Health and Well-being (Goal 3), Quality Education (Goal 4), Affordable and Clean Energy (Goal 7), Sustainable Cities and Communities (Goal 11), Life Below Water (Goal 14), and Life on Land (Goal 15).	Opportunities
2021	Giacomini, Rocca, Zola, & Mazzoleni (2021)	From the perspective of enhanced communication via social media, local governments are increasingly prioritizing citizen engagement in environmental issues. This research specifically examines the role of Facebook in this context, with a focus on Italy. It highlights the	Challenges

		two contrasting ends of the public service spectrum: municipalities' disclosure of information and citizens' responses.	
2021	Franco-Riquelme & Rubalcaba (2021)	This study highlights the importance of social media in digital business development, particularly in network building, product promotion, and crowdfunding. It leverages Twitter-based information mining to support the attainment of the United Nations Sustainable Development Goals (UNSDGs). More specifically, this system is closely linked to Goal 9: Industry, Innovation, and Infrastructure.	Challenges
2021	Grover, Kar, Gupta, & Modgil (2021)	This Twitter-based study examines the stances of political leaders on various Sustainable Development Goals (SDGs) set by the United Nations. It highlights the prominent role of European political leaders in addressing SDGs through online platforms.	Opportunities
2021	Marzouki, Chouikh, Mellouli, & Haddad (2021)	This research examines public engagement on social media, particularly Twitter, in expressing views on urban life, directly linking to Goal 11: Sustainable Cities and Communities. It emphasizes the inclusivity and resilience of cities and their connected communities while addressing economic, social, and environmental challenges. Additionally, the study highlights a strong focus on disaster risk reduction, urban settlements, transportation, and voluntary actions.	Challenges
2021	Shao, et al. (2021)	The UNSDG has reported its concern about making sustainable cities and communities (goal 11). With special reference to Tanzania, this study focuses on the application of Twitter data to supplement the remotely sensed measure of the nature of urban sprawl. This, in turn, opens up new dimensions to study urban morphology that support the goal of quality education (goal 4).	Opportunities
2020	ElAlfy, Darwish, & Weber (2020)	Compared to traditional communication mediums, social media has proven to be a more efficient tool for implementing Corporate Social Responsibility (CSR). In this context, YouTube, Twitter, and Facebook play significant roles. Among the most frequently discussed Sustainable Development Goals (SDGs) are Goal 3: Good Health and Well-being, Goal 7: Affordable and Clean Energy, Goal 5: Gender Equality, and Goal 9: Industry, Innovation, and Infrastructure. Notably, Twitter activities related to financial matters frequently focus on Goal 8: Decent Work and Economic Growth. Additionally, this study observes that material and consumer-based sectors are primarily concerned with Goal 12: Responsible Consumption and Production.	Challenges
2019	Calcagni, Maia, Connolly, & Langemeyer (2019)	This theoretical study focuses on the role of social media in delivering cultural ecosystem services, ultimately contributing to sustainability. It highlights the importance of collaboratively building relational values and fostering the growth of digital communities. Additionally, it recognizes the influence of various social and environmental factors in shaping a comprehensive value system and advancing sustainability.	Opportunities
2019	Nguyen, Han, & Sahito (2019)	The growing importance of mobile social networks in understanding urban dynamics, public space, and its sustainability with reference to Twitter has been discussed in this study. Geo-tagged information has gained significance in creating urban footprints, especially among the youth. Thus, creating an alternative source of big-data.	Opportunities
2018	Ilieva & McPhearson (2018)	Day by day social media data are getting relevant in human behaviour studies in urban areas. It facilitates real-time observations of different events. Thus, offering smarter solutions to deal with urban mobility, health & hygiene, social equity, public health, environment, economy, and sustainability.	Opportunities
2018	Pulido, Redondo-Sama, Sordé-Martí, & Flecha (2018)	This study has documented the notable contribution of social media in creating awareness to achieve the goal of zero hunger (goal 2).	Opportunities

2017	Rodrigues & Niemann (2017)	Research has documented that social media, particularly Twitter, plays a significant role in advocating for cleanliness in India. This, in turn, contributes to achieving Goal 6: Clean Water and Sanitation, ensuring universal access to safe water and sanitation.	Challenges
2016	Nik-Bakht & El-Diraby (2016)	This research has acknowledged the importance of social media in understanding public demands and community perspectives on urban infrastructure management. In today's technologically advanced world, social media serves as a crucial tool for crowdsourcing. The study specifically focuses on the computer architecture required for the effective implementation of a feedback mechanism.	Challenges
2016	Wang, Wang, Ye, Zhu, & Lee (2016)	This study focuses on the use of social media in emergency response systems to enhance urban sustainability. It highlights the importance of location-based information in understanding the geographical scope of an event. Additionally, the research acknowledges the vast amount of data generated by social media and its potential for improving emergency management.	Opportunities

3.2 Timeline of Published Research Works

A timeline analysis of the published research works extracted from the Scopus database indicates a gradually increasing trend in the frequency of studies related to 'Online Social Media and Sustainable Development'. A similar upward trend is observed for research on 'Society and Sustainable Development,' although a significant number of studies on the latter existed even before 2010 (Figure 4). From 2010 onwards, there has been a sudden surge in research activities focusing on online social media and sustainability, particularly in developing countries. Initially, the academic community was primarily concerned with achieving sustainable development, but with the rise of digital platforms, scholars began exploring the role of social media in promoting sustainability from economic, social, administrative, and ecological perspectives. Over the past decade, sustainability research has predominantly shifted its focus to identifying the impact of improvisation using digital tools across various sectoral activities. It has covered corporate activities (Zhong, Lu, Zhu, & Chen, 2022), small industries (Kurniawati, Kohar, & Pirzada, 2022), building construction (Palmer & Udawatta, 2019), forest management (Stupińska, Wieruszewski, Szczypa, Kożuch, & Adamowicz, 2022), psychological issues (Korneeva, Strielkowski, Krayneva, & Sherstobitova, 2022), environmental knowledge (Karim, et al., 2022) and protection (Simionescu, Horváthová, Kovshun, & Kushnir, 2020), literacy and education (Chen, 2021; Adekoya, 2022), adult education (Nwachukwu, Agboeze, Ugwunnadi, & Ugwueze, 2021), government service provisioning (Adrees, Sheta, Omer, Stiawan, & Budiarto, 2019), big data management (Rathinam, et al., 2021), transport and ridesharing (Tang, Duan, & Zhao, 2019), social marketing (Galiano-Coronil, Jiménez-Marín, Elías Zambrano, & Tobar-Pesántez, 2021), citizen's engagement (Bridge, et al., 2021), tourism (Zeng & Gerritsen, 2014; Gupta & Gupta, 2019; Laxmita, Setyaningsih, & Purwani, 2021), green space management (Munawir, Fujianti, Koerniawan, & Dewancker, 2021), etc. Not only that, online social media has played an inevitable role in advanced next-generation ventures like city branding (Thadani, Li, & Chan, 2020), next-generation communication (Piatrov, 2020), eco-innovations in business sectors (Rezníčková & Zaušková, 2020), disaster management (Lindsay, 2011; Waloejo, Ari, Anggraeni, Zakiyah, & Alfiah, 2018), promotional marketing (Jiaqi, Teo, Tingting, & Jiaxun, 2021), and machine learning (Khourdifi & Bahaj, 2020). While talking about new-age applications and recognizing people's preferences, social media is becoming quite handy for restaurant owners too (Chen, Riantama, & Chen, 2021). Even in some countries, political parties are using social media for democratic engagement (Xavier & Campbell, 2014; Molnár & Urbanovics, 2020).

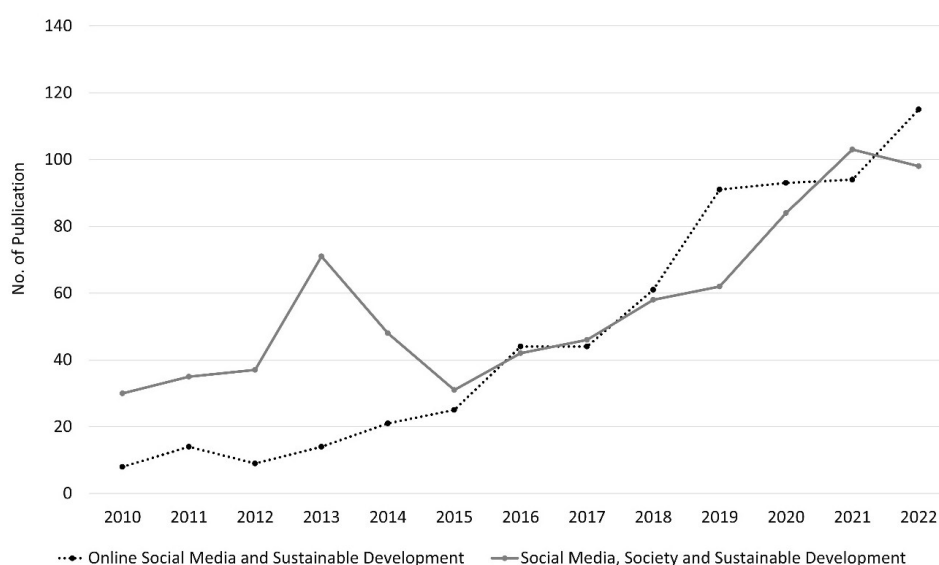


Figure 4. Timeline of the published research work on 'Online Social Media and Sustainable Development' & 'Social Media, Society and Sustainable Development'

3.3 Geographical Coverage of Research Work

This research has found out 85 specific countries have research publications on ‘Online Social Media and Sustainable Development’ and 101 countries have research publications on ‘Society and Sustainable Development’ (Figure. 5). As a whole, the USA is the most researched country with 224 publications, followed by China, United Kingdom, India, Australia, and Indonesia (having 186, 171, 86, 75, 71 publications respectively). Countries like Germany, Spain, Italy, and Canada (69, 68, 64, and 63 respectively) also have a sound number of publications on this matter.

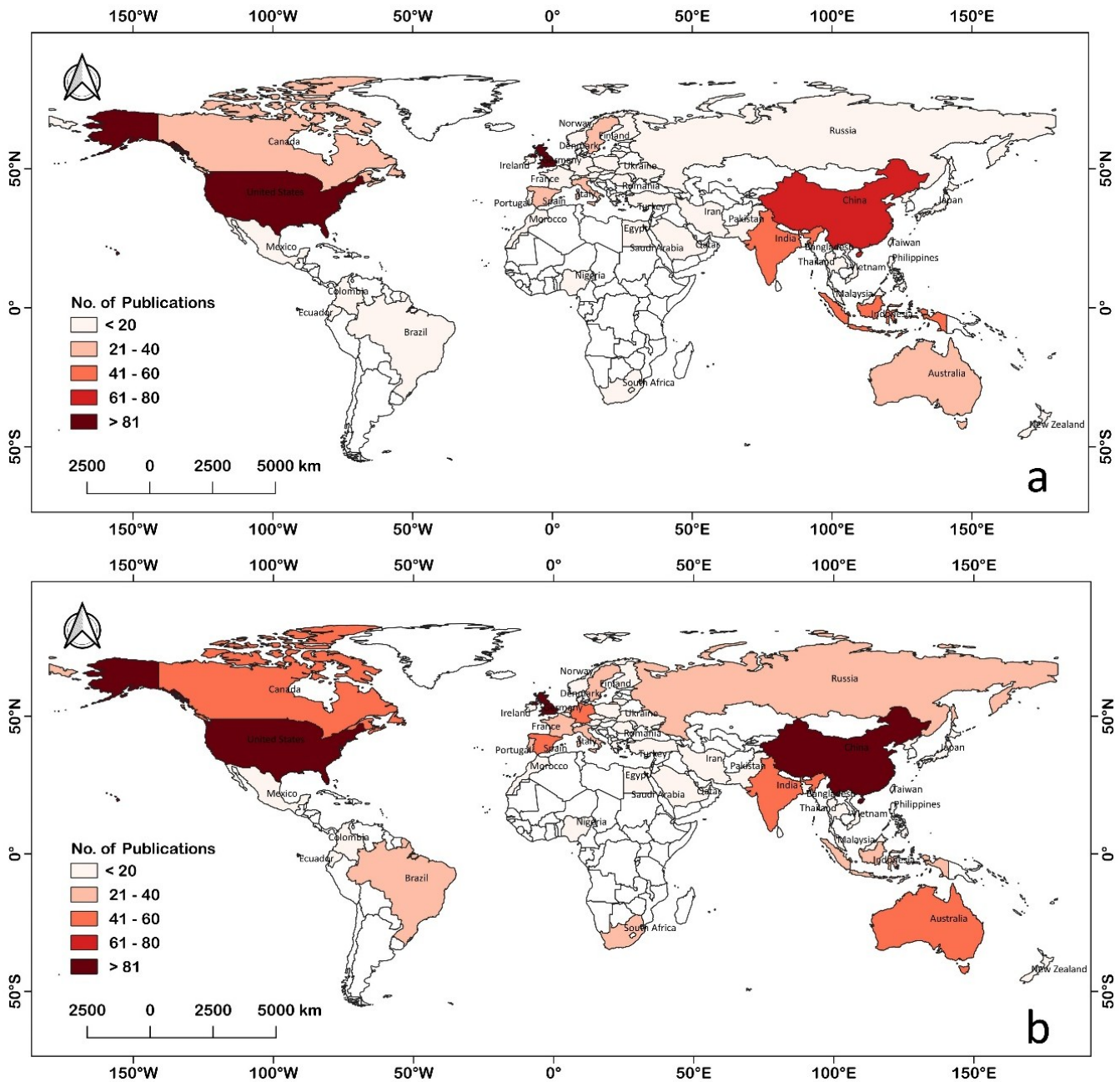


Figure 5. Spatial coverage of the published research works (a) Online Social Media and Sustainable Development (b) Social Media, Society and Sustainable Development

The number of internet users in the leading research-contributing countries (Figure 6) highlights potential opportunities for leveraging social media to promote Sustainable Development Goals (SDGs) through online initiatives. The primary regions considered include North America, Europe, Asia, and Oceania. It is noteworthy that while the developed nations of North America and Europe predominantly concentrate on these endeavours, there is a growing interest from the research community in the developing countries of Asia. This indicates a glimmer of optimism for academic and administrative communities regarding the potential utilization of social media for formal government matters.

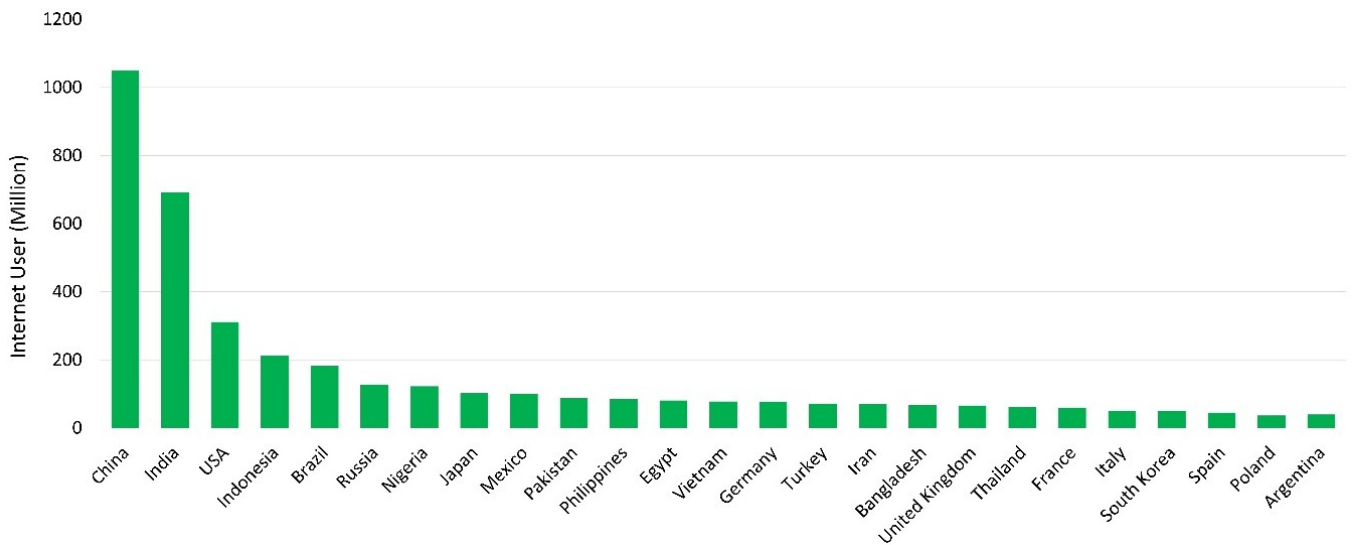


Figure 6. Country wise distribution of digital population (Statista, 2023 d)

3.4 Key Authors, Journals, and Publishers

This study has identified the most influential journals and authors contributing significantly to the intersection of social media, society, and sustainable development. The key findings are summarized in Table 4. Among the journals, Sustainability, published by MDPI, ranks highest for both keywords analyzed. Additionally, Wang Y stands out as the most cited author in this domain. The findings also highlight a notable dominance of Chinese authors in scholarly contributions and activities.

Table 4. Summary of the key authors, journals, and publishers of the scholarly publications

Online AND Social AND Media AND Sustainable AND Development			
Rank	Author with Citation	Journal	Publisher
1	Wang Y (127)	Sustainability (Switzerland) (7.7 %)	Springer (11.3 %)
2	Liu X (63)	IOP Conference Series: Earth and Environmental Science (3.7 %)	MDPI (10.2 %)
3	Wang Z (39)	Advances in Intelligent Systems and Computing (3.1 %)	Institute of Electrical and Electronics Engineers Inc. (9.1 %)
4	Chen J (11)	Journal of Cleaner Production (2.8 %)	Elsevier Ltd. (7.5 %)
5	Li X (8)	Lecture Notes in Computer Science (2.3%)	International Business Information Management Association, IBIMA (5.4 %)
Social AND Media AND Society AND Sustainable AND Development			
Rank	Author with Citation	Journal	Publisher
1	Wang Y (177)	Sustainability (Switzerland) (6.1 %)	MDPI (7.5 %)
2	Kar A K (96)	Journal of Cleaner Production (3.1 %)	Springer (6.1 %)
3	Wang Q (85)	Environment, Development and Sustainability (1.5 %)	Elsevier Ltd. (5.4 %)
4	Carayannis E G (78)	Environmental Management (1.5 %)	Emerald Group Holdings Ltd. (2.9 %)

5	Li W (70)	IOP Conference Series: Earth and Environmental Science (1.5 %)	Routledge (1.8 %)
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3.5 Initiatives on Social Media Platforms

This study has conducted several qualitative case studies focusing on Facebook, Instagram, Twitter (X), LinkedIn, and YouTube to analyze their role in promoting sustainable development. These platforms offer diverse features like micro-chatting, sharing, posting, and community building, which significantly enhance public outreach and engagement compared to traditional communication channels. These platforms facilitate easy information dissemination and opinion generation. Nowadays, both government and non-government organizations are using these platforms to convey messages and enhance community awareness about sustainable development.

Table 5. Initiatives on social media platform to promote sustainable development

Name of the Group/ Page/ Channel	Platform Used	No. of Members/Followers/ Subscribers	Time of Inception
Sustainable Development Goals	Facebook	26400	June 22, 2014
Sustainable development	Facebook	2700	February 22, 2015
Global Goals for Sustainable Development	Facebook	595000	January 01, 2016
Sustainable Development Goals for the 2030 Agenda	Facebook	19500	March 14, 2010
The Sustainable Development Goals (SDGs)	Facebook	651000	July 25, 2017
Sustainable Development Goals	Facebook	13200	September 23, 2015
SDG Talks: Innovative Discussion for Sustainable Development Goals	Facebook	2100	May 06, 2019
sdgsclub	Instagram	4505	Information Not Available
sdg.awareness	Instagram	1468	Information Not Available
The Sustainable Development Goals #SDGs @ConnectSDGs	Twitter	668000 (102000 Tweets)	September 2016
UN DESA Sustainable Development @SustDev	Twitter	2423000 (17500 Tweets)	March 2011
UN Sustainable Development Group @UN_SDG	Twitter	57300 (7749 Tweets)	September 2012
SDSN @UNSDSN	Twitter	31700 (11200 Tweets)	August 2012
Global Goals @GlobalGoalsUN	Twitter	4041000 (304000 Tweets)	February 2010
Action for Sustainable Development @Action4SD	Twitter	4950 (19100 Tweets)	September 2010
Sustainable Development Goals (SDGs) Connect™	LinkedIn	7491	2016
The Sustainable Development Goals Center for Africa (SDGC/A)	LinkedIn	2059	2016
Sustainable Development Goals Alliance (SDGA)	LinkedIn	2122	2017
Sustainable Development Goals Unit	LinkedIn	1150	2015

TED Talks	YouTube	22400000	December 01, 2006
United Nations	YouTube	2650000	May 22, 2006
UCLA	YouTube	879000	March 03, 2006
UNICEF Georgia	YouTube	228000	March 15, 2012
Sustainability Illustrated	YouTube	534000	November 01, 2013
United Nations Foundation	YouTube	113000	November 22, 2006

A recent case study on Facebook depicts a public group on Sustainable Development Goals (SDG). Besides conveying the general guidelines, it aims to develop societal consciousness to wake up for Mother Earth. This virtual group has more than 26400 members from different parts of the world. There are some expert members in this community to guide its members to act at the local level. This group is also collecting goods and money to help distressed people. Another case study on the Facebook group Sustainable Development identifies its activities to share ideas on clean and green eco-friendly energy. This group presently have more than 2700 members. The activities of this online public group are directly related to the UNSDG goal 7: to guarantee the availability of energy that is both affordable, dependable, and environmentally friendly. (UNDP, 2022). Similar kinds of initiatives are also evident on the YouTube platform, where numerous video lectures, special talks, awareness initiatives, and educational content are available completely free of cost. Most importantly, these initiatives have gained impetus from 2010 onwards (Table 5). Initially, these were focused on Millennium Development Goals, but later on, with the promotion of SDGs, their focus has shifted to ensure better living on earth by 2030. It proves that the United Nations Organization, being the premier organization of cooperation and communication is also applying for a leading role on social media platforms. Not only that, country-level and continent-wide initiatives are also coming into the limelight of the discussion.

4. Discussion

What role does social media play in promoting sustainability, as reflected in scholarly works? This study highlights a growing emphasis on conciseness and consensus-building. The constructive role of social media in promoting government policies (Rodrigues & Niemann, 2017) and enhancing mobility, health and hygiene, social equity, and public health awareness is well-documented (Ilieva & McPhearson, 2018). Additionally, citizen engagement in local development activities has emerged as a promising area where social media facilitates easy and real-time communication (Giacomini, Rocca, Zola, & Mazzoleni, 2021). However, timely and effective responses from political leaders remain a crucial need.

How do internet-based activities, such as social media, contribute to sustainable development? Social media plays a pivotal role in promoting social education and fostering collective action. It enables knowledge-sharing on numerous UNSDG targets, fostering global conversations on sustainability. Advocacy campaigns amplify marginalized voices, promote ethical consumption, and influence legislative changes. Virtual communities often replicate these initiatives through waste reduction efforts and increased adoption of renewable energy. Moreover, social media enhances collaboration by facilitating the exchange of innovative solutions to spatial and environmental challenges.

How does social media bridge the gap between formal and informal communication? Social media serves as a dynamic channel for integrating formal and informal communication within sustainability discourse. Real-time interactions enable broader community engagement through informal discussions while simultaneously providing a platform for the scientific community to explore complex issues. This dual function helps decentralize information access, fostering diverse perspectives and enhancing community awareness.

Looking ahead to strategies that enhance the effectiveness of virtual platforms in promoting sustainability, this study identifies maximizing engagement and leveraging interactive tools—such as videos, virtual webinars, and interactive chats—as key to advancing sustainable development education (*UNSDG Goal 4: Quality Education*). Social media campaigns effectively raise awareness and encourage pro-environmental behaviour. Moreover, these platforms help reduce carbon footprints by minimizing the need for physical gatherings.

In this context, Artificial Intelligence (AI) plays a crucial role in content dissemination, user engagement, and the promotion of sustainable livelihood practices. AI-driven algorithms curate personalized content, foster eco-friendly behaviours, and support sustainability-focused marketing and consumption patterns. In recent years, AI has significantly influenced sustainability education by offering opportunities in legal education and bridging the digital divide (Balan, 2023).

While extensive research supports the positive role of social media in sustainability efforts, opposing arguments persist. The spread of unverified and falsified information on social media poses serious threats to environmental conservation, as seen in the case of wildlife protection in Indonesia (Supriadi, Agustin, & Sirait, 2018). Additionally, the growing reliance on e-technologies—integral to social media—may contribute to increased electronic waste (Tjoa & Tjoa, 2016).

Beyond environmental concerns, social media raises ethical and security issues, including privacy breaches (Akram & Kumar, 2017), cyberbullying (De & Chatterjee, 2018), hacking (Siddiqui & Singh, 2016), online criminal activities (Amedie, 2015), misinformation (Venegas-Vera, Colbert, & Lerma, 2020), and fabricated news (Pulido, Redondo-Sama, Sordé-Martí, & Flecha, 2018). The misuse of social media (Williams, Johnson, & Patterson, 2013) underscores the need for better anticipation and mitigation strategies before implementing social media applications in sustainability initiatives.

Simultaneously, the rapid development of social media has posed serious threats to social and urban sustainability. It often amplifies inequalities by glorifying affluent lifestyles, leading to mental distress among others. Additionally, it promotes gentrification by idealizing so-called "modern" living, which, in gentrified neighbourhoods, can foster social marginalization and disrespect toward underprivileged communities. The sudden rise in property values and the displacement of long-standing residents disrupt local socio-cultural practices. To some extent, social media

serves as a platform for displaying social status rather than fostering inclusivity (Bronsvort & Uitermark, 2022). Furthermore, the replacement of grassroots movements with superficial online campaigns often results in limited real-world impact.

Additionally, social media-driven globalization encourages unsustainable consumerism, often silencing local cultures and traditional practices. The digital divide further exacerbates inequalities, preventing impoverished communities from accessing digital platforms and hindering social progress. Additionally, misinformation, a byproduct of social media, obstructs informed decision-making in sustainable development. Nevertheless, the need of the hour is to adopt a balanced and inclusive approach to optimize social media's potential for sustainable development.

4.1 Limitations of this study

A deeper understanding of social media architecture and user psychology is essential for designing a comprehensive social media strategy that enhances knowledge exchange and information dissemination in support of the Sustainable Development Goals (SDGs). Input from software developers and psychologists is particularly valuable in this regard. However, these aspects have not been fully addressed within the limited scope of this paper. Further investigation into the real-world activities of organizations and individuals who actively engage with social media is necessary to better leverage these platforms for sustainable development. Beyond Scopus, metadata from other academic repositories—such as Web of Science, Mendeley, ERIC, and PubMed—could provide additional valuable insights. Moreover, the success of such initiatives depends on achieving comprehensive e-literacy and e-readiness at all levels.

4.2 Policy implications and conclusions

The increasing use of digital platforms has ushered in a new era for global society and the economy. Social media now plays a predominant role in shaping various aspects of human behaviour, life, and livelihood. Consequently, research on social media and sustainable development presents opportunities in five key dimensions: public participation, community building, stakeholder partnerships, affordable technological innovations, and addressing spatial imbalances.

This study observes that social media initiatives primarily focus on the broader aspects of the Sustainable Development Goals (SDGs). Meanwhile, published research has explored each individual SDG. With the growing number of global internet users, social media has undoubtedly emerged as a powerful tool for raising awareness and fostering consensus on sustainability issues.

Since the early 21st century, the number of internet users worldwide has surged from 361 million (5.8% of the global population in 2000) to 5.54 billion (69% of the total population in 2022) (Miniwatts Marketing Group, 2023). This trend underscores the academic community's increasing focus on leveraging social media for sustainable development.

A keyword search using the Scopus database reveals a meaningful correlation between sustainable development and key topics such as society, environmental protection, decision-making, knowledge management, planning, big data, and ecology. Scholars from countries such as the United States, the United Kingdom, China, India, and Australia have made significant contributions to this field of study.

This paper further advocates for greater academic engagement in qualitative research on the intersection of social media, society, and sustainable development. When exploring the theoretical background, researchers are encouraged to rely on authentic, peer-reviewed literature to deepen academic insights. Additionally, comprehensive studies are needed to identify technological misuse and the potential pitfalls of popularizing sustainability concepts. From a methodological perspective, it is essential to thoroughly examine non-traditional information sources, particularly social media platforms. This ongoing analysis establishes a new framework for exploring sustainability research. Furthermore, bureaucrats may benefit from incorporating social media initiatives and research findings into policy planning to align with the Sustainable Development Goals (SDGs). While recognizing social media's impact on SDG-related actions at local, regional, and global levels, this study also highlights its dual role in shaping communities. On one hand, social media fosters community building by enabling networking and collaboration (Gazi et al., 2024). On the other hand, it can contribute to community fragmentation by amplifying socioeconomic disparities, as elites may suppress marginalized voices. Additionally, divergent political views often provoke social conflicts, further deepening inequalities (Sergeant & Tagg, 2019).

This paper argues that while social media applications influence social attitudes, their impact is secondary to the broader framework of sustainable development. Accordingly, this study identifies diverse avenues for sustainability research, addressing both academic and administrative dimensions. Looking forward, this paper emphasizes the need to promote sustainable development, highlighting its benefits and challenges through research publications and social media engagement. However, it acknowledges the absence of standardized quality assessment benchmarks in research on social media, society, and sustainable development. Greater interdisciplinary collaboration is essential to enhance the rigor and impact of such studies. Moreover, bridging the gap between sustainability planning and implementation requires deliberate and well-coordinated efforts to ensure effective real-world application.

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