Optimizing Social Media Platforms to Foster Active Public Engagement in Tackling Climate Change and Environmental Conservation

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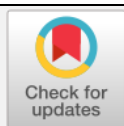[2] Department of Product Research and Software Development, TPL Logistics Pvt Ltd, Karachi, Pakistan

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ABSTRACT

This research aims to optimize social media platforms to foster active public engagement in tackling climate change and environmental conservation. Social media enables rapid and widespread dissemination of information, creates space for public discussion, and encourages collective action on environmental issues. In this study, researchers applied a qualitative method with a systematic literature review approach, using bibliometric analysis using the Scopus database. The analysis results show a significant increase in publications related to this topic from 2019 to 2024, reflecting the important role of social media in climate change mitigation efforts. With interactive features such as hashtags and online campaigns, social media strengthens awareness and collaboration across communities, governments, and the private sector. In addition, social media plays a role in building digital communities that support each other in promoting environmentally friendly behaviors. The study also highlights the importance of managing accurate information to avoid disinformation and maximize the positive impact of digital platforms on sustainable environmental policy advocacy.

1. Introduction

Social media is an internet-based platform or service that allows users to interact, share content, communicate, and build social networks online. Social media encourages public participation in environmental issues (Suryaputra et al., 2024). With its ability to raise awareness, facilitate engagement, and promote pro-environmental behavior, social media is an effective tool for driving collective action (Thanya & Suganthan, 2023). Through these platforms, information on various environmental issues can be disseminated widely and quickly, allowing users to access relevant data, engage in discussions, and take concrete actions in environmental protection efforts (Tian et al., 2021). This makes social media an important tool for strengthening public participation in environmental sustainability and welfare (Azrai et al., 2024).

Climate change and environmental conservation are increasingly urgent global issues (Lebel & Nilsson, 2024). Active public engagement in this endeavor is crucial as the impacts of climate change touch every aspect of human life. As a modern communication platform, social media can significantly encourage wider and faster public engagement (Baack et al., 2024). It allows instant dissemination of information to different layers of society, facilitates open discussions, and creates space for campaigns that can reach more people (Rodella & De Giacomo, 2023). Therefore, the use of social media as a tool to mobilize people's active participation in addressing climate change and preserving the environment needs to be optimized (Maphanga et al., 2023).

Climate change is a global challenge requiring shared and sustainable solutions (Thanya & Suganthan, 2023). One of the main solutions is to switch to clean energy. Reducing dependence on fossil fuels and switching to renewable energy sources such as solar, wind, and hydropower can significantly reduce greenhouse gas emissions (McGovern & Thorne, 2021). The development of green technologies is also an important part of this solution, including the development of electric vehicles and improved energy efficiency in the industrial and residential sectors. In addition, government policies that support the use of renewable energy, such as incentives for green companies and the implementation of carbon taxes, are needed to accelerate the transition (Ahmad et al., 2020).

In addition, climate change has caused various environmental problems that have far-reaching impacts on ecosystems and human life. One of the main impacts is the rise in global temperature, which triggers extreme heat waves, changes weather patterns, and increases water evaporation. It has also contributed to increased frequency and intensity of natural disasters such as floods, droughts, forest fires, and stronger storms due to warmer ocean temperatures.

Nature-based solutions also play an important role in addressing climate change (Angeli et al., 2022). Forest restoration, biodiversity protection, and rehabilitation of ecosystems such as peatlands and mangroves can naturally absorb atmospheric carbon dioxide (Safitri et al., 2024). Planting trees and implementing sustainable agricultural practices can maintain ecosystem balance while providing economic benefits to communities (Farouq & Sulong, 2024). Community participation through education, awareness campaigns, and local action in climate change mitigation is also very important. Collaboration between the government, private sector,

and local communities is key to creating comprehensive solutions that positively impact the environment (Loopmans et al., 2022).

Public engagement is an effort to address climate change and preserve the environment. With active participation from the public, solutions to environmental problems can be expanded and accelerated through collective action (Altassan, 2023). Individuals and communities are important in supporting sustainable issues, such as reducing carbon emissions, recycling, saving energy, and using natural resources wisely (Hendrastiti et al., 2023). Through campaigns, education, and collaboration with the government, non-governmental organizations, and the private sector, communities can encourage behavioral changes and policies that are more environmentally friendly. In addition, public engagement enables better oversight of environmental policy implementation, ensuring the sustainability of climate change mitigation efforts. When the public is actively involved in environmental solutions and actions, success in maintaining ecosystem balance and mitigating climate change impacts becomes more tangible. It can be felt at all levels of society (Ahmad et al., 2020).

Utilizing various platforms, especially digital technology and social media, is a key strategy for strengthening environmental conservation efforts. These platforms provide broad access to the public to obtain information related to environmental issues quickly and easily (Bires & Raj, 2021). Social media, for example, enables more effective dissemination of environmental campaigns, connecting individuals with communities, organizations, and pro-environmental movements in different parts of the world. With interactive features such as hashtags, educational videos, and online challenges, the public is encouraged to actively engage in collective actions such as reducing plastic waste, supporting sustainable products, or participating in tree planting activitie (Delaroche et al., 2022).

In addition, digital platforms also enable environmental organizations and activists to mobilize resources, raise funds, and monitor environmental changes in real-time through apps and data-driven technologies (Fouche & Herbig, 2024). It strengthens climate change mitigation efforts by providing innovative solutions like ecosystem mapping, recycling applications, and energy monitoring systems. Strategic utilization of the platform enables cross-sector collaboration between the government, private sector, academia, and the general public to create more coordinated and sustainable solutions for preserving nature.

This research aims to optimize social media platforms to foster active public engagement in tackling climate change and environmental conservation. In this case, using social media to optimize platforms to encourage active public involvement in addressing climate change and environmental conservation is a strategic step in the digital era. Social media has a wide reach. It can convey the urgency of climate change issues in a more emotional and personalized way so that people feel more involved. However, it is also important to ensure that the information disseminated is accurate, avoids disinformation, and that the platform is used as an advocacy tool supporting sustainable policies.

2. Literature Review
2.1. What is Climate Change

Climate change is a natural phenomenon characterized by extreme changes in climatic elements, resulting in increased incidence of floods and droughts. This phenomenon results from shifts in rainfall characteristics, including depth and intensity (Panda et al., 2024; Yasa et al., 2024). Climate change in Indonesia has a major impact on various sectors, including the environment, economy, and public health (Firdaus & Wandira, 2022). Rising temperatures and changing rainfall patterns are triggering meteorological extremes, including floods, droughts,

and increased frequency of storms. As a result, many coastal areas face the danger of rising sea levels, which intensifies coastal erosion and inflicts damage on coastal ecosystems. The agricultural sector is also affected by climate change, as changes in growing seasons and reduced crop yields jeopardize food security (Malihah, 2022).

Climate change exacerbates the likelihood of natural disasters, such as forest fires and peatland degradation, which worsen air quality and pose risks to public health(Sarvina et al., 2020). As a country comprised of islands with significant biodiversity, Indonesia faces great challenges in adapting to and mitigating the impacts of climate change through implementing sustainable policies and fostering international cooperation (Nugroho et al., 2023).

2.2. Public Participation in Climate Change Mitigation and Adaptation

Public participation in climate change is essential to raise awareness and encourage collective initiatives to address its impacts. Climate change is a universal predicament affecting all aspects of existence, thus underscoring the need for public engagement in strengthening mitigation and adaptation strategies (Van Tricht et al., 2023). Public engagement can cover various modalities, including environmental education, policy advocacy, and adopting environmentally friendly practices, such as reducing plastic consumption, minimizing carbon footprint, and promoting local goods(Brotherston, 2024). In addition, individuals can take part in hands-on efforts, such as reforestation, waste removal, and air and water quality monitoring. With adequate educational resources and information dissemination, individuals are empowered to take an active role in sustainable decision-making processes and to exert pressure on government bodies and the private sector to enact policies that benefit the environment(Skarzauskiene et al., 2024).

Community engagement significantly enhances community resilience to climate change, especially in developing countries with increased vulnerability to its impacts (Elroy et al., 2024). Such participation facilitates the exchange of local knowledge and community-driven methodologies to address the unique consequences of climate change in their geographical areas (Parras et al., 2020). The presence of supportive government policies, favorable regulations, and access to adequate resources and technological advances strongly influence community engagement. This proactive engagement fosters a sense of individual responsibility in environmental conservation while strengthening the social fabric in the face of an increasingly urgent climate crisis (Gunay & Gucdemir, 2024).

2.3. Using Social Media for Public Engagement

Social media has an important function in enhancing public engagement on climate change. Platforms such as Instagram, Twitter, Facebook, and TikTok facilitate the wide and rapid transmission of information related to climate change (Rifki et al., 2024). Through social media, environmental organizations, activists, and the general public can disseminate up-to-date information, empirical data, and guidance on the impacts of climate change and methods to reduce individual carbon emissions (Mandal et al., 2024).

Social media enhances two-way interactions that foster cross-community dialog and collaboration in addressing the climate crisis (Lutfie & Sutan, 2024). Individuals can share personal experiences, exchange innovative ideas, and advocate for green practices in their localities, thus expanding the scope of environmental education (Elroy et al., 2024). Social media also empowers marginalized or geographically isolated communities to express their perspectives on climate change, thus attracting the attention of policymakers and the wider

public. By harnessing the power of social media, community engagement on climate change can evolve into a more inclusive and sustainable effort (Dellmuth & Shyrokykh, 2023).

3. Research Methodology

In this study, researchers applied a qualitative method with a systematic literature review approach, using bibliometric analysis using the Scopus database and focusing on publications between 2019 and 2024. Data was obtained through internet searches and previous journals to illustrate and describe the results of the processed analysis. Most of the information was collected from two main sources, Scopus and VOSviewer, which became the main basis for preparing the research material(Younus et al., 2024). In this case, researchers used VOSviewer to analyze the novelty of previous research by using the last 5 years of literature studies to be more specific. Instagram social media accounts are used as a supporting tool in disseminating information about climate change.

The data mining process in Scopus involves five different stages. In the initial stage, searches were classified by keywords such as "Optimizing Social Media," "Public Engagement Climate," "Tackling Climate Change," "Environmental Conservation Strategies," and "Active Public Participation," which were determined through category analysis, abstracts, or the keywords themselves. The initial result of this step was 39,443 papers. In the second stage, the authors limited the search period to five years, i.e., from 2019 to 2024, to obtain the most recent references on digital governance, which resulted in 245,884 papers at this stage. Furthermore, in the third stage, the papers were categorized in English only, resulting in 11,383 documents, to avoid language bias in data processing. with keywords (TITLE-ABS-KEY ("Optimizing Social Media") OR TITLE-ABS-KEY ("Public Engagement Climate") OR TITLE-ABS-KEY ("Tackling Climate Change") OR TITLE-ABS-KEY ("Environmental Conservation Strategies") OR TITLE-ABS-KEY ("Active Public Participation")) AND PUBYEAR > 2018 AND PUBYEAR < 2025 AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (SRCTYPE , "j") OR LIMIT-TO (SRCTYPE , "b") OR LIMIT-TO (SRCTYPE , "p")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (SUBJAREA , "SOCI")).

4. Results and Discussion
4.1. Results

Based on the analysis of Optimizing Social Media Platforms to Address Climate Change, various data. The results show that 1,041 articles related to Optimizing Social Media Platforms to Address Climate Change were published on the Scopus website. Document limitations of articles and social science fields in the last five years, from 2019 to 2024, as in **Figure 1**.
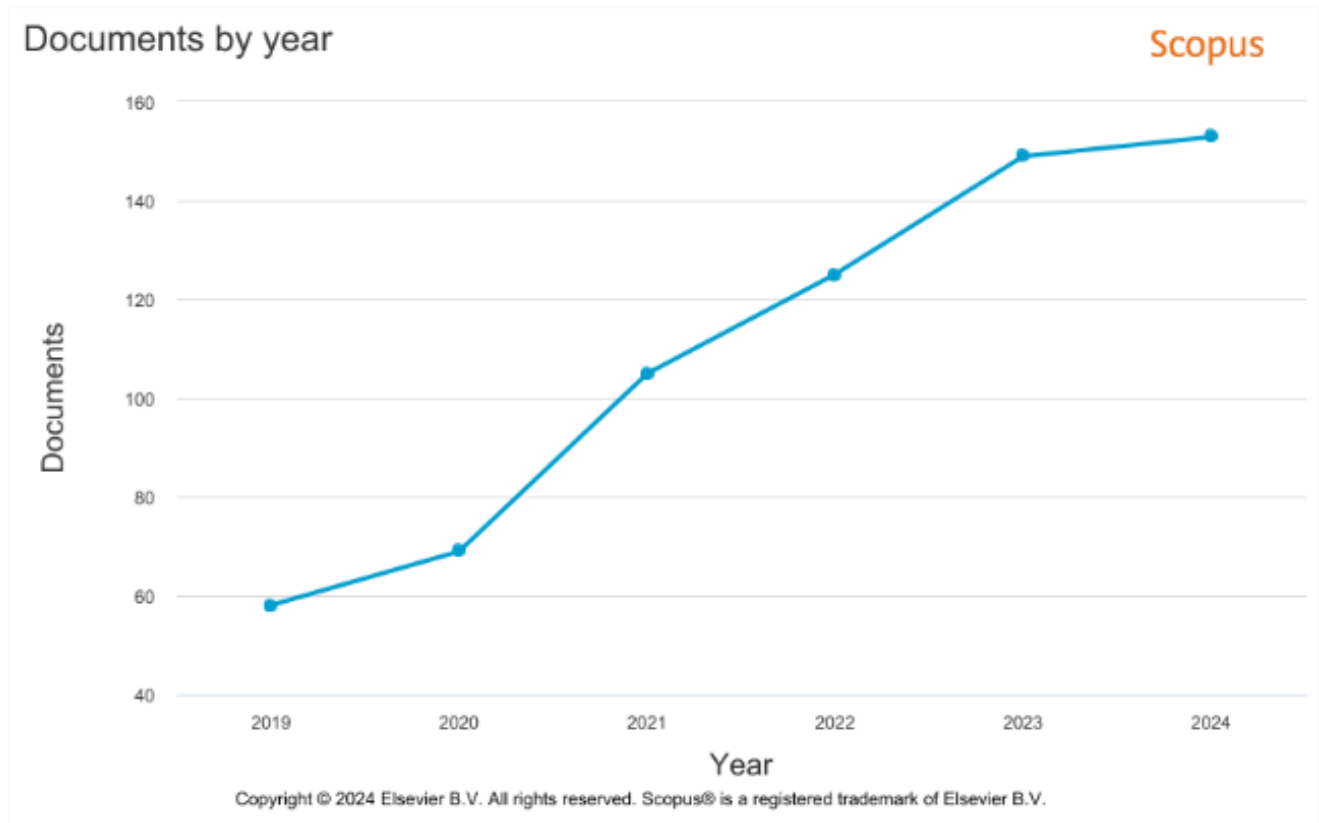
Figure 1. Documents by year
Source: Scopus database

Figure 1 above shows an increase in the document graph from 2019 to 2024. The lowest number of publications was in 2019, with 59 articles, and the highest increase was in 2024, with 155 articles. This situation shows that research on Optimizing Social Media Platforms to Address Climate Change is a topic that is often the main focus and continues to be an important topic of discussion every year. Based on the previous analysis, the number of publications and citations is projected to continue to increase, given the potential of this topic to reach a wider global audience.

4.2. Network Analysis Optimizing Social Media in Climate Change

Figure 2. Co-occurrence network analysis
Source: VOSviewer

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Figure 2 illustrates the method of grouping various themes and the sequencing of these groups to be analyzed based on correlations relevant to the topic discussed.

Table 1. Cluster Network Analysis

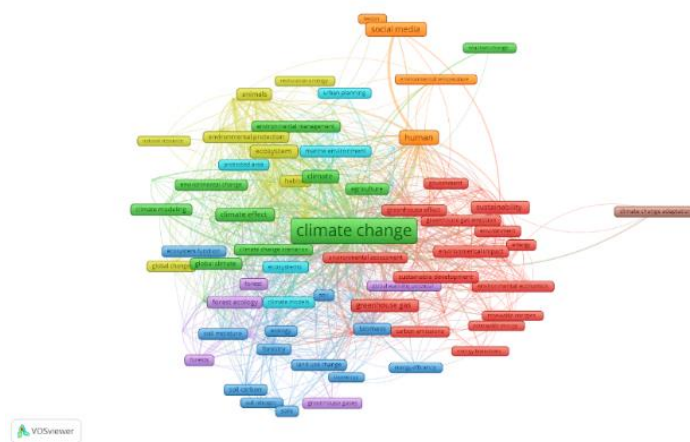| Keywords	Cluster
Climate change, climate effect, global climate, climate modeling, environmental management, environmental change	1
Environmental assessment, sustainable development, sustainability, greenhouse effect, environment	2
Global change, ecosystem, natural resource, environmental protection, restoration ecology	3
Ecology, forestry, land use change, biomass, energy efficiency	4
Climate models, ecosystem, urban planning, protected area, marine environment	5
Human, environmental temperature, social media, Twitter	6
Global warming potential, forest ecology, forest, greenhouse gases	7

Source: VOSviewer

In Figure 2 and **Table 1**, clusters 1, 2, and 3 are highlighted as they are more relevant to the issue of renewable energy sustainability. Cluster I indicates that the dominant keywords include climate change, climate effect, global climate, climate modeling, environmental management, and environmental change. Climate change is a global phenomenon characterized by shifts in weather patterns, an increase in the Earth's average temperature, and long-term impacts on ecosystems. Its consequences include rising sea levels, a higher frequency of natural disasters such as floods and droughts, and threats to biodiversity. Climate modeling is crucial for projecting future climate change and understanding the complex relationships among global climate factors. In environmental management, key priorities involve mitigating greenhouse gas emissions, adapting to environmental change, and conserving natural resources to minimize the negative impacts of climate change.

Cluster 2 Environmental assessment, sustainable development, sustainability, greenhouse effect, environment, and the importance of environmental effectiveness is a process to realize sustainable development. This concept balances economic growth, social welfare, and environmental sustainability. In these efforts, managing the greenhouse effect is the main focus, considering that emissions of gases such as carbon dioxide and methane contribute significantly to global climate change. Humans can minimize environmental degradation and maintain the Earth's carrying capacity for current and future life through sustainability strategies, such as using renewable energy, resource efficiency, and ecosystem preservation.

Cluster 3 dominant keywords are Global change, ecosystem, natural resource, environmental protection, and restoration ecology; as we know, Global change, such as climate change and urbanization, has put great pressure on the world's ecosystems and natural resources. These impacts are seen in habitat destruction, biodiversity decline, and clean water crises. To address these challenges, environmental protection approaches are becoming increasingly important, including restoration ecology, which focuses on restoring disturbed ecosystem functions. These efforts help mitigate the impact of global change and support the sustainable use of natural resources.

In a case study of climate change in Indonesia, Changes in weather patterns due to climate change have increased the intensity of extreme rainfall in Indonesia, leading to major floods

and landslides. One example is the floods that hit Jakarta in early 2020. Unusually high rainfall on New Year's Eve caused many areas in Jakarta to be submerged in water with varying heights, ranging from 30 cm to more than 2 meters. The floods submerged thousands of homes, paralyzed economic activities, and forced thousands of people to evacuate to safer places. In addition to material losses, this disaster also claimed lives due to drifting or electric shocks.

In Sumedang, West Java, a major landslide occurred in January 2021, triggered by heavy rains that lasted several days. The soil could not absorb large amounts of water, so it moved, destroying houses and surrounding infrastructure. The landslide killed dozens of people, including rescue teams trying to evacuate the victims. In addition to extreme rainfall, environmental conditions such as land conversion and lack of soil-retaining vegetation also exacerbated the impact of the landslide in this region. These events serve as a reminder of the importance of better spatial management and environmental conservation to reduce disaster risk.

The floods in Jakarta and landslides in Sumedang show the real impact of climate change on Indonesia's weather patterns. Unusual rainfall intensity is now a big challenge for the government and the community in dealing with disaster risks. Therefore, mitigation measures such as increasing drainage capacity, reforestation of critical land, and community education on disaster preparedness are needed. In addition, cooperation between sectors and developing policies based on climate data are essential to reduce the impact of extreme weather changes in the future.

4.3. Overlay Analysis Optimizing Social Media in Climate Change

Overlay analysis is related to observing the period between publishing articles in climate change studies. This process is carried out by considering the thickness or dominance of elements in the visualization. The color on the node represents the year of publication of the article containing a specific keyword; in this case, the keyword used is "climate change." Nodes with darker colors indicate that the topic has been the focus of research for a longer time, while lighter colors indicate that the topic is of concern in recent research.
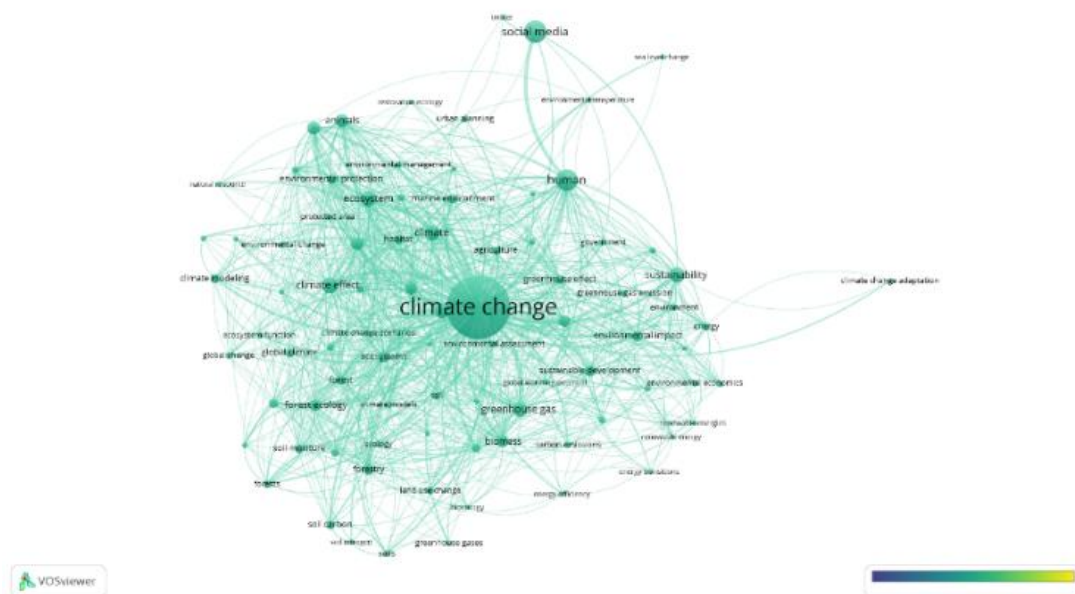

Figure 3. Overlay analysis
Source: VOSviewer

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Figure 3 overlay analysis shows significant differences related to the study theme of Optimizing SocialMedia in Addressing Climate Change in 2024. The focus above is climate change, the greenhouse effect, social media, Twitter, and the ecosystem. Climate change is the impact that is currently being discussed, such as changes in weather patterns and rising sea levels. This affects natural ecosystems, food production, and the availability of clean water while increasing the frequency of natural disasters such as floods and droughts. In addition, climate change exacerbates social inequalities, especially in regions most vulnerable to its impacts, such as developing countries.

The impact of climate change in Indonesia is very diverse and affected by different local conditions in each region. For example, an increase in maximum temperatures is expected to occur on the island of Java, while areas such as Central and South Kalimantan are experiencing an increase in dry days, which impacts drought. Meanwhile, in West Nusa Tenggara (NTB) and East Nusa Tenggara (NTT), climate change can increase the incidence of extreme rainfall during the rainy season, potentially causing flooding. Coastal areas, such as Jakarta, are threatened by rising sea levels that can exacerbate seawater erosion and intrusion. Indonesia's southern region, a food hub, is also experiencing direct impacts from extreme weather, such as tropical cyclones and vortex storms exacerbating flooding.

The importance of social media in providing accurate information in various affected areas is to provide an understanding of climate change among the global community. Platforms such as Twitter, Instagram, and Facebook allow for the rapid and widespread dissemination of scientific information, providing space for scientists, activists, and environmental organizations to share the latest findings and practical mitigation efforts. Additionally, social media allows for direct interaction between policymakers, the community, and affected individuals. However, for now, there has been no impact of the change in the economy; many people are unaware of this, so it is important to use social media for accurate and efficient news dissemination.

4.4. Word Cloud Analysis Optimizing Social Media in Climate Change

Figure 4. Wordcloud analysis
Source: Processed by researchers using NVIVO, 2024

Figure 4 above is a visualization of a word cloud depicting the main themes of various research or discussions regarding the role of social media in environmental issues, climate change, and public responsibility. The words displayed are of different sizes, indicating the frequency or significance of the theme. Words such as social media, environmental, public, and change have the largest size, suggesting that these concepts are at the heart of the analyzed narrative.

Social media is important in disseminating information about climate change, environmental responsibility, and government policies. This is reflected in awareness, messages, information, and organizations, emphasizing that digital platforms educate the public, influence public opinion, and mobilize collective action. In addition, terms such as policies, governments, and scientists indicate collaboration between stakeholders in promoting sustainability. In contrast, words such as responsibility, solutions, and mitigation focus on concrete actions to mitigate the impacts of climate change.

Furthermore, words such as participation, relevance, and success show the importance of community involvement in environmental movements through social media. Platforms like Twitter and Instagram are often spaces for communities to strategically voice environmental issues through influencer-led campaigns or collaborations with non-governmental organizations. Overall, this word cloud illustrates that social media has become an important tool in information dissemination and coordination of environmental action, connecting individuals, organizations, and governments to support sustainability globally.

4.5. Climate Change Advocacy

Figure 5. Instagram Post
Source: Instagram

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Figure 5 explains that Greenpeace is campaigning for religion-based climate change in Indonesia through the Gereenpeaceid account, which has 759 thousand followers and 3,330 likes on the post. In discussing this, "As caliphs on Earth, we should carry out Amar Ma'ruf Nahi Munkar - calling for goodness and preventing damage. One form is to protect the environment from destruction. The easiest concrete step is to continue to voice kindness." "Give your support, urge religious leaders to call for faith-based climate action at COP29." "Visit act.gp/COP29-U4E link now and realize your role as the guardian of the Earth!." The post above received various positive comments from various circles, such as "azrnft_ this is true, it has been taught in Islam that there are three relationships: *hablumminallah* (relationship with God), *hablumminannas* (relationship with humans), sama *hablumminalalam* (relationship with nature). So, if there are mass organizations that bring Islam but are not pro-nature, they need to be suspected.

Climate change is not just an environmental issue but also a moral and spiritual call that demands our responsibility as khalifahs on Earth. From a religious perspective, humans are mandated to maintain the balance of nature as part of the principle of Amar Ma'ruf Nahi Munkar, which is to invite goodness and prevent damage. Destructive actions such as pollution and over-exploitation not only damage the environment but also violate the mandate given by God. Climate change also creates social injustice, where the most vulnerable groups, such as people with low incomes, feel the impact the most. Therefore, faith-based climate action becomes urgent to educate the public, implement environmentally friendly lifestyles, and fight for social justice.

There is a need to integrate religious values in climate policy, from promoting awareness of the importance of protecting the environment to supporting concrete solutions such as the use of renewable energy and waste reduction. In addition, engaging the younger generation in concrete actions is also a strategic step to create sustainable change. Through multi-sector discussions and collaboration, such as with religious communities, governments, and individuals, we can jointly face the challenges of climate change. Safeguarding the environment is part of realizing the responsibility of earth sustainability and a better future for future generations.
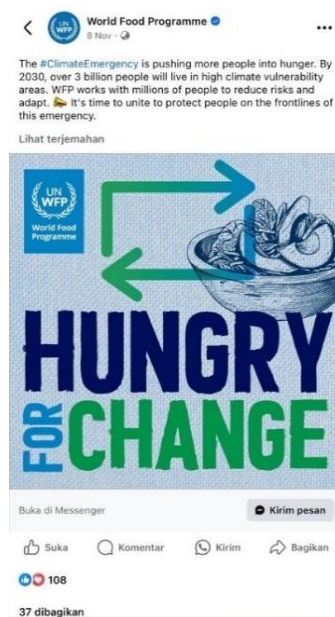

Figure 6. Facebook Post
Source: Facebook

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Figure 6: in a Facebook post, the World Food Programme (WFP), which has 2.3 million followers, discussed the impact of the climate emergency on the increasing number of people experiencing hunger. In the post, WFP stated that by 2030, more than 3 billion people will live in highly vulnerable areas to climate change. While the post only received 108 likes, WFP highlighted their efforts in working with millions of people to reduce risks and adapt to the impacts of climate change. The message is also a global call to arms to protect communities on the frontlines of this critical situation.

Climate change has seriously threatened global food security, especially for people living in areas vulnerable to climate disasters such as droughts, floods, and extreme weather. Meeting this challenge requires collective action from all stakeholders, including governments, international organizations, and the wider community, to strengthen adaptation and mitigation measures. These measures include sustainable resource management, adopting environmentally friendly technologies, and empowering local communities to increase their resilience to climate change.

Public Engagement Theory (Zhuang, 2024) is highly relevant in understanding how communities can effectively engage with environmental issues through digital platforms. The theory emphasizes the importance of implementing various engagement strategies that facilitate dialogue and encourage collective action among community members. With the integration of digital tools, public engagement can be significantly enhanced, creating a more inclusive and participatory approach to environmental governance.

Research has identified various organizations and institutions that leverage Instagram as a platform to run environmental campaigns. Accounts like @GreenpeaceID stand out through data-driven advocacy, highlighting the serious impact of plastic waste on the environment. Meanwhile, @greengnrid emphasizes individual solutions by encouraging eco-friendly lifestyles as a concrete step towards tackling the problem of plastic waste. On the other hand, @zerowaste.id_official focuses more on the community approach by offering practical solutions to reduce plastic waste through collaboration and community education.

The use of social media, especially Instagram, is the main focus in optimizing environmental campaigns. The platform allows for quick and effective dissemination of information to a wide audience, making it a strategic tool to increase public awareness and participation in environmental issues. With a diverse and data-driven approach, lifestyle, and community, Instagram campaigns drive behavior change toward sustainability. Instagram has a strategic role in optimizing the dissemination of information related to climate change due to various features that support effective visualization of messages. Using hashtags such as #ClimateChange, #Sustainability, and #ActOnClimate can expand the reach of messages to a wider audience. In addition, Instagram allows for two-way interaction through comment sections, polls in Stories, and Q&A features, which can increase audience engagement in discussions about climate change. Strong communities on Instagram, such as the accounts of environmental organizations Greenpeace, WWF, and Earth Alliance, and individuals who act as eco-influencers, contribute to disseminating information and building collective awareness of environmental issues.

Meanwhile, TikTok is also a platform that plays a major role in spreading awareness about climate change, but with a different approach than Instagram. TikTok focuses more on short video content with an entertaining concept, fast viral, and based on a very strong personalization algorithm. This makes climate change information more accessible to younger audiences, especially Generation Z, who are active on the platform.

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There are challenges in using social media for climate change advocacy. First, disinformation and fake news often spread faster than accurate information, hampering public education efforts. Second, the digital divide in Indonesian society limits access to social media platforms, especially in remote areas. In addition, the uncertainty of public response to digital campaigns makes it difficult to evaluate their impact. Third, there is information saturation, where a flood of content makes it difficult for important messages to stand out. Finally, the lack of cross-sector collaboration between government, communities, and the private sector reduces the effectiveness of social media-based initiatives on climate change.

5. Conclusion

Social media is important for active public engagement on climate change and environmental conservation issues. It provides tools to effectively disseminate information, mobilize collective action, and raise public awareness. With interactive features such as viral challenges and cross-sector collaboration, social media can motivate communities to engage in action. However, its success depends on accurate information management and strategic use to support policy advocacy. Challenges such as disinformation and information saturation must be overcome to ensure campaign success. With collaboration involving governments, communities, and the private sector, social media can be a key tool in creating inclusive and sustainable solutions to the challenge of climate change. This research confirms the importance of optimizing social media in the digital age to strengthen environmental sustainability and community well-being and build a global communication ecosystem that supports behavior change.

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7. Declaration of Conflicting Interests

The authors have declared no potential conflicts of interest regarding this article's research, authorship, and/or publication.

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