



# Emerging research themes and evolution of climate change communication research from the last twenty years

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**Citation:** Kulkova, M. A., Vorobyeva, K. I., Dmitrichenkova, S. V., Korzhuev, A. V., Filippova, A. A., & Kontarov, N. A. (2026). Emerging research themes and evolution of climate change communication research from the last twenty years. *Online Journal of Communication and Media Technologies*, 16(3), Article e202639. <https://doi.org/10.30935/ojcm/18787>

## ARTICLE INFO

Received: 25 Dec 2025

Accepted: 28 Apr 2026

## ABSTRACT

Climate change communication (CCC) is an important area of research that examines how various strategies are used to raise awareness, educate, and promote action on the impacts of climate change. Although CCC holds a significant place in the environmental communication literature, there is limited research identifying the development and key topics in this field over the past 20 years. Therefore, this paper aims to provide a comprehensive overview of research on CCC worldwide from January 2006 to December 2025. To address the research question, we used bibliometric mapping to systematically assess and visually represent the development of this research field using VOSviewer to summarize and visualize research topics and the evolution of the frontiers in CCC literature. For data collection, 825 articles in the Scopus database were analyzed. The results showed that most journals with the highest number of publications are classified as Q1 in Scopus, and co-cited documents covered the field, which began with psychological behavioral theories, developed through media ethics and framing strategies, and has evolved into a multidimensional discipline that now encompasses political and economic constraints. In addition, the results demonstrated that emerging research themes included public perceptions, psychological and demographic dynamics, policy and risk management, public opinion and public health, social media, and geographic focus. Furthermore, the results highlight a significant research gap, indicating that future studies should examine CCC in diverse cultural environments.

**Keywords:** climate change, communication, climate change communication, environmental communication, bibliometrics, science communication

## INTRODUCTION

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The adverse effects of climate change have been observed and experienced by people worldwide. These effects have led to an increase in communication studies aimed at mitigating climate change's impacts (Tan et al., 2023). Research indicates that public understanding of climate change is often influenced by misconceptions and misinformation (Nost et al., 2021). As a result, climate change communication (CCC) has become important for mitigating climate change's adverse effects and shaping public attitudes and beliefs regarding climate change (Bere-Semerédi & Bere-Semerédi, 2020; Happer, 2017; Lamb & Lane, 2016; Singh et al., 2020). Additionally, research has shown a gap between scientific understanding and public perception of climate change (Nost et al., 2021). This gap between scientific understanding and public perception necessitates the use of effective communication strategies.

CCC helps the public understand scientific information about climate change (Waters et al., 2025). It has become a robust research field in which scholars from environmental sciences, psychology, political science, and communication studies collaborate (Chen et al., 2022). CCC enables people to understand the various impacts of climate change on their lives. Therefore, effective CCC requires understanding people of all ages and education levels to address and mitigate the global impacts of climate change. The main objective of CCC is to enhance public awareness and foster engagement with environmental issues, especially climate change (Lohani et al., 2025; Plechatá et al., 2024). Research highlights that CCC at national and local levels is essential for effective climate action (Goggin et al., 2014; Nousiainen et al., 2022). Although climate change is often presented as a global issue, it also has national and local effects (Goggin et al., 2014). This broad scope highlights the need for well-constructed and implemented communication strategies for everyone.

In addition, effective climate communication addresses the uncertainties surrounding climate change and helps mitigate its effects (Prosinger et al., 2016). CCC plays a key role in shaping public attitudes and actions toward this complex and often ambiguous issue (McGill et al., 2024; Nousiainen et al., 2022; Waters et al., 2025). Successful communication strategies increase awareness of climate change concerns and encourage necessary behavioral changes, such as individual participation in emission control activities. Advancing CCC is therefore fundamental for improving public perception of climate risks, developing mitigation and adaptation policies (Balasubramanyam et al., 2019; Brosch, 2021; Orlove et al., 2024).

Although the importance of CCC in mitigating the effects of climate change on humanity is recognized, there are few reviews analyzing the outcomes of CCC. These reviews offer valuable insights from different perspectives. However, their number is small and limited. Moreover, research and practice have been evolving rapidly in response to ongoing climate change and its communication. This underscores the need for recent studies and reviews to update our understanding of the field. Previous reviews have been based on a limited number of studies, particularly those focused on bibliometric analyses (e.g., Abdullah, 2023; Asmi et al., 2019; Chen et al., 2022; Chiquetto & Nolasco, 2024). A broader community of research remains unexamined, resulting in the lack of a comprehensive map illustrating the outcomes of CCC research. Therefore, further research is needed to thoroughly analyze the scientific knowledge about CCC produced by the global research community. To address this gap, the present review applies bibliometric methodology to map researchers' responses to climate change by identifying patterns and themes in research and practice related to CCC. Accordingly, the purpose of this study is to conduct a bibliometric systematic review to explore the emerging body of knowledge, focusing on uncovering research and practice trends in CCC.

## REVIEW OF THE RELATED STUDIES

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Given the importance of CCC in mitigating its effects on humanity, researchers have examined the overall status of research in this field. To this end, they have conducted review studies to map publications on CCC and identify research trends and topics from various perspectives. For example, Abdullah (2023) examined evolving trends in CCC research and publication using the Scopus and Web of Science databases. His findings indicated a notable increase in the number of publications since 2008. Additionally, the results showed that the main keywords related to science communication, environmental communication, and climate action appeared most frequently after 2020.

In another study, Chiquetto and Nolasco (2024) analyzed publications on climate change research and discussed the nature of research topics. They identified four main clusters within climate change:

- (1) impacts on forest and plant development,
- (2) land use and ecology,
- (3) adaptation and governance, and
- (4) climate and atmospheric studies.

Syakirah et al. (2025) examined climate change discourse on social media using the Scopus database for research published between 2008 and 2024. They analyzed 57 articles with bibliometric methods to track the evolution of climate change discourse on social media. Their results showed a significant annual increase in publications, peaking in 2024. The USA and the UK lead in publications and global scientific influence, while contributions from developing countries remain limited.

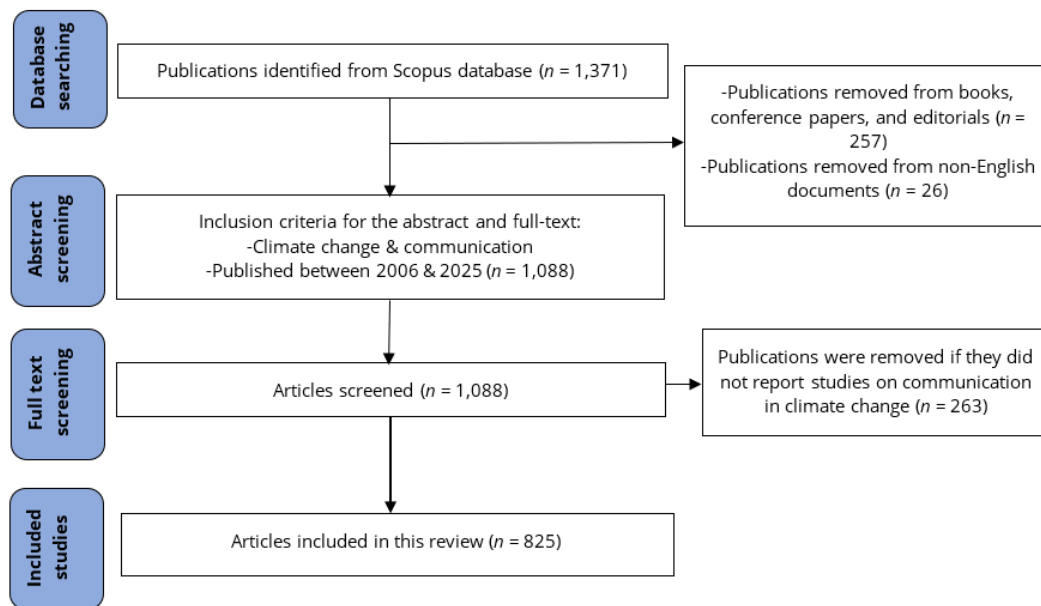
Asmi et al. (2019) analyzed publications on CCC, focusing on articles from the Web of Science database. Their results showed that most research has concentrated on the framing and human aspects of risk perception, with some studies addressing the polarization and politicization of the issue. Public perceptions of climate change are closely linked to individuals' exposure to these changes, and the importance they assign to any climate change effect tends to be minimal, especially regarding global warming; the same pattern is observed for policy support. Public understanding of climate change and global warming is strongly associated with spatial concerns, local expertise, and existing knowledge. From 2001 to 2008, keywords such as "climate change risk," "communication," and "risk" were prominent; from 2009 to 2010, newspaper coverage and global warming were frequently used; from 2011 to 2013, "mental model" and "intervention" appeared as keywords; and from 2015 to 2017, "ethics," "emotions," "psychological distance," and "climate change adaptation" became common keywords in studies of the knowledge domain.

Chen et al. (2022) examined the development of global research on CCC hot topics and frontier progress since the 21<sup>st</sup> century using a bibliometric approach. They analyzed 1,175 valid papers published from 2000 to 2021 in the Web of Science database. Their results showed that

- (1) CCC research has become a relatively independent field and has entered a stage of rapid development, with broad prospects for further research in light of new understandings of climate change and a new international context,
- (2) research in this field is currently dominated by developed countries, but developing countries are actively building their own unique climate communication discourse, and
- (3) public understanding and media information presentation have been hot topics in climate communication research in recent years.

The studies above commonly find that CCC research has increased and gained momentum since 2008 (Abdullah, 2023; Syakirah et al., 2025). These studies reveal that the field has entered a "rapid development phase" (Chen et al., 2022). Another finding is that most CCC research is produced in developed countries, particularly the USA and the UK (Chen et al., 2022; Syakirah et al., 2025). In addition, public understanding of climate change and its presentation in the media are among the most prominent research topics (Asmi et al., 2019; Chen et al., 2022). This research has contributed to documenting and reflecting on how CCC has responded to mitigate the adverse effects of climate change since humanity first experienced its negative impacts. Researchers and scholars have conducted several review studies on CCC. However, research in this area has been evolving rapidly in response to ongoing climate change and its communication. This underscores the need for recent studies and reviews to update our understanding of the field. Previous reviews have been based on a limited number of studies, particularly those focused on bibliometric analyses. (e.g., Abdullah, 2023; Asmi et al., 2019; Chen et al., 2022; Chiquetto & Nolasco, 2024).

Given that the number of existing studies is very small and presents limited findings to researchers, further research is needed to thoroughly analyze the scientific knowledge about CCC produced by the global research community. To address this gap, this paper aims to provide a holistic view of research investigating CCC worldwide from January 2006 to December 2025. Through bibliometric analyses, we identify the evolution of scientific output in this field, prominent topics, future research directions, and research gaps. First, we



**Figure 1.** PRISMA flowchart for data screening (Source: Authors' production)

examine how CCC has been studied. Second, this review identifies research themes on CCC emerging from the literature. Specifically, the following research questions guide this study:

1. What is the geographical distribution of publications, the most co-cited references, and the journal with the most publications?
2. What themes emerged from the literature on CCC around the globe from 2006 to 2025?

## METHOD

In this study, bibliometric analysis was used to address the research questions. This approach enables researchers to examine topics within a research field, as well as the interrelationships among topics, using a large body of literature. Additionally, bibliometric analysis allows for the examination of descriptive characteristics of publications, such as authors, institutions, journals, keywords, disciplines, and citations, to reveal knowledge maps of research topics and networks, and to identify research themes and promising future research directions. Because of these features, researchers and scholars have frequently used bibliometric analysis methods to review research topics in a given field. In this article, researchers used VOSviewer to analyze data from CCC research to identify research frontiers and themes using bibliometric data. To achieve this, we conducted keyword analysis with VOSviewer to examine research patterns and reveal topics reported in peer-reviewed publications on CCC.

### Data Collection

In this study, researchers used the Scopus database to analyze relevant publications from peer-reviewed journals for this literature review. As is well known among scholars, Scopus is the largest multidisciplinary database of scientific literature on communication research and is widely used for bibliometric studies. In this study, the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) (Liberati et al., 2009) was used to search for and screen documents (see [Figure 1](#)). For data collection, a Boolean search was conducted in the Scopus database, combining three parts of the search string:

- (1) CCC and
- (2) climate communication.

During the search, a wide range of keywords and phrases were used to identify additional documents related to CCC. The researchers reviewed all keywords during the database search. While searching the database for data collection, we used keywords including "climate change communication," "climate change communications," "climate-change communication", and "climate communication".

**Table 1.** A list of the top 10 journals in terms of the number of articles and citations on CCC

| No | Journal   | Number of articles | Number of citations | Rank in the database |
|----|---|--------------------|---------------------|----------------------|
| 1  | Environmental Communication                     | 83                 | 2,420               | Q1                   |
| 2  | Climate Change                                  | 32                 | 914                 | Q1                   |
| 3  | Journal of Environmental Psychology             | 25                 | 699                 | Q1                   |
| 4  | Science Communication                           | 20                 | 1,980               | Q1                   |
| 5  | Sustainability                                  | 20                 | 252                 | Q2                   |
| 6  | Frontiers in Communication                      | 17                 | 311                 | Q2                   |
| 7  | Global Environmental Change                     | 12                 | 1,788               | Q1                   |
| 8  | Environmental Education Research                | 12                 | 526                 | Q1                   |
| 9  | Journal Of Science Communication                | 11                 | 157                 | Q2                   |
| 10 | Wiley Interdisciplinary Reviews: Climate Change | 10                 | 2,015               | Q1                   |

For data collection, the researchers aimed to cover an extended period to reveal the history of CCC research and to analyze research trends and prominent topics. To achieve this, we used a time frame from January 2006 to December 2025. The initial search yielded 1,371 documents. We included only articles published in English. As a result, the number of articles in the database decreased to 1,347. We then limited the results to peer-reviewed articles to ensure the quality of the documents analyzed, so that the number of articles in the database decreased to 1,063. Finally, the final number of publications included in this review is 825 articles published in peer-reviewed journals.

For the inclusion and exclusion criteria, we aimed to include a comprehensive number of articles on CCC research, specifically those published between 2006 and 2025. Our goal was to obtain and present a holistic view of research on CCC. Additionally, we excluded any document that did not emphasize CCC. Thus, as a result of the screening process, articles that do not meet the inclusion criteria were removed from data collection. This resulted in a final database of 825 articles for bibliometric analysis.

## Data Analysis

To apply the bibliometric analysis method in this study, bibliometric data were used. The data include information on author names, affiliations, titles, keywords, abstracts, and cited references for articles selected according to the inclusion and exclusion criteria. An Excel file was downloaded from Scopus and converted to a tab-delimited file format. This file was then imported into the VOSviewer software for bibliometric analysis. To determine the characteristics of articles on CCC, the authors first conducted a descriptive statistical analysis of the number of documents by country and by journal using VOSviewer. **Table 1** presents the results for journals with the most publications.

Next, the analysis focused on prominent journals and articles using co-citation analyses. The authors conducted co-citation analysis techniques to identify key units, such as authors, articles, and journals, within the specific topic. Citation analysis measures how often an article is cited by documents included in the relevant research topic (CCC research) in the database. It is widely recognized that highly cited articles are considered to have made significant contributions to the field.

Compared to citation analysis, co-citation analysis provides a more reliable and comprehensive measure of scientific contributors and their contributions. Therefore, co-citation analysis was used to identify the most prominent documents with the highest number of co-citations in the CCC research data (see **Table 2**). Additionally, VOSviewer's co-occurrence mapping functionality was used to reveal and analyze connections among publications based on keywords and terms appearing in the publications. This analysis enables researchers to examine research frontiers and themes based on the clusters provided by VOSviewer and to explore the structural analysis of research topics in CCC research.

## RESULTS

### Bibliometric Characteristics of the Literature

#### *Journals with the most publications*

Between 2006 and 2025, numerous journals published articles examining CCC. The journals have a widely varying number of articles published, number of citations, ranking, and publishing model.

**Table 2.** List of the top 10 most highly co-cited documents on CCC

| No | Document   | Title  | PT      | Source   | n  |
|----|--|--|---------|--|----|
| 1  | Brosch (2021)  | Affect and emotions as drivers of climate change perception and action: A review   | Article | Current Opinion in Behavioral Sciences               | 31 |
| 2  | Boykoff and Boykoff (2004)   | Balance as bias: global warming and the US prestige press  | Article | Global Environmental Change                          | 24 |
| 3  | Ajzen (1991)   | The theory of planned behavior   | Article | Organizational Behavior and Human Decision Processes | 24 |
| 4  | Oxford Research Encyclopedias: Climate Science—Editor in Chief: Hans von Storch—2017 |  | Book    |  | 23 |
| 5  | Ballantyne (2016)  | Climate change communication: What can we learn from communication theory?   | Article | Wiley Interdisciplinary Reviews Climate Change       | 19 |
| 6  | Brulle et al. (2012)   | Shifting public opinion on climate change: An empirical assessment of factors influencing concern over climate change in the U.S., 2002-2010 | Article | Climatic Change                                      | 18 |
| 7  | Badullovich et al. (2020)  | Framing climate change for effective communication: A systematic map   | Article | Environmental Research Letters                       | 18 |
| 8  | Antilla (2005)   | Climate of skepticism: US newspaper coverage of the science of climate change  | Article | Global Environmental Change                          | 16 |
| 9  | Bernauerb and McGrath (2016)   | Simple reframing is unlikely to boost public support for climate policy  | Article | Nature Climate Change                                | 16 |
| 10 | Boykoff and Boykoff (2007)   | Climate change and journalistic norms: A case-study of US mass-media coverage  | Article | Geoforum   | 16 |

Note. PT: Publication type & n: Number of co-citations

**Table 1** shows a list of the top 10 journals in terms of the number of articles. **Table 1** is particularly important because it shows which peer-reviewed journals publish CCC research. According to the trends in **Table 1**, Environmental Communication is by far the most published journal, with 83 articles. It is followed by Climate Change with 32 articles and the Journal of Environmental Psychology with 25 articles. These journals are followed by Science Communication, Sustainability, Frontiers in Communication, Global Environmental Change, Environmental Education Research, Journal of Science Communication, and Wiley Interdisciplinary Reviews: Climate Change. As can be seen from **Table 1**, the journals with the fewest articles are Frontiers in Communication, Global Environmental Change, Environmental Education Research, Journal of Science Communication, and Wiley Interdisciplinary Reviews: Climate Change. Overall, this result shows that CCC research is published not only in communication journals but also in environmental science and psychology disciplines.

When examining the citation numbers of articles published by journals with the most publications, the data in **Table 1** shows that the number of publications does not always guarantee the highest number of citations. For example, the journal Environmental Communication, with the highest number of publications (83) and 2420 citations, appears to be the most influential in the field. However, Wiley Interdisciplinary Reviews: Climate Change, with only 10 articles and 2015 citations, demonstrates an extraordinary performance in terms of the citation rate per article. Similarly, Science Communication (1,980 citations) and Global Environmental Change (1,788 citations) have published “high-impact” articles on CCC despite their low number of publications.

Furthermore, the data in **Table 1** reveal that the journals publishing CCC research exhibit interdisciplinary diversity. For example, the Journal of Environmental Psychology, with 25 articles, shows a concentration of research related to behavioral change and psychological analysis in cluster 2. Similarly, the journal Sustainability, with 20 articles, demonstrates the presence of sustainability-focused studies on CCC in cluster 1. Finally, the journal Environmental Education Research, with 12 articles, shows the institutionalization of education-focused research.

While the literature on CCC is generally concentrated quantitatively in the journal Environmental Communication, journals such as Wiley Interdisciplinary Reviews: Climate Change and Science Communication have published impactful and in-depth articles with high citation rates per article.

## Results Regarding Co-Cited Documents

Using co-citation analysis, we identified the most co-cited documents among the publications analyzed in this study on CCC. **Table 2** presents the top 10 most co-cited documents in our database. These highly co-cited documents span from 1991 to 2021. Of the top 10, two articles were published after 2020: Brosch (2021) and Badullovich et al. (2020). Four documents were published between 2010 and 2020, and the remaining four were published before 2010. This collection of 10 co-cited studies demonstrates that CCC encompasses a multidisciplinary field at the intersection of media norms, psychological barriers, political framing, and societal dynamics. For example, studies by Ajzen (1991) and Brosch (2021) are directly related to cluster 2.

Among the most co-cited studies, some focus on how the media constructs climate change. For instance, the work of Boykoff and Boykoff (2004, 2007) examines how the principle of “neutrality” in journalism, by giving equal weight to scientific facts and denialist views, influences the public. Furthermore, Antilla (2005) and Boykoff and Boykoff (2007) investigate how mass media framing of scientific uncertainty affects societal skepticism.

Another group of most co-cited studies has examined the psychological processes underlying individual decisions about CCC. For example, Brosch (2021) reviewed the impact of emotions and feelings on climate perception and action. Ajzen’s (1991) work provides one of the most fundamental theoretical frameworks in the social sciences for understanding the intentions and attitudes behind environmentally friendly behaviors. In this context, articles on CCC frequently refer to Ajzen’s (1991) theory.

Another group of highly co-cited studies has explored how the strategic framing of CCC is perceived and its effect on public support. For example, Badullovich et al. (2020) present a systematic map of how climate change should be framed for effective communication, while Bernauer and McGrath (2016) offer a critical perspective on the limitations of simple reframing methods in increasing policy support.

Some of the most frequently co-cited studies have focused on empirical research into the trajectory of public concern about climate change. For example, Brulle et al. (2012) empirically assessed the factors (economic situation, political discourse, etc.) influencing public concern about climate change in the USA. In contrast, Ballantyne’s (2016) study explores what can be learned from communication theory for CCC.

## Emerging Research Themes From Keyword Analysis

**Figure 2** shows a graphical map of themes emerging from the literature on CCC, based on the co-occurrence of keywords across publications, with a minimum occurrence threshold of 10 documents.

### Cluster 1–Public perceptions

Cluster 1, which consists of the co-occurring keywords “climate action,” “climate effect,” “climate science,” “perception,” “public engagement,” “science communication,” “United States,” “United Kingdom,” and “sustainability,” is located in the red cluster on the left side of **Figure 2**. Research in this cluster includes studies that analyze participants’ individual perceptions of climate change and aim to stimulate local participation and action. The results in this cluster show that research is not only focused on climate science and climate effects but also attempts to build a bridge to how this information can be translated into action regarding “climate action” (Flores et al., 2025; Nousiainen et al., 2022) and “sustainability” (Kelinsky-Jones & Levine, 2025; Poonamallee, 2025). An example of such a link appears in the study by Ballew et al. (2025), who aimed to test the effects of climate change messages on climate action globally. They conducted an online experiment across 23 countries and found that three climate messages had modest positive effects on support for climate action. They also found that, when deployed at a large scale, climate change messages have the potential to strengthen public support for climate action.

The presence of keywords such as “science communication” and “public engagement” indicates that climate change is no longer viewed solely as an environmental or climate issue but is now studied as a matter of participation and communication in research. In particular, the concept of “perception” confirms that how individuals understand the climate crisis and how this perception influences behavioral change are central to research. In this context, researchers have explored participants’ perceptions (e.g., Orlove et al., 2024; Raimi et al., 2024; Thaker, 2024), public engagement (e.g., Duan & Bombara, 2026; Dumitrescu, 2025; Smith et al., 2025), and actions (e.g., Doyle et al., 2024; McGill et al., 2024). We note that the terms “perception” and “public



Finally, the presence of the keywords “United States” and “United Kingdom” in the findings indicates a geographically Western-centric concentration in academic output on CCC. This suggests that theoretical frameworks and communication strategies in the field of CCC are largely shaped by social factors in these regions.

Regarding the studies in the context of the USA, for example, Laatsch and Ma (2016) explored the strategies used to communicate about climate change among USA Forest Service employees and found limited awareness of climate policy among employees. Their findings also revealed a horizontal information flow through informal social networks, which was an important way climate change information was communicated. For example, Balasubramanyam et al. (2019) examined interpreters’ perceptions of climate change and its impacts in Missouri state parks and historic sites in the USA. Their findings showed that although nearly 70% of interpreters were either alarmed or concerned about climate change, many were unsure about its causes. They found that participants believed climate-based education could be addressed within existing programs and activities.

### ***Cluster 2—Psychological and demographic dynamics of climate change***

Cluster 2, which consists of co-occurring keywords “human,” “humans,” “interpersonal communication,” “female,” “male,” “adult,” and “emotions,” is located in the green-colored cluster on the right side of **Figure 2**. Studies in this cluster show that by addressing the climate crisis as a matter of individual psychology and behavior, they have investigated the effects of age, gender, and emotional states on climate and environmental communication. These studies, in particular, have been analyzed in depth through controlled studies (e.g., Plechatá et al., 2024). Additionally, interpersonal communication emerges as a field examining how climate messages spread within social networks (friend/family environment). The keywords “psychology, cognition, attitude, behavior change, and pro-environmental behavior” within this cluster represent research investigating the relationship between CCC and pro-environmental behavior (e.g., Maduneme & Cohen, 2024; Plechatá et al., 2024). For example, Plechatá et al. (2024) tested the effectiveness of virtual reality experience-based communication and found that a virtual reality experience led to stronger pro-environmental intentions and behaviors among participants. In light of this data, cluster 2 focuses more on individual psychology, demographics, and behavioral responses.

### ***Cluster 3—Policy and risk management***

Cluster 3, which consists of co-occurring keywords “environmental policy, public attitude, mitigation, farming, and climate policy, adaptation, and risk assessment,” is located in the blue-colored cluster on the bottom of **Figure 2**. The studies in cluster 3 focus on the impact of CCC efforts on political discourse and how information about the climate crisis is “served” (framing). The concepts of climate policy, political ideology, adaptation, and mitigation focus on the political and strategic dimensions of CCC efforts. In this context, studies related to the keyword “political ideology” stand out in the literature as the strongest determinant of support for climate policies. At the heart of this cluster are risk perception, risk assessment, and risk communication (Jurnet & Ureta, 2025). Studies in this group examine how imminent society feels the threat is and the critical role this perception plays in building policy support. Additionally, the keywords “framing,” “discourse analysis,” “knowledge,” and “fear” address “how” CCC is constructed, while discourse analysis deciphers how the language used by the media and politicians constructs society’s view of the climate crisis. In summary, the studies in cluster 3 explore how climate crisis communication is perceived as an element of risk management and the determining influence of political ideologies on this perception. Finally, using discourse analysis and risk communication methods, the studies in this cluster analyze the process by which information about climate change translates into policy support. In light of this data, it appears that cluster 3 focuses more on policy, risk management, and ideological framing.

### ***Cluster 4—Public opinion and public health***

Cluster 4 contains fewer keywords than the other clusters. These keywords are “environment,” “focus groups,” “public health,” and “public opinion.” They indicate that CCC is also related to public health and public opinion. Specifically, the keyword “public health” suggests that research in this cluster examines the effects of CCC on general health. For example, a study by Ittefaq (2024) explored the perceptions and communication

strategies of state and territorial health agency officials in the USA regarding climate change's impact on human health. The analysis revealed three major themes: community building and coalitions, climate denialism on social media, and misinformation about climate change and its effects on human health. Furthermore, the keyword "public opinion" indicates that studies in this cluster analyze the impact of CCC on societal acceptance. These studies were conducted to explore the views of political groups on global warming (Abeles et al., 2019), the impact of communicating the scientific consensus to the general public (Bayes et al., 2023), and the opinions and attitudes of individuals with different political identities (De Sousa, 2025).

Finally, the keyword "focus groups" refers to the methodology used in this cluster to examine people's responses to messages about climate change. In summary, cluster 4 reflects a pragmatic approach that frames climate change as a public health issue, deeply analyzes societal perceptions, and examines public opinion formation processes through focus groups.

### **Cluster 5–Social media**

Cluster 5 includes only the keywords "social media," "Twitter," and "China." Studies in this cluster examine the digitalization of CCC and global discussions shaped by platforms like Twitter, with a particular focus on China and new media dynamics. Research in this cluster shows how CCC is discussed on social media (Jiao et al., 2025; Liu, 2025; Wu et al., 2023; Xia et al., 2025; Yan & Schäfer, 2025) and digital platforms such as Twitter (Holmberg & Hellsten, 2015; León et al., 2022; Liu, 2025; Mayfield-Smith et al., 2021). Additionally, it proves that region-specific communication strategies, for example, in China, regarding climate change issues related to China, have become a focal point of research. For example, research by Liu (2025) examined the Chinese government's efforts to shape global climate change discourse through external propaganda, using data from Twitter's information operation database and China's English-language newspapers. The results show that only a small proportion of tweets relate to energy and climate, indicating these topics were not the primary focus of China's information operations during the study period. In addition, the results indicate that the most relevant operations target Chinese-speaking users and tend to highlight China's achievements with strong national pride. The author also notes that the findings confirm previous research on China's influence, showing that Chinese propaganda frequently criticizes Western democracies while emphasizing the success of its development model. As another example, Holmberg and Hellsten (2015) explored gender differences in CCC on Twitter and in the use of Twitter affordances. Their results showed that, overall, male and female users used very similar language in their tweets, but there were clear differences in the use of hashtags and usernames. Their findings revealed that female users mentioned significantly more campaigns and organizations with a convinced attitude toward anthropogenic impact on climate change, while male users mentioned significantly more private individuals and usernames with a skeptical stance.

### **Cluster 6–Geographic focus**

The keyword analysis identified 47 keywords, including "United States" and 18 related to "Australia." These results indicate that most articles were published in the USA. Additionally, there are articles published in the Australian context on CCC. The findings in cluster 6 show that researchers in the USA examined climate change engagement and attention (Loria et al., 2025; Spisak et al., 2022), policy support (Ansah et al., 2023; Smith & Leiserowitz, 2014), climate change behaviors and activism (Latkin et al., 2025; Valdez et al., 2018), emotional responses and affect (Muradova & Beauvais, 2025; Spitzer et al., 2024), climate change beliefs and risk perceptions (Akerlof et al., 2015; Merritt et al., 2025), climate literacy, knowledge, and understanding (Guido et al., 2013; Singh et al., 2020), self-efficacy (O'Neill et al., 2013), and attitudes toward adaptation (Singh et al., 2020). In summary, research in the USA specifically focuses on measuring the impact of CCC on public perception.

In addition, the research focused on Australia focused on public engagement and climate change impact (O'Callaghan et al., 2025; O'Neill et al., 2012), self-efficacy/agency (O'Callaghan et al., 2025; Waters et al., 2025), policy support (Badulloovich, 2023; Klas et al., 2022), behavioral intentions/action (Waters et al., 2023, 2024), climate change attitudes (Cocolas et al., 2024), emotional responses and affective impact (Miller, 2025; Waters et al., 2023a), risk perceptions (Boon, 2016), psychological distance (Jones et al., 2017), climate literacy/knowledge (Waters et al., 2025 (beyond threats), salience (O'Neill et al., 2012), media discourse and framing patterns (Huan, 2024; Painter et al., 2023).

## DISCUSSION

This paper provides a comprehensive overview of research on CCC worldwide from January 2006 to December 2025, using a bibliometric analysis of the literature. One of our main findings is that most journals with the highest number of publications are classified as Q1 in Scopus, with only three journals in the Q2 category. These results indicate that Q1 journals have a long-standing history of publishing peer-reviewed articles in communication.

Another important finding is that the co-cited documents used in CCC research indicate that the field began with psychological behavioral theories, developed through media ethics and framing strategies, and has evolved into a multidimensional discipline that now encompasses political and economic constraints. The fact that authors such as Ajzen (1991) and Brosch (2021) are among the most cited demonstrates that CCC research is grounded in social psychology. Secondly, the frequent citations of works by Boykoff and Boykoff (2004, 2007) and Antilla (2005) demonstrate a strong emphasis on the role of the media in the analyzed studies. Thirdly, the use of sources such as Badullovich (2023) and Bernauer and McGrath (2016) shows that researchers are now employing “simple framing” (reframing) methods, and that factors such as economic conditions and political discourse (Brulle et al., 2012) are also decisive in determining public support for the climate crisis.

In addition, the results of this research show that CCC research not only explains climate science but also examines how individuals process this information (perception) and their emotional responses. The findings indicate that demographic and social variables such as gender (male or female), age (adult), and interpersonal communication play a critical role in the acceptance of climate change-related messages. Notably, the effectiveness of experience-based communication methods, such as virtual reality, in promoting pro-environmental behaviors demonstrates that research uses experiential persuasion in communication. Specifically, as studies such as Lambebo et al. (2025) show, the gap between scientific reality and public perception can be bridged only when cultural and individual dynamics are understood.

Furthermore, the findings of this research reveal that CCC is not only an environmental issue but also involves risk management and environmental policy. This finding confirms the results of Asmi et al. (2019). Some studies indicate that political ideology is the most significant determinant of support for climate policies. This finding is also very parallel to those of Asmi et al. (2019), who found that most research on CCC focused on and addressed the polarization and politicization of the issue. In this context, how climate change messages are presented (framing) and which risks, such as public health, are emphasized play a key role in shaping public opinion (e.g., Kim & Chae, 2025). Additionally, framing the climate crisis as a public health issue (see cluster 4) stands out as a strategy for persuading individuals or groups about climate change. For example, researchers have examined CCC in the context of a climate crisis and studied the effects of an activist movement to reframe climate change as a climate crisis among adults (Reichel et al., 2022).

Additionally, this research reveals that publications and researchers from the USA, the UK, and Australia (cluster 6) predominate in the production of literature related to CCC. This shows that Western-centric studies largely shape current communication strategies. This result confirms the results of Chen et al. (2022), who found that research in this field is currently dominated by developed countries, but developing

However, the presence of the keywords “China” and “Social Media” in cluster 5 suggests that CCC is being transformed by digital platforms. This result closely aligns with those of Chen et al. (2022), who found that public understanding and media information presentation were among the prominent topics in climate communication research. The use of social media platforms such as Twitter (X) in research appears to democratize climate change discussions while also providing a breeding ground for disinformation and ideological polarization, including gender differences and national propaganda. For example, a study by Liu (2025) is a large-scale investigation of CCC and social media use, examining the Chinese government’s efforts to shape global climate change discourse through external propaganda, using data from Twitter and China’s English-language newspapers. This review also reveals an uneven distribution of the evolving literature and most co-cited documents within a Western context. This raises the question of how to promote more equitable production, dissemination, and transfer of knowledge about CCC worldwide. Using large-scale,

cross-sectional research approaches, future studies can examine country-, university-, faculty-, and student-level factors that contribute to the effectiveness of CCC.

## FUTURE RESEARCH

This study offers a holistic knowledge map of research on CCC; however, it has some limitations. First, the study used data on CCC from one database to provide valuable information to the existing literature and scholars. However, the use of only Scopus may affect the number and depth of studies included in the review. Thus, follow-up studies are needed to provide a more detailed analysis.

Second, the bibliometric analysis used in this study limits our focus to the overall topical themes emerging from the large body of literature. As a result, our analytical strategy leaves some questions unanswered, such as the quality of publications and a more detailed understanding of the applications of various technologies and pedagogies in CCC. Therefore, future research can identify emerging themes in CCC research and examine similarities and differences in the themes identified in this study.

Third, our search parameters, which included only documents published in English, may have led to the exclusion of relevant studies available in other languages. In particular, previous research has shown that high-income or Western countries publish more research in English compared to other countries. Thus, it is important to note that this parameter might impact the findings of this study. Future bibliometric research could consider expanding search parameters to include more studies published in other languages.

Fourth, some studies on CCC may not have been published at the time of our search. In particular, some journals have a lengthy peer review and publication process. As a result, many forthcoming studies may not have been included in the current analysis. Therefore, researchers should consider conducting a follow-up analysis in the future.

## CONCLUSION

This paper presents a comprehensive overview of global research on CCC from January 2006 to December 2025, using a bibliometric analysis of the literature. The bibliometric analysis enabled examination of a large body of studies on how CCC has been addressed by researchers during this period. Co-citation analysis of key documents indicates that CCC research began with psychological behavioral theories, advanced through media ethics and framing strategies, and has developed into a multidimensional field that now incorporates political and economic constraints. Keyword analysis shows that research topics have centered on psychological and demographic factors, political strategy, and risk management, as well as digitalization and geographic dominion in CCC.

Achieving effective communication about climate change is an ongoing process for scholars, institutions, and countries. Therefore, it remains necessary to encourage researchers and practitioners to adopt new communication practices to address ongoing and unexpected challenges and opportunities related to climate change. The results show that studies on climate change are presented mostly from a Western-centric perspective. This finding highlights a significant gap, indicating that future studies should examine climate perception globally and in diverse cultural ecosystems.

In conclusion, this research shows that CCC is now a critical intersection of natural sciences, social psychology, and political science. Future research will be essential to determine how to integrate advanced communication models into communication studies at local and national levels.

**Author contributions:** **MAK:** Conceptualization, data curation, methodology, writing – original draft; **KIV:** Formal analysis, methodology, writing – original draft, writing – review and editing; **SVD:** Conceptualization, formal analysis, methodology; **AVK:** Data curation, methodology, writing – original draft; **AAF:** Conceptualization, formal analysis, writing – review and editing; **NAK:** Data curation, writing – review and editing. All authors approved the final version of the article. All authors approved the final version of the article.

**Funding:** The authors received no financial support for the research and/or authorship of this article.

**Ethics declaration:** This study presents a bibliometric review based solely on previously published, peer-reviewed literature. Therefore, it did not involve human participants, animal subjects, personal data, or any form of primary data collection, and did not require institutional ethical approval. The authors confirm that the review was conducted in accordance with established standards of academic integrity.

**AI statement:** Generative AI tools were used only to assist with language editing and grammatical refinement. All ideas, study design, and data analysis are the authors' own, and full responsibility for the content remains with the authors.

**Declaration of interest:** The authors declared no competing interests.

**Data availability:** Data generated or analyzed during this study are available from the authors on request.

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