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EDITED BY
Anabela Carvalho,
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REVIEWED BY
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Complutense University of Madrid, Spain
Rogelio Fernández,
Independent Researcher, Sevilla, Spain

*CORRESPONDENCE
Pablo A. Cortés
✉ pablocortesgarcia@gmail.com

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How academic research and news media cover climate change: a case study from Chile

Pablo A. Cortés[1]* and Riva Quiroga[2]

[1]Education, Research, and Innovation (ERI) Sector, NEOM, Tabuk, Saudi Arabia, [2]Departamento de Ciencias del Lenguaje, Pontificia Universidad Catolica de Chile, Santiago, Chile

Introduction: Climate change has significant impacts on society, including the environment, economy, and human health. To effectively address this issue, it is crucial for both research and news media coverage to align their efforts and present accurate and comprehensive information to the public. In this study, we use a combination of text-mining and web-scrapping methods, as well as topic-modeling techniques, to examine the similarities, discrepancies, and gaps in the coverage of climate change in academic and general-interest publications in Chile.

Methods: We analyzed 1,261 academic articles published in the Web of Science and Scopus databases and 5,024 news articles from eight Chilean electronic platforms, spanning the period from 2012 to 2022.

Results: The findings of our investigation highlight three key outcomes. Firstly, the number of articles on climate change has increased substantially over the past decade, reflecting a growing interest and urgency surrounding the issue. Secondly, while both news media and academic research cover similar themes, such as climate change indicators, climate change impacts, and mitigation and adaptation strategies, the news media provides a wider variety of themes, including climate change and society and climate politics, which are not as commonly explored in academic research. Thirdly, academic research offers in-depth insights into the ecological consequences of global warming on coastal ecosystems and their inhabitants. In contrast, the news media tends to prioritize the tangible and direct impacts, particularly on agriculture and urban health.

Discussion: By integrating academic and media sources into our study, we shed light on their complementary nature, facilitating a more comprehensive communication and understanding of climate change. This analysis serves to bridge the communication gap that commonly, exists between scientific research and news media coverage. By incorporating rigorous analysis of scientific research with the wider reach of the news media, we enable a more informed and engaged public conversation on climate change.

KEYWORDS

climate change, academic research, news media, LDA topic modeling, text-mining, web-scrapping, Chile

1. Introduction

Climate change is the most pervasive threat to the world's natural, social, political, and economic systems. Human activities have caused a rise in greenhouse gas (GHG) concentrations in the atmosphere and caused the earth's surface temperature to rise, leading to many other changes around the world—in the atmosphere, on land, and in the oceans (Wyser et al., 2020; Masson-Delmotte et al., 2021).

Indicators of these changes include increases in global average air and ocean temperature, rising global sea levels (Zemp et al., 2019; Garcia-Soto et al., 2021; Oliver et al., 2021), amplification of permafrost thawing and glacier retreat (Sommer et al., 2020; Wilkenskjeld et al., 2022), reduction of snow and ice cover (Shepherd et al., 2018), ocean acidification (Doney et al., 2020) and stronger and more frequent extreme events such as heatwaves, storms, droughts, wildfires, and flooding (Abram et al., 2021; van der Wiel and Bintanja, 2021). These changes are projected to continue throughout at least the rest of this century (Smale et al., 2019; Cook et al., 2020; Kwiatkowski et al., 2020; Ortega et al., 2021). Mitigation and adaptation are two complementary strategies for addressing climate change (Abubakar and Dano, 2020; Diamond et al., 2020; Tosun, 2022). Mitigation focuses on reducing emissions or enhancing GHG sinks, while adaptation involves building resilience to the unavoidable impacts on people and ecosystems. To be successful, these efforts require a deep scientific understanding, as well as the active engagement of the scientific community, civil society, and other stakeholders (Wamsler, 2017; Tai and Robinson, 2018; Gonçalves et al., 2022).

News media and academic research have distinct roles in communicating scientific findings on climate change (Corbett, 2015). News media rapidly disseminate scientific findings to a broader audience, shaping public understanding and influencing science-policy translation, practices, politics, public opinion, and understanding of climate change. They select and frame information to shape public awareness and perception, often influenced by various factors such as political, economic, scientific, ecological, or social events. Academic research provides a scientific foundation, evidence-based insights, and focuses on rigorous methodologies, data analysis, and the generation of scientific knowledge related to climate change. Aligning news media and academic research in their coverage is essential for effectively addressing climate change. Consistent messaging and shared thematic structures between media and academia build public trust and understanding, enabling informed decision-making and collective action. However, it's important to acknowledge that variations may exist between news media and academic research coverage due to factors like economic development, political influences, and differing focuses on the societal dimension of climate change (Hase et al., 2021).

Over the past decade, media coverage of climate science has grown in accuracy, though the extent and type of coverage varies between countries and is often connected to political, scientific, ecological, or social events (Shehata and Hopmann, 2012; Schmidt et al., 2013; Lopera and Moreno, 2014; Schäfer and Schlichting, 2014; Stecula and Merkley, 2019; Hase et al., 2021; Dubash et al., 2022). A growing body of experimental research has explored how climate change has been represented in news media (Dotson et al., 2012; Wozniak et al., 2015; Barkemeyer et al., 2017; Bohr, 2020; Keller et al., 2020) as well as providing an overview of the state of knowledge on the science of climate change (Berrang-Ford et al., 2015; Pacifici et al., 2015; Rojas-Downing et al., 2017; Cianconi et al., 2020; Fawzy et al., 2020; Olabi and Abdelkareem, 2022; Talukder et al., 2022). As far as we know, however, no previous research has investigated simultaneously news media coverage and academia's research agenda on climate change globally or locally. Therefore, the primary goal of our study is to evaluate, by means of text-mining, web-scraping methods, and topic-modeling techniques, the extent of alignment between news media and academic research in their coverage of climate change topics in the context of Chile. By examining the content and comparing the thematic focus of climate change discourse in both sources, this study will contribute to understanding the similarities, discrepancies, and gaps in the coverage of climate change in Chile. Furthermore, the findings can inform future efforts to improve the alignment and comprehensiveness of climate change communication between news media and academia, ultimately promoting public awareness and understanding of this critical global issue (Leuzinger et al., 2019; Albagli and Iwama, 2022).

Chile is particularly interesting as study model due to a variety of political, geographic, ecological, political, and social factors. Despite contributing only 0.23% to global GHG emissions (Labarca et al., 2023), Chile is highly vulnerable to climate change impacts. Evidence of current and future effects of climate change on Chilean territory has been mounting (Bozkurt et al., 2017; Araya-Osses et al., 2020; Martínez-Retureta et al., 2021), which could have detrimental consequences for citizens' health and wellbeing by impacting key sectors such as fisheries and aquaculture, forestry, agriculture and livestock, mining, energy, and water resources. Additionally, the Government of Chile chaired the 2019 United Nations Climate Change Conference (COP25) in Spain (Navia, 2019) and has committed to reducing its GHG emissions by 30% compared to 2007 levels as part of its nationally determined contributions. Previous studies have explored ideological bias in media coverage of climate change in Chile (Dotson et al., 2012), however there is a lack of research comparing academic research with news media. Although this study focuses on climate change in Chile, its results more broadly inform gaps in the coverage of climate change between academic and media discourse and emphasizes the importance of analyzing both sources to improve public understanding of climate change issues.

2. Materials and methods

2.1. Academic articles

The ISI Web of Science WOS Core Collection (https://apps.webofknowledge.com/) and Scopus (https://www.scopus.com/home.uri) database were chosen for the collection of academic articles. On January 18, 2023, we retrieved all publications related to climate change in Chile using the following Boolean search strategy: [(climat* chang* OR global chang* OR "climat* emergenc* OR "climat* crisis OR "global warming) AND Chile*]. A comprehensive search strategy was employed to identify relevant publications from 2012 to 2022, without any language restrictions Following the search based on these criteria, a total of 1,758 articles from Web of Science (WOS) and 1,730 articles from Scopus were retrieved. The search results were downloaded in.xlsx format for further analysis. To ensure data accuracy, a manual comparison was conducted between the SCOPUS and WOS records, which involved examining the title, primary author, source title, and year of publication. All the articles obtained, including their titles

and abstracts, were exclusively in English. Duplicate articles were discarded. We next used the title and abstract- when available- of each article to ensure we only included studies aimed at understanding climate change in Chile either by Chilean or international scientists. We include original articles and reviews, but not conference proceedings or books/book chapters, in our analysis. Articles without an abstract were also excluded. This resulted in 1,261 articles used to build the academic corpus, which comprises the following metadata for each document: database, title, abstract, and publication year.

2.2. News media articles

Climate Change coverage from Chilean electronic news platforms was also studied over the 10-year period from 2012 to 2022. This time period was determined by the availability of items on the selected platforms. The sample included eight electronic platforms: La Tercera, Meganoticias, CNN Chile, El Mostrador, T13, CHV Noticias, El Desconcierto and Diario Financiero. The platforms were chosen based on their national coverage, their high circulation and accessibility without a subscription fee. The approach to retrieve the articles was as follows. First, tags directly related to climate change were identified: "climate change," "global warming," "climatic crisis," and "climatic emergency." This strategy allows for a systematization of sampling. For each article, the name of the media, tag, headline, date, and URL of the source page were retrieved using the Rvest (Wickham, 2016) and RSelenium (Harrison and Harrison, 2022) R-packages. The URLs were then used to extract the articles' full text (body). Those articles that were not retrievable using this method due to forbidden access or any other restrictions in the source page were discarded from the collection. A total of 6,056 news articles were retrieved between January 06 and 15, 2023. Because a news item may include different tags, we removed duplicate articles for each of the platforms. Articles in which the date could not be retrieved were also discarded. After this filtering process, we obtained 5024 articles, which were used to build the news media corpus (Table 1).

2.3. Preprocessing

The corpora were preprocessed as follows: performing tokenization into unigrams (one word) using the "tidytext" R-package (Silge and Robinson, 2016), normalizing text into lowercase and removing punctuation, symbols, numbers, and HTML tags. English and Spanish lists of stop words were applied to the academic (Puurula, 2013) and news media (a proposed list of Spanish stop-words was used; Díaz, 2016) corpus, respectively. Additional terms (e.g., academic corpus: "mission", "b.v", "rights", "reserved"; news media corpus: "tags", "u-uppercase", "video", "cnn", "iphone") were added to the list of stop words as frequent words present across many documents that are expected not to be related to any topic and whose presence might hinder the interpretation of the results. Also, plural words were converted to singular (e.g., academic corpus: "glaciers" to "glacier", "southern" to "south"; news media corpus: "gases" to "gas", "emissions" to "emission"). To preprocess the corpora, we used the "quanteda" R-package (Benoit et al., 2018).

2.4. Publication trends

The Mann-Kendall trend test was used to detect an increase, decrease or no difference in the number of articles published for both academic and news media corpora. Mann-Kendall test is a distribution-free test that can be used to identify monotonic trends for as few as four samples (Mann, 1945; Kendall, 1975). This is relevant for our purposes, given the results of our study were limited by a small sample size ($n = 10$). In brief, we tested the null hypothesis if the data are identically distributed (i.e., non-trend). The alternative hypothesis was that the data follow a monotonic trend. This monotonic trend could be positive or negative. We fitted the Mann-Kendall model using the "Kendall" R-package (McLeod and McLeod, 2015).

2.5. LDA topic modeling

Latent Dirichlet Allocation (LDA), a probabilistic topic-modeling technique, was used to identify the most common topics and themes in both corpora. Briefly, topic modeling is an unsupervised machine learning technique which can identify co-occurring terms and patterns from collections of text documents (Kherwa and Bansal, 2019). Latent LDA is a well-suited unsupervised algorithm for general topic modeling tasks, particularly when dealing with long documents, which is the case with analyzing academic or news media articles (Anupriya and Karpagavalli, 2015; Goyal and Kashyap, 2022). LDA is a three-level hierarchical Bayesian model that employs three basic elements, namely the corpus which is constituted from a set of documents that is composed from a group of words (Blei et al., 2003; Blei, 2012). LDA can infer probabilistic word clusters, called topics, based on patterns of (co) occurrence of words in the documents that are analyzed. LDA models each document as a mixture of topics and the model generates automatic summaries of topics in terms of a discrete probability distribution over words for each topic, and further infers per-document discrete distributions over topic. LDA output can be used logically to classify the documents according to the topic it belongs to.

Before performing the LDA, the number of topics needs to be estimated. In this study, we used two metrics from the R-package "ldatuning" (Nikita, 2016): CaoJuan2009 and Deveaud2014. Whereas measure CaoJuan2009 has to be minimized (Cao et al., 2009), Deveaud2014 has to be maximized (Deveaud et al., 2014). Both metrics showed a plateau in the curves at 9 and 13 topics (k) for both academic and news media corpora, respectively (Figure 1). For each corpus, we fitted the LDA model using the "topicmodels" R-package (Grün and Hornik, 2011). The collapsed Gibbs sampling method was used to estimate the LDA parameters with 1,000 iterations for $k = 13$ and $k = 9$ topics for academic and news media corpora, respectively). Once generated, we assigned a label that adds an interpretable meaning to each of the inferred topics. It is important to note that the news media corpus was

TABLE 1 Information of electronic platform and news media articles retrieved.

News media	Tag	Articles	Individual articles	Date retrieval	Time span	Site
La Tercera	Climate change	879	1,031	2023-01-16	2012–2022	latercera.cl
	Global warming	316				
	Climatic crisis	50				
	Climatic emergency	17				
Meganoticias	Climate change	276	295	2023-01-23	2019–2022	meganoticias.cl
	Global warming	118				
CNN Chile	Climate change	500				
	Global warming	102	602	2023-01-23	2012–2022	cnnchile.com
	Climatic crisis	71				
	Climatic emergency	44				
El Mostrador	Climate change	1,417	1,439	2023-01-25	2012–2022	elmostrador.cl
	Global warming	228				
	Climatic crisis	84				
	Climatic emergency	27				
T13	Climate change	719	865	2023-01-23	2015–2022	t13.cl
	Global warming	266				
	Climatic crisis	118				
chv noticias	Climate change	227	273	2023-01-24	2016–2022	chvnoticias.cl
	Global warming	51				
	Climatic emergency	27				
El Desconcierto	Climate change	344	344	2023-01-06	2013–2022	eldesconcierto.cl
Diario Financiero	Climate change	175	175	2023-01-23	2022	df.cl
Total			5,024			

analyzed in its original language (i.e., Spanish), but the results (i.e., topics and themes) are presented in English.

Lastly, we used a variation of Vu et al. (2019) and Keller et al. (2020) procedures to sort the topics into five overarching themes: climate change indicators (e.g., warming, temperature, glaciers, sea-level, oceans, coastal, weather, wildfires, drought, etc.); climate change impacts (e.g., water, food, agriculture, livestock, biodiversity, ecosystems, financial etc.); climate change and society (e.g., health, wellbeing, pollution, education, humanity, population, etc.); climate politics (e.g., government, law, policy, regulation, U.N., COP, agreement, etc.); and addressing climate change (e.g., adaptation, mitigation, action, renewable, GHG, emissions, fuel, management, etc.). Figure 2 summarizes the steps of data retrieval, corpus creation and content analysis.

2.6. Visualizations

Data visualizations were performed using R (R Core Team, 2022) in conjunction with the software package ggplot2 (Wickham et al., 2016) and dplyr (Wickham et al., 2022).

3. Results

3.1. Publications trends over 2012–2022 period

National and international authors published 1,261 research academic articles related to climate change in Chile during the 2012–2022 period. More than half of these articles, approximately 66.0%, were published from 2019 onwards. In terms of news media, we retrieved 5,024 articles over the period 2012–2022. Of these articles, 76.6% were published in the past 4 years. Figure 3 shows trends in the number of articles for both the academic and news media corpus. Note that the scales of the y-axis are different between corpora. Mann-Kendall trend analysis showed a significant and upward trend for the number of academic articles ($\tau = 1$, $p < 0.01$, Figure 3A) and news media articles ($\tau = 0.85$, $p = <0.05$, Figure 3B) articles. The number of articles published per year follows a similar trend in both corpora, however, news media articles showed a sharp increase in 2019. After these peaks, the number of published media articles decreased before an additional increase was observed.

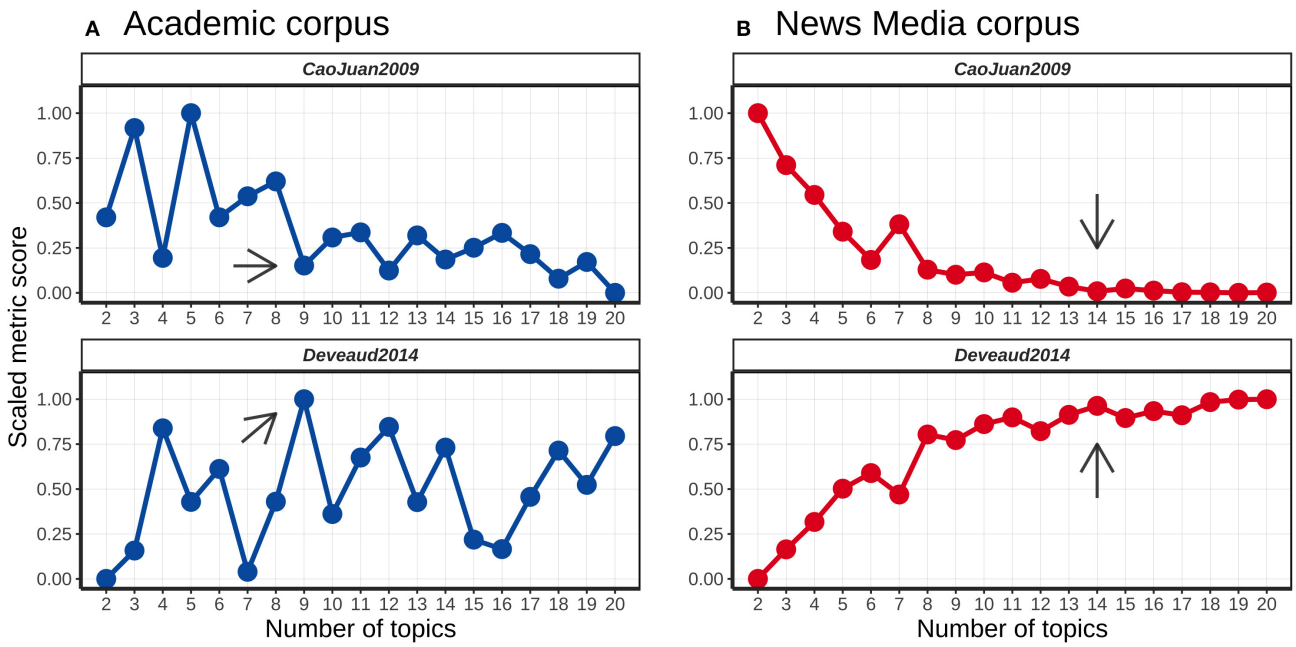

FIGURE 1
Suggested number of topics in the **(A)** academic and **(B)** news media corpora using the CaoJuan2009 and Deveaud2014 metrics.

3.2. LDA topic modeling

The output of the LDA for the academic and news media corpora are displayed in Table 2. Topics were labeled based on the top 15 keywords with the largest probabilities in topics vectors (Figures 4, 5) and content in most relevant articles. In the academic corpus, the nine topics extracted were categorized into three overarching themes: "climate change indicators" (Topic A 2, A3 and A 4), "climate change impacts" (Topics A 7, A 8, and A 9), and "addressing climate change" (Topics A 1, A 5, and A 6). No topics in the academic corpus were classified as "climate change and society" or "climate politics". The 13 topics extracted from news media corpus were classified in five themes: "climate change indicators" (Topic NM 1, NM 4, NM 7, and NM 9), "climate change impacts" (Topic NM 8 and NM 12), "addressing climate change" (Topics NM 5 and NM 13), "climate change and society" (Topics NM 2 and NM 11), and "climate politics" (Topics NM 6 and NM 10).

4. Discussion

This study evaluates the extent of alignment between news media and academic research in their coverage of climate change topics in Chile between 2012 and 2022. By comparing two corpora consisting of 1,261 news articles and 5,024 academic articles, this research sheds light on the similarities, discrepancies, and gaps in the coverage of climate change in Chilean academic and general-interest publications. Our analysis revealed three key findings. Firstly, the number of articles on climate change has increased substantially over the past decade, reflecting a growing interest and urgency surrounding the issue. Secondly, while both news media and academic research cover similar themes, such as climate change indicators, climate change impacts and mitigation and adaptation strategies, the news media provides a wider variety of themes, including climate change and society and climate politics, which are not as commonly explored in academic research. Thirdly, academic literature offers in-depth insights into the ecological consequences of global warming on coastal ecosystems and their inhabitants. In contrast, press media tends to prioritize the tangible and direct impacts, particularly on agriculture and urban health. These disparities not only underscore the differing emphases between news media and academic coverage but also illustrate how news media predominantly focuses on the immediate and visible impacts of climate change events.

4.1. Publications trends over 2012–2022 period

Our study explores the coverage of climate change in Chile by news media and research academia during the 2012–2022 period. We found a significant increase in the number of academic and news media articles published on climate change in Chile over the past decade, indicating growing interest and urgency surrounding the issue (Figure 3). The rise in Chilean literature suggests an increased interest by the scientific community in understanding climate change in Chile, which is crucial for understanding global environmental changes and their impacts on natural, social, political, and economic systems. Our findings are consistent with previous studies that have mapped the evolution of climate change science worldwide (Klingelhöfer et al., 2020;

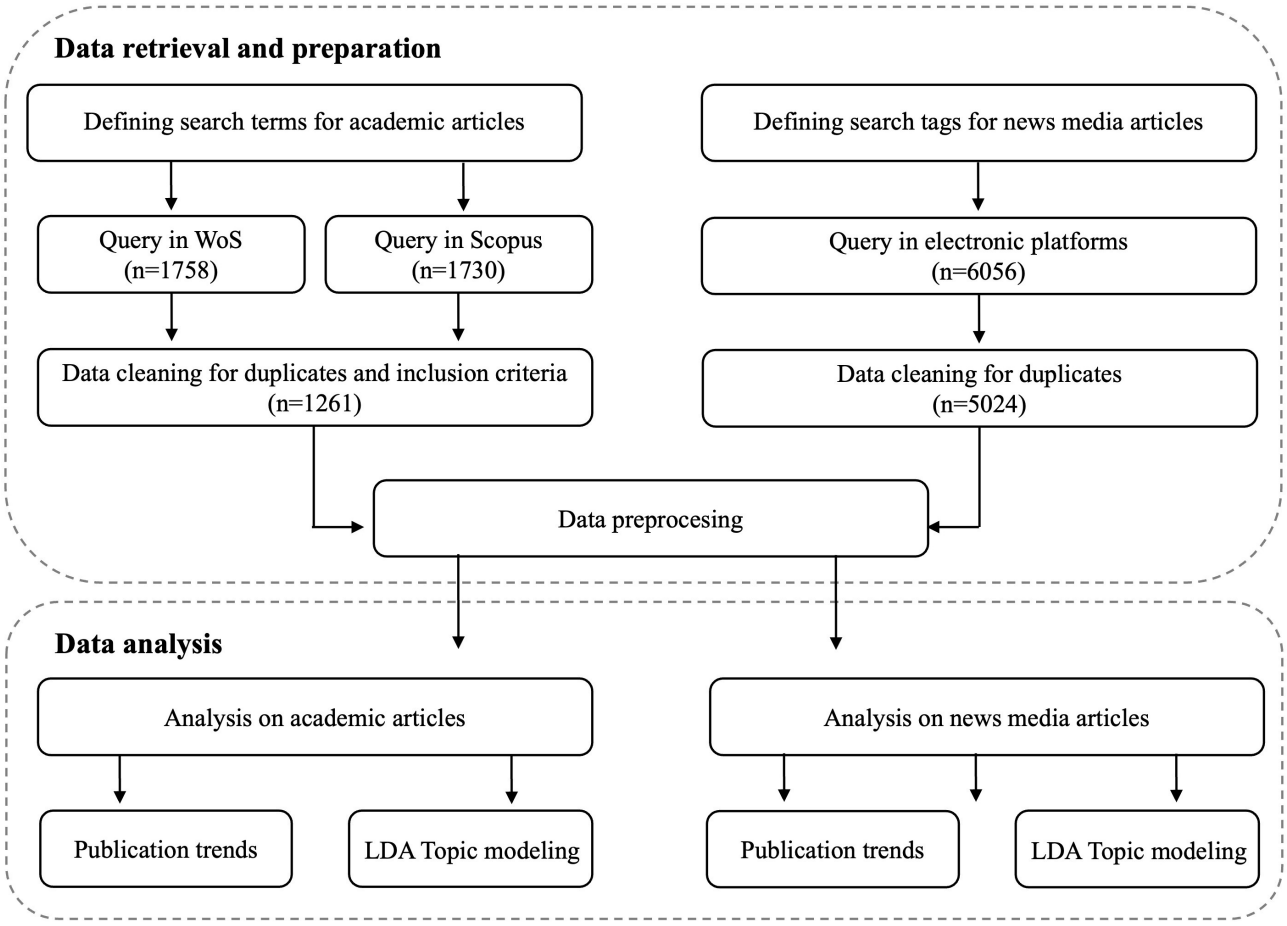

FIGURE 2
Data collection and analysis framework.

Nalau and Verrall, 2021; Reisch et al., 2021; Rocque et al., 2021). The media coverage of climate change in Chile also increased significantly since 2012, reaching a peak during 2019 before decreasing sharply in 2020 and increasing again thereafter. In 2019, the peak coincided with the climate summit (COP 25) held by Chile, generating great interest among civil society, scientists, and the private sector to share their plans for mitigating and adapting to climate change (Hjerpe and Linnér, 2010). This event occurred at the same time as the #FridaysForFuture campaign, which mobilized an unprecedented number of youths worldwide to join the climate movement, including Chile (Fisher, 2019). The campaign was instrumental not only for its potential impact on policy but also for raising public awareness about climate change and promoting action to address it. However, the media landscape experienced a notable shift in priorities due to the global COVID-19 pandemic. The pandemic brought about unprecedented challenges and uncertainties, leading to changes in media coverage patterns and public attention. News media had to allocate significant resources to reporting on the pandemic, including public health information, policy responses, and updates on the spread of the virus (Krawczyk et al., 2021; Mach et al., 2021). This shift in media priorities affected the extent and prominence of climate change coverage. Consequently, the media coverage of climate change in Chile experienced a temporary decline in 2020. However, as the world gradually adapted to the ongoing pandemic, news media resumed their coverage of climate change, and the topic regained attention. Additionally, the upcoming international conferences, such as COP 26 in England (2021) and COP 27 in Egypt (2022), may have contributed to the increased media coverage observed since 2021, as these events serve as key moments to discuss global climate action.

4.2. LDA topic modeling

Using LDA topic analysis, we found that both academic and news media articles covered three of the five evaluated themes—"climate change indicators", "climate change impacts", and "addressing climate change"—as shown in Table 2 and Figures 4, 5. The themes "climate change and society" and "climate politics" were covered by news media but has been relatively underexplored in academic research.

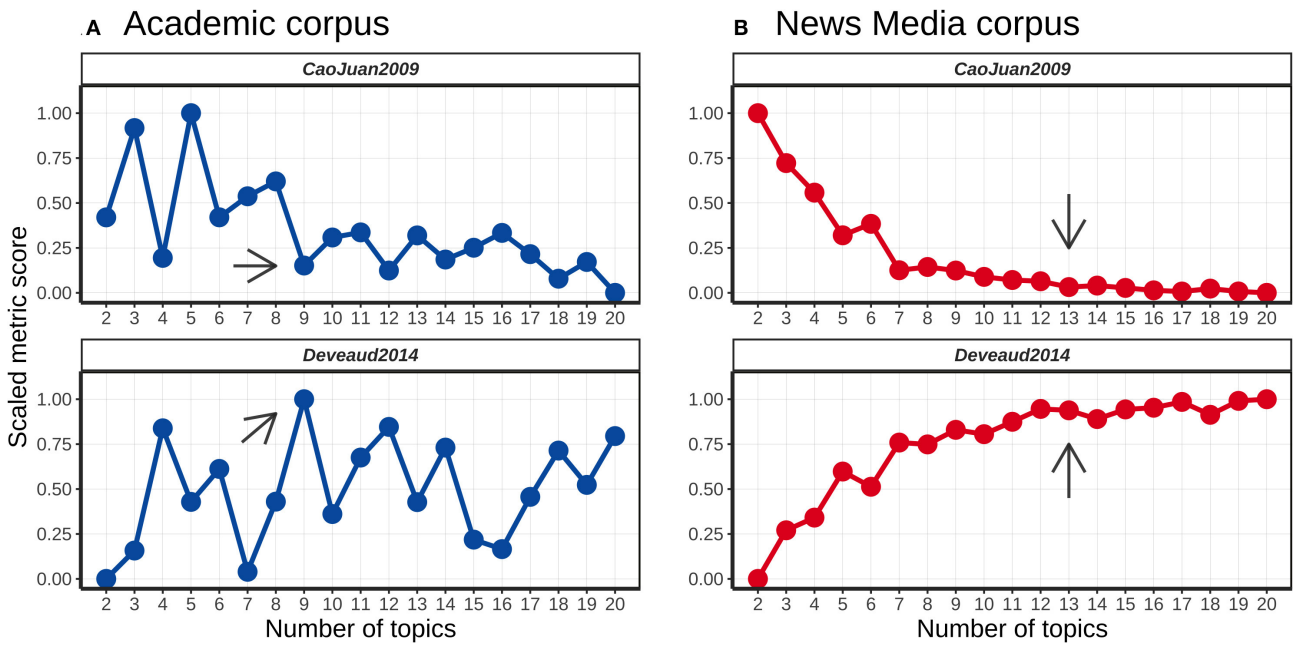

FIGURE 3
Annual trend of **(A)** academic and **(B)** news media articles published from 2012 to 2022.

TABLE 2 Themes, labels, and topics identified by LDA for academic ($n = 9$) and news media ($n = 13$) corpora.

Theme	Academic corpus		News media corpus	
	Topic ID	Topic label	Topic ID	Topic label
Climate change indicators	A 2	Precipitation patterns in the Andean region	NM 1	Indicators and trends
	A 3	Climate change scenarios	NM 4	Melting ice and sea level rise
	A 4	Extreme precipitations and droughts	NM 7	Heat waves, fires, and floods
			NM 9	Droughts and precipitation patterns
Climate change impacts	A 7	Population response of coastal species	NM 8	Agriculture and ecosystem services
	A 8	Impacts of global warming on coastal organisms	NM 12	Health impacts on urban populations
	A 9	Environmental impact and risk assessment		
Addressing climate change	A 1	Mitigation and adaption in the energy sector	NM 5	Transition toward low carbon energy systems
	A 5	Forest carbon management	NM 13	Adaptation efforts and mitigation strategies
	A 6	Agriculture and water management		
Climate change and society			NM 2	Society and sustainable development
			NM 11	Climate action
Climate politics			NM 3	International conferences and commitments
			NM 6	IPCC Reports
			NM 10	Chilean climate change framework law

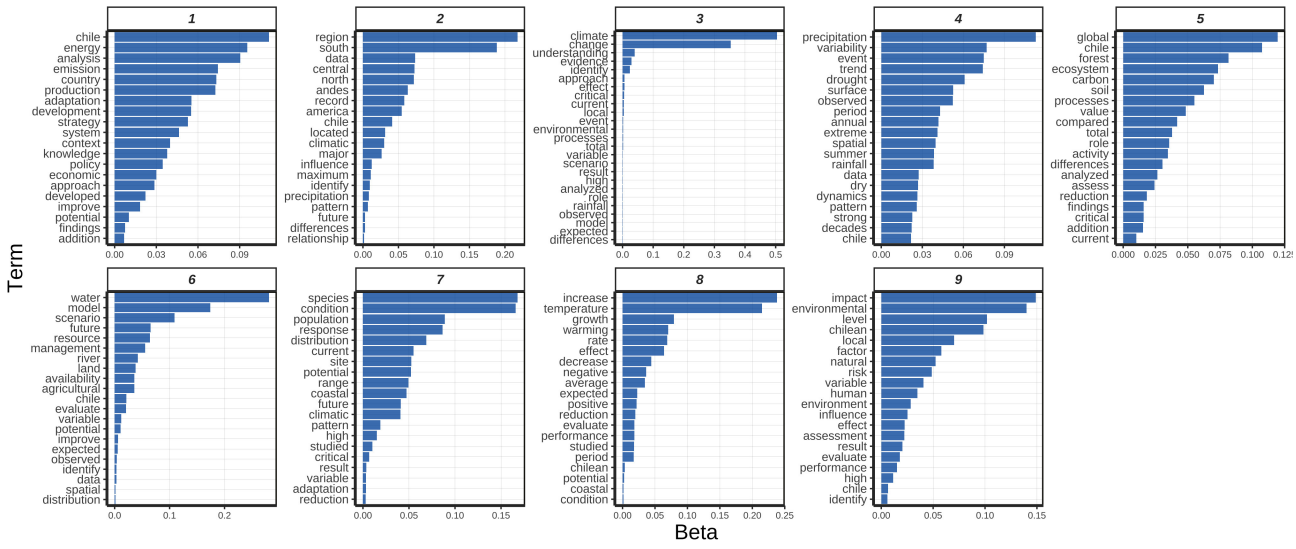

FIGURE 4
Word-topic probability from LDA model in the academic corpus.

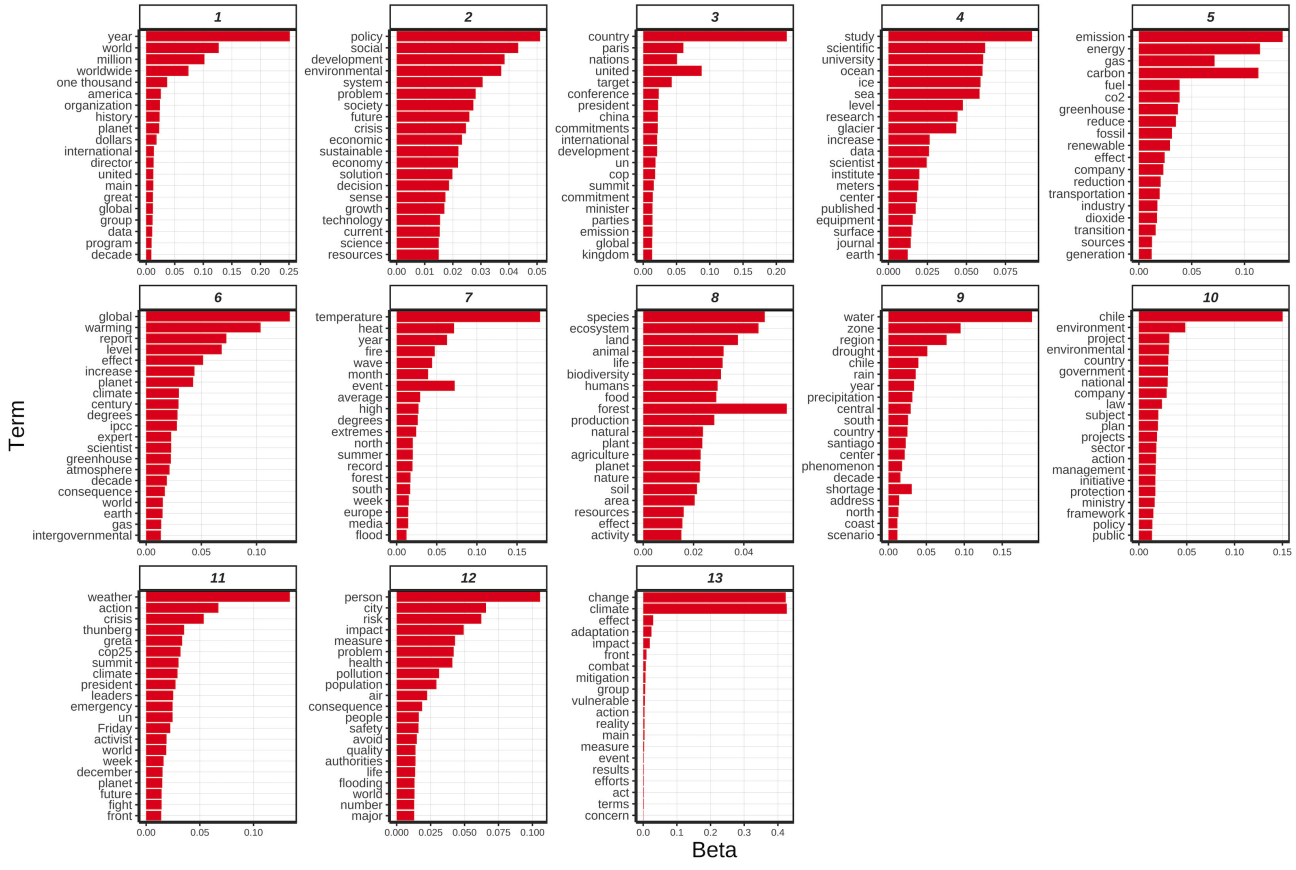

FIGURE 5
Word-topic probability from LDA model in the news media corpus.

4.2.1. Climate change indicators

Both corpora shared a common focus on droughts and precipitations as key climate change indicators. Academic studies covered extreme precipitation and drought (Topic A 2), as well as precipitation patterns in the Andean region (Topic A 4). Similarly, news media concentrated on drought and precipitation patterns in

central Chile (Topic NM 9). Research by Chilean scientists shows that since 2010, the country has witnessed a significant increase in drought intensity and frequency, accompanied by a sharp reduction in precipitation (Garreaud et al., 2020; González-Reyes et al., 2023). The resulting prolonged drought has caused acute water stress, food insecurity, loss of livelihoods, and severe biodiversity impacts, particularly in the central region. The shared focus reflects the concern for the tangible and urgent impacts of the mega-drought experienced by Chile over the last decade (De la Barrera et al., 2018; Sarricolea et al., 2020; Alvarez-Garreton et al., 2021). Thus, the alignment in attention to these issues highlights the pressing nature of the topic in Chile's context.

Moreover, the academic corpus focuses on climate change scenarios scenarios (Topic A 3) related to precipitation patterns. This indicates a strong emphasis on understanding the potential impacts of climate change on rainfall patterns and hydrological systems. On the other hand, the news media corpus predominantly focuses on indicators and trends (Topic NM 1) related to financial aspects, such as countries' expenditures, economic programs over the last decade, and historical perspectives on the planet. Although the focus of the two corpora differs in terms of temporal perspective, both share the overarching objective of understanding climate change and its indicators. The academic corpus with its emphasis on scenarios offers valuable insights into long-term projections and the potential consequences of climate change. Meanwhile, the news media corpus, with its focus on indicators and trends, serves to inform the public about the immediate impacts of climate change. By examining these complementary approaches, a more holistic understanding of climate change and its multifaceted nature can be obtained, incorporating both long-term projections and current reality.

Interestingly, news media coverage of climate change impacts extends beyond droughts and precipitation scenarios, encompassing a wide range of issues such as melting ice, sea-level rise, urban flooding, heatwaves, and fires, which have become particularly problematic in Chile and other countries, notably Europe (Topic NM 4 and 7). Heatwaves have been increasingly frequent and intense, resulting in record-breaking high temperatures across, Chile (Piticar, 2018; Suli et al., 2023), Europe (Xu et al., 2020; Becker et al., 2022; Lhotka and Kyselý, 2022) and worldwide. These episodes result in elevated mortality rates, particularly among vulnerable populations, and the amplification of other health-related risks (An der Heiden et al., 2020; Błazejczyk et al., 2022). Fires, fueled by warmer and drier conditions, have also received considerable attention in news media. The incidence of wildfires has risen substantially, causing significant ecological damage, property destruction, and threats to human wellbeing (Wong-Parodi, 2020; Hertelendy et al., 2021). Fires have been a significant concern in Chile between 2015 and 2022, accounting for 36% of the total burnt area from 1985 to 2022 (Ruffault et al., 2018; CONAF, 2022; Varga et al., 2022). These fires have resulted in the destruction of thousands of hectares of land, vital ecosystems, and significant air pollution, all of which have adverse effects on human health. This broader coverage aligns with academic research findings that emphasize the devastating effects of climate change events on the environment, local communities, economy, welfare, and health in Chile and elsewhere (Piticar, 2018; Suli et al., 2023). The news media serves a pivotal role in disseminating information about these climate change impacts, effectively highlighting their far-reaching consequences. Furthermore, these examples shed light on the differing emphases between news media and academic coverage, with news media giving considerable attention to the immediate and visible impacts of climate change events. This approach serves to raise awareness and engage the public in comprehending and addressing these pressing challenges.

4.2.2. Climate change impacts

The analysis reveals that academic literature predominantly concentrates on the impacts of global warming on coastal organisms (Topics A 9). Similarly, the population response of coastal species is a major research focus within academia, examining the implications of climate change on species' survival, reproductive success, and migration patterns (Topics A 7). Changes in oceans, such as temperature increase, sea level rise, and acidification, have had wide-ranging biological implications (Dewitte et al., 2021; Navarrete et al., 2022), and recent studies have shown that marine organisms can adapt or acclimate to these changes (Navarro et al., 2016; Ramajo et al., 2019; Fernandez et al., 2021; Lardies et al., 2021; Vargas et al., 2022). For instance, Navarro et al. (2020) examined the effects of ocean warming and acidification on juvenile Chilean oysters (*Ostrea chilensis*), inhabiting coastal and estuarine areas of the mid to high latitudes of southern Chile. Silva et al. (2016) investigated the impacts of projected sea surface temperature on habitat suitability and geographic distribution of anchovy (*Engraulis ringens*) due to climate change in the coastal areas off Chile, an important commercial fishery resource in Chile. Most of these species are commercially important and provide food and livelihoods for local communities. The future impacts of climate change on marine biodiversity in Chile are uncertain but could be severe if current trends persist (Du Pontavice et al., 2020). Additionally, a considerable amount of academic research revolves around environmental impact and risk assessment (Topics A 9), which reflects the growing concern over the susceptibility of human and natural systems to climate change impacts in Chile. Vulnerability and risk assessment can help identify populations, regions, and sectors that are most susceptible to the current and future impacts of climate change (Urquiza et al., 2021). Addressing these vulnerabilities can inform decision-making processes and support the development of effective policies and adaptation strategies (Gandini et al., 2021; Simpson et al., 2021).

In contrast, news media predominantly highlights the significant impacts of climate change on Chilean agriculture and ecosystem services (Topic NM 8) (Fernández et al., 2019). Extreme weather events, such as heatwaves and droughts, have resulted in significant alterations in the timing and quantity of rainfall. These changes, in turn, have led to notable shifts in soil moisture levels and water availability for crop cultivation. These events have also impacted soil fertility, crop yields, and farm infrastructure, as well as pollination services provided by insects, such as bees, which are critical for fruit and vegetable production (Gajardo-Rojas et al., 2022). By emphasizing this interconnectedness, news media can

help people understand the significant economic, social, and food security impacts of climate change on the country's agricultural sector (Muluneh, 2021). Furthermore, news articles often focus on the health impacts of climate change on urban populations (Topic NM 12), such as the increased prevalence of heat-related illnesses, air pollution-related respiratory diseases, and the spread of vector-borne diseases in cities (Bell et al., 2008; Oyarzún et al., 2021).

These disparities between academic literature and news media highlight the communication gap between scientific research and mainstream discourse on climate change impacts in Chile. While academia provides detailed insights into the ecological consequences of global warming on coastal ecosystems and their inhabitants, the news media places more emphasis on tangible and direct impacts, such as those on agriculture and urban health. Bridging this gap between academia and news media is crucial for enhancing public awareness and understanding of the comprehensive range of climate change impacts, ultimately supporting informed decision-making and sustainable action in response to this urgent global issue.

4.2.3. Adressing climate change

An alignment between academic literature and news media can be observed in their shared focus on adaptation efforts and mitigation strategies. Academic literature extensively examines the role of mitigation and adaptation in the energy sector (Topic A 1), emphasizing the importance of diversifying energy sources, developing and implementing renewable energy sources, and energy efficiency to reduce GHG emissions and provide cost-effective mitigation and adaptation benefits to households and businesses (Nasirov et al., 2019; Pamparana et al., 2019; Kairies-Alvarado et al., 2021; Martinez-Soto et al., 2021; Raihan, 2023). This aligns with the coverage in news media, which highlights the transition toward low carbon energy systems (Topic NM 5), reflecting policy agendas in many countries, including Chile, where the energy sector is the largest contributor to GHG emissions (Álamos et al., 2022; Labarca et al., 2023). The transition to a more sustainable energy system in Chile has been promoted through the implementation of renewable energy production and energy efficiency (Simsek et al., 2019, 2020; Babonneau et al., 2021; Osorio-Aravena et al., 2021; Ferrada et al., 2022). These findings are in line with those of Lyytimäki (2018), who found that news media created a highly positive narrative of renewable energies as an environmentally friendly solution to GHG emissions.

However, disparities between academic literature and news media coverage are apparent. While both sources recognize the significance of these measures, academic literature provides more comprehensive coverage than news media. Academic literature places significant emphasis on forest carbon management, acknowledging the crucial role of forests in carbon sequestration (Topic A 5), and climate change mitigation. This involves implementing forest conservation, reforestation, and afforestation practices to increase carbon sequestration in forest biomass and soil, thereby reducing GHG emissions Additionally, academic literature extensively addresses agriculture-water management (Topic A 6), emphasizing the importance of sustainable agricultural practices and efficient water resource management in response to changing climate conditions. Relevant mitigation and adaptation strategies for agriculture, such as improving water use efficiency, adopting irrigation technologies, and modifying crop choices, have been identified in academic research (Novoa et al., 2019; Jordán and Speelman, 2020; Zúñiga et al., 2021). In contrast, news media coverage is more limited in these areas, focusing more narrowly on the transition toward low carbon energy systems (Topic NM 5), and general adaptation efforts and mitigation strategies (Topic NM 13). Despite this, news media plays a vital role in climate change communication by highlighting various actions that can be taken to effectively mitigate and adapt to the impacts of climate change, which can help promote the adoption of sustainable solutions.

4.2.4. Climate change and society

Our analysis reveals an interesting pattern: the theme of "climate change and society" is covered by news media but has been relatively underexplored in academic research. In news media coverage, the theme of society and sustainable development (Topic NM 2) takes center stage, focusing on dimensions such as economy, technology, social, and environment. Additionally, news media pays significant attention to climate action (Topic NM 11), exemplified by movements like "Fridays for Future" and speeches by climate activist Greta Thunberg during international climate conferences such as COP.

This media coverage plays a vital role in highlighting contingent events and showcasing the direct and indirect impacts of climate change on people's daily lives on both local and global scales. However, it is notable that the theme of "climate change and society" lacks adequate representation in the scientific literature.

Understanding the societal implications of climate change is of paramount importance for all stakeholders, including policymakers, civil society organizations, and individuals. The scientific exploration of this topic can provide valuable insights into effective and equitable adaptation and mitigation strategies. Consequently, there is a pressing need to develop further research on this topic, bridging the gap between news media coverage and scientific inquiry. By expanding our understanding of the societal dimensions of climate change in the academic literature, we can better inform evidence-based decision-making, foster collective action, and ultimately contribute to a more sustainable future.

4.2.5. Climate politics

Climate politics is another topic covered by news media underexplored in academic. This theme has included topics such international conferences and commitments (Topic NM 3), IPCC Reports (Topic NM 6) and Chilean climate change framework law (Topic NM 10). The Climate Change Framework Law, is a recent important policy instrument for addressing climate change, as it aims to reduce greenhouse gas emissions and adapt to the impacts of climate change (Madariaga Gómez de Cuenca, 2021). The IPCC report, on the other hand, is a crucial scientific report that provides a comprehensive assessment of the state of knowledge on climate change, its causes, impacts, and future risks (Pörtner et al., 2019). IPCC report coverage in the news media is vital for the understanding of climate change in Chile and worldwide, as

they inform the public about the latest developments in climate policy and the scientific understanding of climate change. The coverage of these topics in the news media is important for society's understanding of climate change, both in Chile and worldwide, as it highlights the importance of political will and action in tackling climate change at local, national, and global levels. The relatively low coverage of these themes in academic research, however, suggests the need for more interdisciplinary research on the social and political dimensions of climate change.

4.3. Analyzing news media and academic research

Our study focused on assessing the alignment between climate change coverage in news media and academic research in Chile, revealing significant gaps in the framing of climate change between these two domains. Academic research and media coverage of climate change often focus on different aspects and utilize distinct methodologies. Academic sources offer rigorous scientific investigations, providing in-depth analysis and evidence-based insights into the complexities of climate change (Cook, 2019; Farrell et al., 2019; Masson-Delmotte et al., 2021). In contrast, media sources serve as a bridge between scientific findings and public understanding, shaping public opinion and influencing societal actions (Boykoff, 2009; Drews and Van den Bergh, 2016; Boykoff and Luedecke, 2017; Stecula and Merkley, 2019; Merkley, 2020; McAllister et al., 2021; Okoliko and de Wit, 2023). The complementary nature of academic and media sources allows for a more comprehensive communication and understanding of climate change (Goldstein et al., 2020; Lewandowsky, 2021). Through analyzing both academic and media sources, discrepancies and gaps in climate change coverage can be identified, uncovering biases and insufficient attention to certain aspects. This analysis significantly enhances public understanding by facilitating the development of targeted communication strategies that bridge these gaps, ultimately promoting informed public debates and driving effective actions. However, it is crucial to recognize that the level of media influence on public opinion depends on the level of audience engagement with climate change discourse (Wonneberger et al., 2020). Consequently, aligning academic and media coverage becomes even more essential as it enables a more accurate and balanced portrayal of climate change, thereby facilitating the implementation of necessary policies and practices to address this pressing global concern. Our findings have important implications for future research and climate communication in Chile, suggesting the need for increased attention to the challenging dimensions of climate change, such as the social dynamics and political factors associated with this global issue.

4.4. Limitations

This study has several limitations that should be taken into account when interpreting the findings. Firstly, the academic corpus only included articles published in English, while the news media corpus only included articles published in Spanish. As a result, topics' keywords had to be translated into English for comparison between corpora, which could have an effect on the results. Secondly, we selected eight Chilean electronic news media sources with high readership and free accessibility without subscription fees; however, future studies should consider including other paid subscription news media as well. Thirdly, our research does not take into account other mass media platforms that can provide information about climate change (Tandoc and Eng, 2017; Becken et al., 2022). Future research could explore this topic further. Lastly, this study analyzed two corpora inherently different in terms of their coverage; news media tends to cover climate change from an international perspective, while academia focuses on a more local or regional level. These limitations do not diminish the significance of our findings. Our study highlights the need for better communication and dissemination of scientific findings to the general public. The findings of this study are not only relevant to Chile but also have global implications in addressing the pressing issue of climate change. It is crucial to bridge the gap between academic research and news media coverage to promote effective solutions for tackling this issue.

5. Conclusion

Through the application of text-mining, web-scraping methods, and topic-modeling techniques to an academic and news media corpus, this study has yielded valuable insights into the similarities, discrepancies, and gaps in the coverage of climate change in Chilean academic and general-interest publications. By identifying and analyzing these patterns, our research contributes to a deeper understanding of climate change coverage in Chile, providing relevant evidence that bridges the communication gap between scientific research and mainstream discourse. The integration of academic and media sources in this study has revealed their complementary nature, facilitating a more comprehensive communication and understanding of climate change. This interdisciplinary approach expands our perspective, allowing us to appreciate the multifaceted aspects associated with climate change more holistically. This study underscores the importance of considering both academic and media sources when addressing climate change. By combining the rigorous analysis of scientific research with the broader reach of media coverage, it's possible to promote a more informed and engaged public discourse on climate change.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

PC and RQ contributed to conception and design of the study. PC organized the database, retrieved the information, performed

the analysis, and wrote the first draft of the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fcomm.2023.1226432/full#supplementary-material

SUPPLEMENTARY TABLE 1
Academic and news media corpora analyzed in this study.

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