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Climate change: Profile, behavior and trends in Brazilian academia from the perspective of social network analysis

Mudanças climáticas: Perfil, comportamento e tendência na academia do Brasil sob a perspectiva da análise de redes sociais

Cambio climático: Perfil, comportamiento y tendencias en la academia brasileña desde la perspectiva del análisis de redes sociales

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ABSTRACT

Background: Climate change is one of the most urgent problems faced by societies around the world, and therefore, climate change is seen as one of the great global challenges of the 21st century. Therefore, it is of fundamental importance to expand scientific knowledge about the topic of climate change in Brazil, and metric studies, through sociometry or social network analysis (SNA), are of great importance and value for this, as they provide opportunities and enable the understanding and comprehension of the structures and formations of networks of the actors involved in the process of constructing academic knowledge on the subject of climate change.

Purpose: To investigate the profile, behavior and trend of the topic of climate change in Brazilian academia, from the perspective of the SPELL database and from the perspective of the SNA.

Method: Social network analysis was used in 176 articles identified on the topic of climate change.

Results: 2023 was the most central period; GeAS was the most dominant journal; José Célio Silveira Andrade was the most influential author; USP was the most relevant HEI; and sustainability, sustainable development, global warming, tourism, innovation, public policies, environment, performance, environmental education, adaptation, climate risks and clean development mechanism (CDM) were the most central keywords.

Conclusions: In a macro sense, this research concludes by highlighting the theme of climate change from the perspective of social network analysis, investigating the structure and formation of the networks of actors involved in the process of construction and creation of scientific value regarding this important subject, thus contributing to its better understanding and, simultaneously, comprehension, consequently influencing its evolution in the academic literature of Brazil.

Keywords: climate change; scientific production; Brazilian journals; SPELL; SNA.

RESUMO

Contextualização: As mudanças climáticas são um dos problemas mais urgentes enfrentados pelas sociedades em todo o mundo, logo, as mudanças climáticas são vistas como um dos grandes desafios de âmbito global do século XXI. Logo, é de fundamental importância ampliar o conhecimento científico acerca do tema mudanças climáticas no Brasil, e os estudos métricos, mediante a sociometria ou análise de redes sociais (ARS), são de grande importância e valia para isso, pois oportunizam e viabilizam o entendimento e a compreensão das estruturas e das formações de redes dos atores envolvidos no processo de construção do saber acadêmico sobre o assunto das mudanças climáticas.

Objetivo: Investigar o perfil, o comportamento e a tendência do tema mudanças climáticas na academia do Brasil, sob a perspectiva do banco de dados SPELL e sob a ótica da ARS.

Método: Utilizou-se a análise de redes sociais em 176 artigos identificados sobre o tema mudanças climáticas.

Resultados: 2023 foi o período mais central; GeAS, o periódico mais dominante; José Célio Silveira Andrade, o autor mais influente; USP a IES mais relevante; e sustentabilidade, desenvolvimento sustentável, aquecimento global, turismo, inovação, políticas públicas, meio ambiente, desempenho, educação ambiental, adaptação, riscos climáticos e mecanismo de desenvolvimento limpo (MDL) foram as palavras-chave mais centrais.

Conclusões: De maneira macro, essa pesquisa conclui, ao colocar em realce o tema mudanças climáticas sob a perspectiva da análise de redes sociais, investigando a estrutura e a formação das redes dos atores envolvidos no processo de construção e criação do valor científico a respeito do destacado assunto, contribuindo, assim, para seu melhor

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entendimento e, simultaneamente, compreensão, influenciando, conseqüentemente, na sua evolução na literatura acadêmica do Brasil.

Palavras-chave: mudanças climáticas; produção científica; periódicos brasileiros; SPELL; ARS.

RESUMEN

Contextualización: El cambio climático es uno de los problemas más urgentes que enfrentan las sociedades a nivel mundial y, por lo tanto, se considera uno de los grandes desafíos globales del siglo XXI. Por ello, es fundamental ampliar el conocimiento científico sobre el tema en Brasil, y los estudios métricos, mediante sociometría o análisis de redes sociales (ARS), son de gran importancia y valor para ello, ya que brindan oportunidades y facilitan la comprensión de las estructuras y formaciones de redes de los actores involucrados en el proceso de construcción del conocimiento académico sobre el cambio climático.

Objetivo: Investigar el perfil, comportamiento y tendencia del tema del cambio climático en la academia brasileña, desde la perspectiva de la base de datos SPELL y desde la perspectiva de la ARS.

Método: Se utilizó el análisis de redes sociales en 176 artículos identificados sobre el tema del cambio climático.

Resultados: 2023 fue el período más central; GeAS fue la revista más dominante; José Célio Silveira Andrade fue el autor más influyente; la USP fue la IES más relevante; y sostenibilidad, desarrollo sostenible, calentamiento global, turismo, innovación, políticas públicas, medio ambiente, desempeño, educación ambiental, adaptación, riesgos climáticos y mecanismo de desarrollo limpio (MDL) fueron las palabras clave más centrales.

Conclusiones: En sentido macro, esta investigación concluye destacando la temática del cambio climático desde la perspectiva del análisis de redes sociales, investigando la estructura y formación de las redes de actores involucrados en el proceso de construcción y creación de valor científico sobre este importante tema, contribuyendo así a su mejor entendimiento y, simultáneamente, comprensión, influenciando conseqüentemente su evolución en la literatura académica de Brasil.

Palabras clave: cambio climático; producción científica; revistas brasileñas; SPELL; ARS.

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1 INTRODUCCION

The *Intergovernmental Panel on Climate Change* (IPCC) defines climate change as a change in the state of the climate that can be identified by alterations in the mean and or variability of its properties and that persists over an extended period of time. In this regard, it is evident that climate change, as well as global warming and, more recently, climate emergencies, have, over the past decade, been emphasized as key terms in relation to the greatest sustainability challenge of the 21st century (Santos & Bakhshoodeh, 2021).

The effects of climate change are a source of uncertainty for businesses worldwide. Consequently, climate change has caused significant and disruptive alterations in the ecological systems with which societies interact (Tautiva, Huaman & Oliva, 2024). As a result, climate change has been attracting widespread scientific, political, and public attention, leading to the involvement of international initiatives such as the Paris Agreement (PA) and the IPCC (Fu & Waltman, 2022).

Thus, climate change is considered one of the major global challenges (Tan, Zhu, Sun, Zhao & Chen, 2021), as it is a worldwide problem that can influence the way of life of all living beings (Usta, 2023). Consequently, in recent years, climate change has begun to put pressure on humanity and affect natural and human systems, simultaneously impacting measures related to disaster risk reduction and sustainable practices (Iancu, Tudor, Dumitru, Sterie, Micu, Smedescu, Marcuta, Tonea, Stoicea, Vintu, Jitareanu & Costuleanu, 2022).

In this regard, it is noteworthy that, over time, the purpose of research on climate change has evolved from understanding the climate system to developing climate technologies and regulations, such as laws and efficient energy use. Thus, the concept of climate change is reflected in modern models of energy efficiency, renewable energy transition, and carbon pricing. Accordingly, knowledge about climate change, from a general perspective, affects the carbon footprint, social and economic impacts, rising carbon dioxide (CO₂) levels, and carbon sequestration (Lindawati & Meiryani, 2024). Furthermore, it is important to emphasize that CO₂, whose atmospheric concentration has been increasing, is the main greenhouse gas (GHG) causing global warming and climate change. Climate change driven by rising GHG emissions has wide-ranging impacts on both health and the environment. Therefore, anthropogenic GHG emissions represent a significant cause of global warming (Matenda, Raihan, Zhou & Sibanda, 2024).

Given the above, it is evident that the carbon footprint has gained tremendous popularity in advancing climate-related goals. In particular, current energy use has been identified as the main cause of climate change. Therefore, the carbon footprint plays an irreplaceable role in managing energy consumption, reducing gas emissions, and improving climate change outcomes (Cao, Qi, Cui & Yuan, 2023).

That said, it is worth highlighting that the Kyoto Protocol (KP) established three flexible mechanisms to achieve emission reductions: joint implementation, emissions trading, and the Clean Development Mechanism (CDM). Specifically, the CDM focuses on strengthening collaboration between developed and developing countries and is designed to assist developed nations in reducing emissions while simultaneously helping developing countries mitigate climate change and achieve sustainable development. Consequently, it is emphasized that strategies for addressing climate change mitigation include energy policies such as renewable energy and energy transition (Hou & Wang, 2021; Ribeiro, 2025a).

In general, the effect of climate change is a real-world problem that threatens the existence of species and human beings, impacting sustainable development, therefore, climate change and sustainable development are interconnected global challenges that demand urgent attention. In this regard, it is noteworthy that the issue of climate change has been receiving critical concern from policymakers as well as from academic researchers worldwide (Islam, Chowdhury, Begum & Amir, 2022; Baidya & Saha, 2024).

Therefore, in the academic context, it is evident that several metric studies (Assan, Serra, Meira & Kniess, 2018) on the topic of climate change have already been published (Li, Wang & Ho, 2011; Haunschild, Bornmann & Marx, 2016; Freitas & Paiva, 2018; Wang, Zhao & Wang, 2018; Sharifi, Simangan & Kaneko, 2021; Fu & Waltman, 2022; Iancu *et al.*, 2022; Usta, 2023; Baidya & Saha, 2024; Lindawati & Meiryani, 2024; Oliveira, Santos, Weiler, Aguiar, Fernandes & Ziglio, 2024; Tautiva, Huaman & Oliva, 2024). It should be noted that these studies predominantly relied on international databases, particularly *Web of Science* (WoS) and *Scopus*.

The publication of these studies focusing on metric investigations is explained by the fact that this methodological approach is suitable for examining the profile, behavior, and trends of publications indexed in databases, this, in turn, makes it possible to identify future research opportunities, as well as to gain knowledge and understanding of how collaboration occurs among the actors involved in the construction of scientific knowledge, such as cooperation between authors and their respective native Higher Education Institutions (HEIs) (Oliveira *et al.*, 2024; Ribeiro, 2024c).

Among these metric studies, Social Network Analysis (SNA), or sociometry, stands out as a research method that provides a unique perspective on the scientific analysis of networks, since SNA can investigate the dynamic interactions among actors, the evolutionary development of scientific articles, and the complexity of research groups (Chen, Zhang, Lau, Wang, Wang & Zhang, 2023; Xiao, Si & Guo, 2024; Ribeiro, 2024d). Regarding databases, one of the most important and influential in the Brazilian academic landscape, and particularly relevant in metric-focused research such as sociometry, is the *Scientific Periodicals Electronic Library* (SPELL) (Ribeiro, 2024b).

Thus, considering that future research on climate change can be developed by including other databases that capture studies whose results were communicated and disseminated at a more local level (Oliveira *et al.*, 2024), such as the Brazilian SPELL database (Freitas & Paiva, 2018), this study raises the research question that grounded and guided this scientific article: What is the profile, behavior, and trend of the theme of climate change in Brazilian academia, from the perspective of the SPELL database and through the lens of Social Network Analysis (SNA)? Accordingly, the objective that helped answer this research question was: To investigate the profile, behavior, and trend of the theme of climate change in Brazilian academia, from the perspective of the SPELL database and through the lens of SNA.

Thus, it is emphasized that climate change is increasingly present as a topic when addressing its everyday effects and discussing how to confront economic and political issues. Scientific evidence shows that it is more than a future problem; it is about confronting changes that already exist. Therefore, the justification for investigating the theme of climate change is reinforced, as it has been gaining increasing attention from the academic community, influencing its growth in the scientific literature in Latin America, especially within the Brazilian academic context (Oliveira *et al.*, 2025).

The relevance of conducting this research is reinforced by the following reasons: (i) climate change is a hot topic; (ii) it requires further investigation at a global level; and (iii) studies on climate change are steadily increasing in academia (Sharifi, Simangan & Kaneko, 2021; Fu & Waltman, 2022; Iancu *et al.*, 2022; Lindawati & Meiryani, 2024; Oliveira *et al.*, 2024). Another justification for carrying out this study lies in the fact that, for the first time and up to the present moment, climate change is being highlighted in an investigation focusing on scientific production and on the structure and formation of social networks of Brazilian scientific articles related to the subject, from the dominant perspective of the SPELL database and under the prevailing lens of sociometry.

Therefore, the relevance of this academic study is demonstrated, grounded in its novelty for the fields of Administration, Accounting, and Tourism, which guide and serve as the common thread of the articles published in their respective journals within the SPELL database. In other words, this study is original as it contributes to the literature by providing an overview of the production and dissemination of knowledge on the topic of climate change. To the best of our knowledge, this is the first study to predominantly use SNA to investigate publications on climate change, aiming to understand research trends on this topic in Brazil from the perspective of the SPELL database.

In this way, this scientific article is both pertinent and timely, as it will contribute to the creation and publication of further investigations on the scientific production related to climate change, particularly in academic journals, consequently, it will foster a better and broader understanding of the subject, while simultaneously impacting its growth within the Brazilian academic literature.

In summary, this study can be used by researchers and policymakers to generate reflections on the possible directions in which climate change research is developing and, at the same time, to foster discussions that may be necessary and significant for future research on climate change. In light of the above, this research contributes to gaining insights into current potential research trends and to demonstrating the breadth of scientific production and the importance of the role of the climate change theme. Finally, this investigation provides valuable information for the creation and subsequent publication of future studies, thereby simultaneously suggesting the possibility of advancing a research agenda on climate change within the Brazilian academic context.

Finally, the study is divided into five sections, as follows: the first emphasizes the Introduction. The theoretical framework, which addresses the theme of climate change, is presented in the second section. The third section highlights the methodological procedures. The analysis and discussion of the results are the focus of the fourth section. Finally, the conclusion is presented in the fifth section of the study.

2 CLIMATE CHANGE

Climate change is among the most contemporary international issues, as this theme represents major risks for a wide range of businesses and for society as a whole. That said, the environmental, economic, and social impacts resulting from climate change are numerous, including hunger, heat, an increase in diseases, and environmental disasters. Therefore, the issue of climate change is urgent for Society (Freitas & Paiva, 2018; Brito, 2022; Ribeiro, Corrêa, Pierot & Leal, 2024).

Climate change, a multifaceted and intergovernmental issue, affects many aspects of the ecological, environmental, sociopolitical, and socioeconomic fields on a global scale, for example, with regard to Earth's temperature. Temperatures are rising in different countries due to climate change, and thus the Earth's climate crisis has become much more acute, broad patterns of long-distance temperature and precipitation, along with additional factors such as atmospheric pressure and humidity, characterize climate change. Furthermore, the most widely recognized local and global repercussions of climate change are sea-level rise and erratic weather patterns caused by the disappearance of ice sheets—in other words, polar ice melting—driven by the increase in the Earth's average surface temperature, a phenomenon known as climate change or global warming (Freitas & Paiva, 2018; Lindawati & Meiryani, 2024).

That said, it is emphasized that the increase in greenhouse gas (GHG) concentrations, as a result of human activity, intensifies the greenhouse effect, leading to global warming. This process influences the climate, causing changes in weather patterns, sea levels, and other aspects of the environment. Combating climate change involves reducing GHG emissions and exploring sustainable solutions for the future. Thus, GHGs play a central role in climate change, with CO₂, methane (CH₄), and nitrous oxide (N₂O) being the main components. In light of the above, it is observed that global efforts to reduce emissions have been undertaken, beginning with the KP of 1997 and culminating in the PA of 2015 (Filonchik, Peterson, Zhang, Hurynovich & He, 2024).

During the Third Conference of the Parties, known as COP 3, of the Climate Convention, the KP emerged in 1997. However, it was only implemented in February 2005, with its first commitment period spanning from 2008 to 2012. Market mechanisms, such as the clean development mechanism CDM, were created under the KP to help countries meet their obligations, encourage the private sector, and enable developing countries to contribute to efforts to reduce GHG emissions. According to Article 12 of the KP, the CDM is a two-way instrument designed both to achieve reductions in GHG emissions and to foster sustainable development in developing countries (Lazaro & Gremaud, 2017).

Thus, it is stressed that sustainable development is a main element in the Climate Convention, since all policies and measures carried out to combat climate change are linked to the achievement of sustainable development, and the KP, particularly, incorporated the integration between these two concepts. Then, through the CDM, GHG mitigation objectives are combined with targets to achieve sustainable development (Lazaro & Gremaud, 2017).

Thus, in 2015, the PA established long-term goals to guide all countries to reduce GHG emissions and, simultaneously, to mitigate climate change. The PA emphasized the importance of accelerating actions in all areas, including an appeal to governments, through public policy initiatives, to speed up the energy transition from fossil fuels to renewable energy, such as wind and solar power, which constitute an important part of sustainable development. It is worth adding that the CDM was incorporated by the PA; in other words, the CDM continued in effect beyond the Kyoto Protocol Kyoto (Silva, Sarges, Gontijo, Oliveira & Rocha, 2024; Wang, 2024).

It is also important to state that, in order to slow down global warming, and, consequently, climate change, while simultaneously achieving sustainable development, the PA, in its Article 6, established collaborative approaches and the implementation of the Sustainable Development Mechanism (SDM) for carbon trading. The SDM is a mechanism that closely resembles the CDM, however without the requirement that projects be implemented in developing nations. Therefore, it is noted that the SDM is a new approach that promotes mitigation and sustainable development and is perceived as the successor of the CDM (Fawzy, Osman, Doran & Rooney, 2020; Deng, Su, Liao & Wu, 2022; Oliveira, 2022).

In summary, climate change refers to rapid alterations of natural phenomena such as climate patterns that are not caused by natural causes. In light of the above, environmental education is emphasized, which can be a strategy used for adaptation to climate change and, consequently, to achieve sustainable development. This is explained because environmental education has an interconnection with the Sustainable Development Goals established by the United Nations (Ferrer & Peña, 2023; Cemara & Ismail, 2024; Velepini, 2025).

However, environmental education plays an extended role in other interconnected topics, such as, for example: poverty, gender, health and inequality, natural resources, energy and climate change. Consequently, it is observed that many researchers agree that a solid framework needs to be established as an effort for adaptation and mitigation to climate change, and this form of endeavor to achieve this is through environmental education (Ferrer & Peña, 2023; Cemara & Ismail, 2024; Velepini, 2025).

Therefore, it can be seen that environmental education is preponderant for achieving adaptation to climate change in sectors of the economy, such as in the case of the Tourism sector. In view of this, it is evidenced that tourism can be considered a highly sensitive economic sector to climate change, and has contributed to the emission of GHGs, which is one of the causes of global warming. Therefore, to minimize its negative impacts, the conception of sustainable development in tourism arises, which must incorporate the relative externalities of climate change (Grimm, Alcântara & Sampaio, 2018; Cemara & Ismail, 2024; Ribeiro & Souza, 2025).

However, it is manifested by saying that there is a vulnerability of tourism to climate change, therefore, environmental education is necessary so that tourism adaptation to climate change occurs. However, it is necessary to remember that the tourism industry requires many sources of energy, such as water, electricity, fossil fuel, etc., therefore, it is prudent to stimulate more sustainable innovations and actions, thus seeking to achieve resilience to climate change (Grimm, Alcântara & Sampaio, 2018; Cemara & Ismail, 2024; Ribeiro & Souza, 2025).

Better explaining, climate change, driven mainly by human activities such as the burning of fossil fuels and deforestation, represents a profound threat to global ecosystems and human societies. The accumulation of GHGs in the atmosphere has led to the rise of global temperatures, altered climate patterns, and extreme environmental events. Addressing this issue requires innovative and multifaceted strategies to reduce carbon emissions and increase Sustainability (Khan, 2024; Saxena, Seetharaman & Shawarika, 2024).

In other words, innovation needs to be sustainable and involve the creation of new solutions that address current challenges, preserving resources, increasing resilience for future generations, and integrating environmental, social, and economic considerations. Thus, when innovation is sustainable, it becomes an essential ingredient, as it promotes creativity and collaboration between sectors and encourages the adoption of renewable energy sources, waste reduction strategies, and ethical business practices (Khan, 2024; Saxena, Seetharaman & Shawarika, 2024).

3 METHODOLOGICAL PROCEDURES

The objective of this study was to investigate the profile, behavior, and trend of the theme of climate change in Brazilian academia, from the perspective of the SPELL database and through the lens of SNA. The choice of SNA as the predominant method in this research stems from the need to understand the structures and social formations in networks related to the subject under investigation. It is further emphasized that SNA aims to enhance the ways of investigating trends and influences of thoughts and research lines. As a consequence of studies under this analytical approach, the understanding, and subsequent comprehension, is improved not only of the subject investigated but also of its social significance and of the profile and behavior of the actors involved in the process of constructing academic knowledge regarding the analyzed theme as disseminated through its intellectual scientific production (Bufrem, Gabriel & Sorribas, 2011; Ribeiro & Souza, 2022).

It is emphasized that social networks can be generated through multiple affiliation matrices, as is the case of *two-mode* social networks. That said, *two-mode* networks, or two-mode social networks, comprise the interactions between two different sets of actors, since the term “mode” refers to specific categories of actors. A *one-mode* social network, or one-mode network, is characterized when actors in a given network have connections with other actors of the same category, as in the case of a network of researchers. Two-mode networks, on the other hand, occur when their actors have interactions with actors from other categories, in other words, the two-mode network is symbolized by the relationship between different actors within a single social system, such as the interactions between journals and researchers, that is, two different sets of actors in the same social network (Tomaél & Marteleto, 2013; Maltseva & Batagelj, 2021; Ribeiro, 2024a).

Still in relation to SNA, it is emphasized that the structure and formation of social networks are investigated through the elements that constitute them, which are: nodes (actors), ties (relationships between actors), cohesion (dense network), giant component (largest group in the network, that is, the *cluster* with the largest number of nodes in a social network), structural holes or gaps (failures in the formation and structure of the network, that is, *gaps* in the flows of information and knowledge among actors), density (number of interactions among actors), and centrality (actors with the largest number of relationships/partnerships in the network). An addendum is made here to emphasize that these social network elements are intrinsic both to one-mode networks and to two-mode networks. That said, it is envisioned that, in order to investigate more deeply the formation and structure of social networks, this scientific article more predominantly employed the concepts of network density and actor centrality, thus enabling the identification of their roles in the respective social networks of the actors involved (Sampaio, Sacerdote, Fonseca & Fernandes, 2015; Grácio, 2018; Mineiro & Mazzer, 2020; Kohler & Digiampietri, 2021; Urbizagástegui-Alvarado, 2022; Ribeiro, 2024a).

In this way, it is evidenced that density is a measure that determines the intensity of the network’s internal cohesion. Thus, when there is a direct relationship among all the actors in the network, this network is referred to as a complete social network. Considering this, the density of a network is defined as the quotient between the total number of existing interactions in the network and the maximum possible number of connections for the social network (which is equivalent to saying that it is a complete network). It is emphasized that the density of a social network ranges from 0 (zero), corresponding to all actors in the network being disconnected, to 1 (one), corresponding to a network in which all its actors are connected. It is further added that density shows that the denser the network is, the closer its measurement will be to 1, and therefore, the more uniform the actors will be; meanwhile, a network with low density is measured with a value below 0.2, characterizing it as a dispersed social network with low internal cohesion (Santos & Farias, 2016; Grácio, 2018).

Now, regarding the centrality measures, emphasis is placed on (*degree*) centrality and (*betweenness*) centrality. These measures are among the most frequently used in scientific articles focused on SNA. *Degree* centrality considers the number of relationships (partnerships) that an actor has with other actors in the network, thus making it possible to specify the actor’s structural position in relation to the other actors in the network, therefore, the higher the measurement value of *degree* centrality, the greater the centrality (influence) of the actor in the network (Grácio, 2018; Favaretto & Francisco, 2017; Ribeiro & Souza, 2022; Ribeiro, 2024c).

Betweenness, in turn, considers the number of shortest paths between any two other actors, for example, “actor a” and “actor b,” that pass through “actor c.” In this way, *betweenness* measures the actor’s ability to mediate the flow and exchange of information, communication, and knowledge among the actors in the social network. It is further noted that both *degree* and *betweenness* are represented as percentages in the actors’ social networks (Grácio, 2018; Favaretto & Francisco, 2017; Ribeiro & Souza, 2022; Ribeiro, 2024c).

The use of degree centrality is justified because it is a widely employed measure to assess the structural connections of actors, and in this research, *degree* centrality was applied in two-mode networks. Betweenness centrality was also used in this study, as it is the most significant in establishing interactions among actor *clusters*. In other words, *betweenness* serves as a “bridge” for the relationships among actors, which, in this case, for this research, were the authors, HEIs, and keywords (Favaretto & Francisco, 2017; Ribeiro, 2024d; Ribeiro, 2025b).

3.1 Data collection and analysis procedures

The scope of this study highlighted scientific articles published in journals indexed in the SPELL database. The choice of using SPELL to search for investigations on the topic of climate change is reinforced by the fact that this database is a repository of research in the field of Applied Social Sciences, particularly in the areas of Public and Business Administration, Accounting, and Tourism, organized in a system of indexing, searching, and free access to scientific production on various topics within these fields of knowledge. It is further emphasized that SPELL is among the main Brazilian data platforms used by researchers in scientific articles focused on literature review. In addition, SPELL is used by *Qualis*, a system of the Coordination for the Improvement of Higher Education Personnel (CAPES), as an indexer to classify journals in the evaluation strata, along with the *h-index*, *Scopus CiteScore*, and the *Web of Science Journal Citation Reports* (Ribeiro, 2023; Rossoni & Rosa, 2024; Santos, Rosa & Soares, 2024).

It should be added that, starting in 2015, SPELL began measuring the impact factor of indexed journals using the following indicators: (a) average number of references per scientific article; (b) impact (2 and 5 years); (c) immediacy index; (d) self-citation rate; (e) impact (2 years without self-citation); (f) impact (5 years without self-citation); (g) citation half-life; and (h) H-index (Rafael, 2023). Thus, H-SPELL is considered reliable for carrying out accurate measurements regarding the impact of academic journals in the fields of Administration, Accounting, and Tourism, being the only Brazilian database used for the evaluation of scientific journals by CAPES (Rosa & Romani-Dias, 2019a).

It is further stated that, in 2017, the impact factor of scientific journals created by the SPELL database became part of the quality criteria in the classification of scientific journals by *Qualis*/CAPES in the fields of Public and Business Administration, Accounting, and Tourism. This is evidenced in the Brazilian CAPES agency within “Area 27,” which envisions “evidence of the impact of permanent faculty members based on citation metrics, considering the following: *h-index* and *i10-index* from Google Scholar, *Scopus H-index*, and *SPELL H index*” (CAPES, 2020, p. 12).

Finally, it is stated that SPELL is understood as an innovative scientific database, as it was developed strictly to index Brazilian academic journals in the fields of Administration, Accounting, and Tourism, possessing its own impact indicators for these scientific journals. In this way, the relevance of the indexers for the future classification of scientific journals is demonstrated in the 2017–2020 CAPES Quadrennial Evaluation Report, through the detailed disclosure of the definitions of the evaluation parameters, thus recognizing the SPELL impact factor as a consolidated and legitimized metric (Rosa & Romani-Dias, 2019b; Rafael, 2023).

The process of collecting the sample of studies on the topic of climate change occurred as follows: a) typing the selected keywords in the SPELL search filter (*drop-down boxes*); b) selecting the studies in SPELL; c) searching for the keywords in the fields: titles, abstracts, and keywords of the studies; d) defining the sample through the reading of the titles and/or abstracts of each scientific article. In SPELL, a filter was applied with the following keywords: “*mudança climática*”; “*mudanças climáticas*”; “*climate change*”; “*climate changes*”; “*cambio climático*”; “*cambios climático*”; “*mudança do clima*”; “*mudanças do clima*”; “*alterações climáticas*”; and “*alteração climática*.”

The choice of these keywords is justified because: (i) they are adherent to the research question and objective of this study; (ii) these keywords similarly underpin analogous research (Li, Wang & Ho, 2011; Haunschild, Bornmann & Marx, 2016; Freitas & Paiva, 2018; Wang, Zhao & Wang, 2018; Sharifi, Simangan & Kaneko, 2021; Fu & Waltman, 2022; Iancu *et al.*, 2022; Usta, 2023; Baidya & Saha, 2024; Lindawati & Meiryani, 2024; Oliveira *et al.*, 2024; Tautiva, Huaman & Oliva, 2024); and (iii) they generally enable the search and selection of articles that disseminated content on the topic of climate change in journals indexed on the SPELL data platform.

It is emphasized that the start and end dates of the search and subsequent data tabulation of the studies occurred between 01/30/2025 and 02/05/2025. Consequently, the sample resulted in 176 scientific articles, covering the period from 2002 to 2024, totaling 23 years. The interval from 2002 to 2024, that is, 23 years, is considered appropriate in bibliometric studies (Stefanuto, Oliveira, Moreira, Aguiar & Farias, 2022), as is the case of social network analysis (SNA), which is the predominant method of the present research.

It is emphasized that the aforementioned timeframe was conditioned to the articles found in the SPELL database, in other words, the first research on the topic of climate change only appeared in 2002, and its latest publication occurred in the period of 2024, specifically on 02/05/2025. In other terms, the justification of the timeframe from 2002 to 2024 is optimized due to the appearance of the first study on climate change in the SPELL database in 2002, as well as, at the time of the searches, the identification of the latest research on climate change in 2024, more precisely on 02/05/2025. It is also revealed that the measurement of the sociometric indicators, that is, of SNA, as well as the creation of symmetric matrices

Ribeiro – Climate change: Profile, behavior and trends in Brazilian academia from the perspective of social network analysis (*one-mode* networks) and the generation of asymmetric matrices (*two-mode* networks) of the actors' social networks, and their respective graphical visualizations, occurred between 02/05/2025 and 02/25/2025.

The sociometric data and information were calculated using the UCINET software, and the graphical visualization of the social networks was performed through the *NetDraw* software. It is further noted that the analyses of the 176 studies were carried out according to the sociometric indicators, that is, of SNA, which were: (i) two-mode networks of periods and authors; (ii) two-mode networks of journals and authors; (iii) co-authorship networks; (iv) networks of HEIs; and (v) networks of keywords. Finally, Figure 1 provides a summary of the step-by-step methodological procedure of this research.

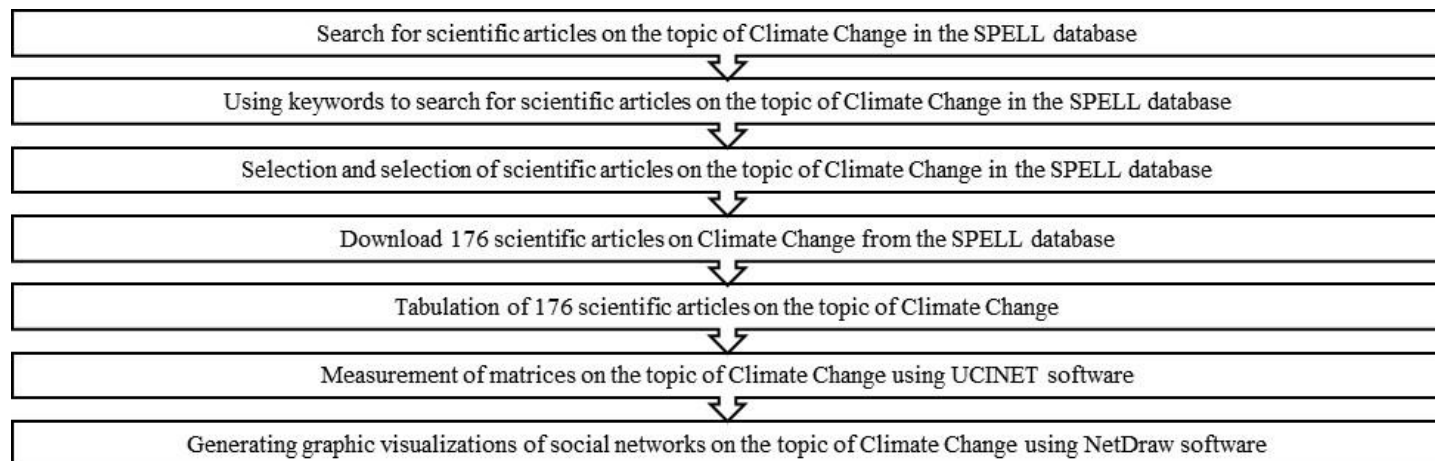


Figure 1. Methodological Procedure

Source: Prepared by the author.

4 ANALYSIS AND DISCUSSION OF RESULTS

This section addressed the analysis and discussion of the results of the 176 scientific articles on the topic of climate change from the perspective of SNA and through the lens of the SPELL database.

4.1 Two-mode social networks including periods and authors in the same social network from the perspective of degree centrality

Figure 2 highlights the two-mode networks of the 20 periods and the 417 authors. It is emphasized that degree centrality was used to highlight the periods most central in relation to the researchers.

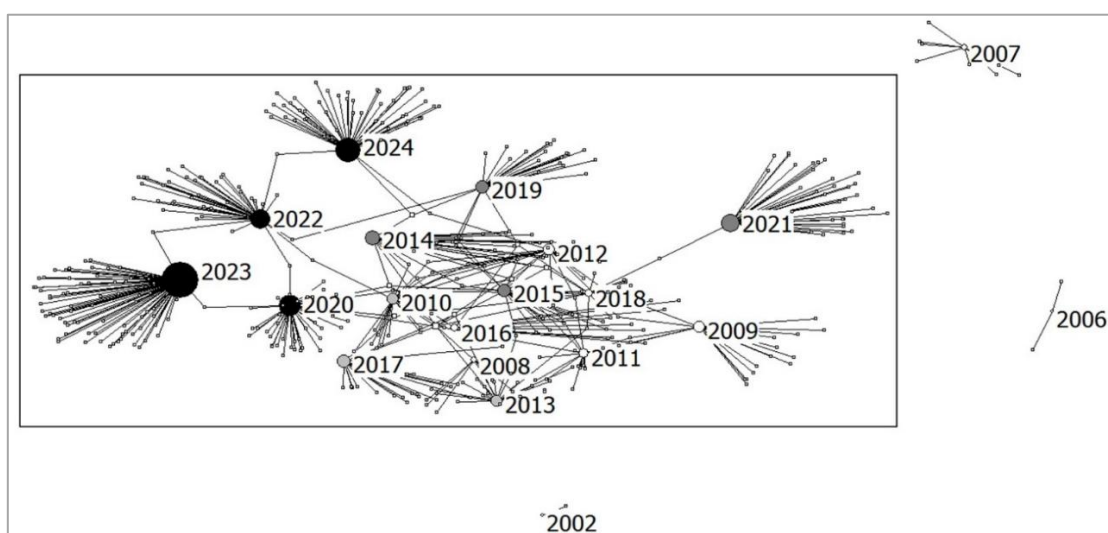


Figure 2. Two-mode social networks including periods and authors in the same social network from the perspective of degree centrality
Source: Research data.

The most prominent periods were: 2023, 2024, 2022, and 2020. It is also worth highlighting the years: 2021, 2014, 2015, 2019, 2017, 2013, and 2010. It is interesting to note that the giant component, that is, the most relevant element in Figure 2 (Sampaio *et al.*, 2015), consequently encompasses the greatest flow of information and the most robust exchange of communication and knowledge (Ribeiro, 2024a) regarding the topic of climate change, this prominent *cluster* also encompasses the most contemporary years, in other words, the state of the art of academic knowledge concerning climate change in Brazilian academia in light of the scientific journals organized in the SPELL database.

In general, what can be observed, from the perspective of the authors who published during these highlighted periods, is that the topic of climate change shows a tendency of evolution in the Brazilian academic literature under the lens of journals indexed in the SPELL database. This finding is similarly corroborated in analogous studies (Haunschild, Bornmann & Marx, 2016; Sharifi, Simangan & Kaneko, 2021; Iancu *et al.*, 2022; Baidya & Saha, 2024; Lindawati & Meiryani, 2024; Oliveira *et al.*, 2024), confirming that the topic of climate change has been growing not only within the Brazilian scientific landscape but also globally, in light of the journals. It is emphasized that the journals provide a more macro-level view of scientific production on the topic of climate change (Freitas & Paiva, 2018).

4.2 Two-mode social networks including journals and authors in the same social network from the perspective of degree centrality

Figure 3 presents the two-mode networks of the 71 journals and the 417 authors. It is noted that *degree* centrality was used to highlight the most central scientific journals from the perspective of the authors.

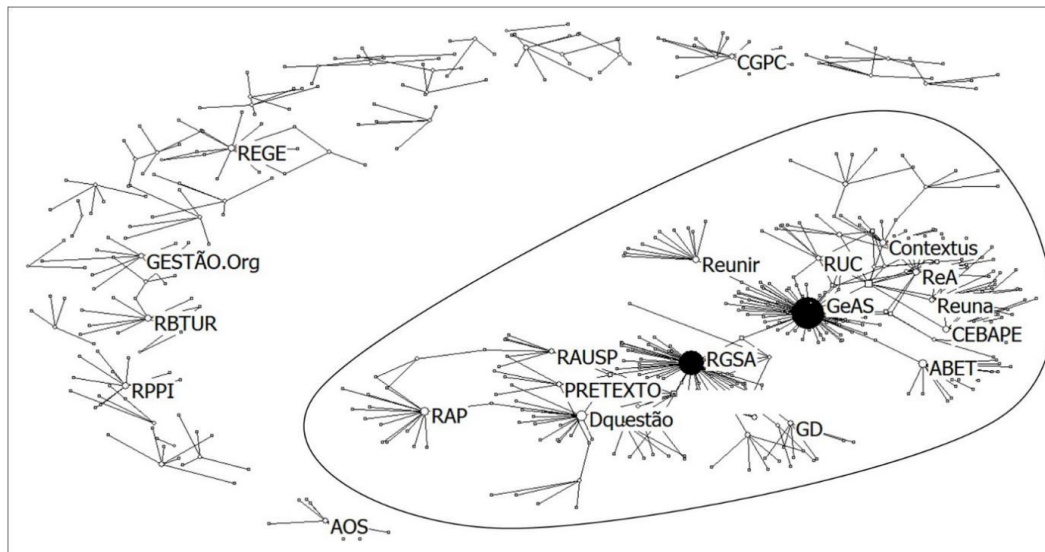


Figure 3. Two-mode social networks including journals and authors in the same social network from the perspective of degree centrality
Source: Research data.

These journals were: Journal of Environmental Management and Sustainability (GeAS), Journal of Social and Environmental Management (RGSA), Development in Question (Dquestão), Journal of Public Administration (RAP), UFSM Journal of Administration (ReA), Brazilian Annals of Tourism Studies (ABET), EBAPE.BR Notebooks (CEBAPE), Contemporary Journal of Economics and Management (Contextus), Journal of Management (REGE), Journal of Administration, Accounting, and Sustainability (Reunir), Reuna Journal (Reuna), Brazilian Journal of Tourism Research (RBTUR), Brazilian Journal of Public and International Policies (RPPI), Public Management and Citizenship Notebooks (CGPC), USP Journal of Administration (RAUSP), Accounting Universe Journal (RUC), Amazon, Organizations, and Sustainability (AOS), Management and Development (GD), Electronic Journal of Organizational Management (GESTÃO.Org), and PRETEXTO Journal (PRETEXTO).

Of these 20 most influential journals, 14 (GeAS, RGSA, Dquestão, RAP, ReA, ABET, CEBAPE, Contextus, Reunir, Reuna, RAUSP, RUC, GD, and PRETEXTO) are part of the giant component in Figure 3 (Kohler & Digiampietri, 2021), showing that the largest flow and exchange of information and knowledge on the topic of climate change in Brazilian academia occur among these 14 journals from the authors' perspective. Furthermore, regarding the 20 most central journals, 14 belong to the field of Administration (GeAS, RGSA, Dquestão, RAP, ReA, CEBAPE, Reuna, RPPI, CGPC, RAUSP, AOS, GD, GESTÃO.Org, and PRETEXTO), demonstrating and confirming the intrinsic focus and trend of research published on environmental management and sustainability, such as climate change, in administration journals (Assan *et al.*, 2018). Four journals are more closely related to Accounting (Contextus, REGE, Reunir, and RUC), and two originate from the field of Tourism (ABET and RBTUR).

It is important to note that the two most prominent journals (*GeAS* and *RGSA*) have a strong focus on environmental management and sustainability (Lindawati & Meiryani, 2024), thus highlighting their status as the most central scientific journals regarding the topic of climate change in Brazilian academia, from the perspective of the academic journals indexed by the SPELL electronic library. Furthermore, concerning the *RGSA* journal, it was also highlighted in the study by Ribeiro *et al.* (2024), which analyzed the academic output of studies published in Brazilian journals on the KP, which is intrinsically related to climate change (Hou & Wang, 2021).

In general, these most central journals are considered in this study to be the most relevant to the topic of climate change, as well as the most sought after by authors to disseminate their respective findings and contributions on climate

change within Brazilian academia. In this regard, there is an opportunity for other scientific journals to refine their research approaches and focus areas, thereby enabling the investigated topic to be more widely disseminated in additional academic journals, directly impacting its growth, development, and greater maturity within the Brazilian scientific context, from the perspective of the SPELL database.

4.3 Authors' social networks from the perspective of betweenness centrality

Figure 4 visualizes the co-authorship networks, which were composed of 417 nodes and 1,146 ties. Here, betweenness centrality was used to highlight the most central researchers.

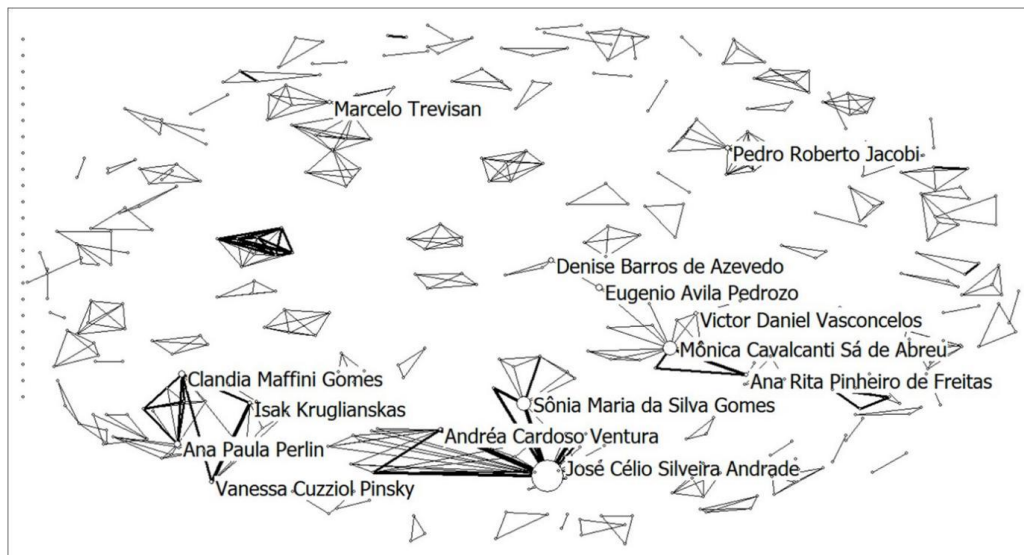


Figure 4. Authors' social networks from the perspective of betweenness centrality
Source: Research data.

Thus, the most central authors, in descending order of importance, were: José Célio Silveira Andrade, Sônia Maria da Silva Gomes, Mônica Cavalcanti Sá de Abreu, Cláudia Maffini Gomes, Eugenio Avila Pedrozo, Ana Paula Perlin, Denise Barros de Azevedo, Pedro Roberto Jacobi, Andréa Cardoso Ventura, Victor Daniel Vasconcelos, Ana Rita Pinheiro de Freitas, Marcelo Trevisan, Isak Kruglianskas, and Vanessa Cuzziol Pinsky. In general, these scholars can be considered, for this study, the most influential researchers in terms of mediating the flow and exchange of information, knowledge, and communication among other academics regarding the investigated topic (Grácio, 2018; Ribeiro, 2024c), from the perspective of journals indexed in the SPELL database system.

Among these researchers, José Célio Silveira Andrade stands out prominently, having published 16 scientific articles related to the topic of climate change in this study. This information is similarly corroborated by the studies of Freitas and Paiva (2018) and Ribeiro (2025), who investigated, respectively, the international academic output of Brazilian researchers on climate change and the profile and behavior of scientific production of articles published on the topic of the CDM in Brazilian academia from a social network analysis perspective under SPELL. Consequently, these authors reinforced in their findings that José Célio Silveira Andrade, currently affiliated with the Federal University of Bahia (UFBA), is a national reference in the study of climate change in the organizational context (Freitas & Paiva, 2018).

Further examining Figure 4, it is noteworthy that the density of the researchers' networks in this study was measured at 0.0073, equivalent to 0.73% of the interactions actually realized among the 417 scholars. This finding indicates that the co-authorship networks analyzed in this study have low density, reflecting high dispersion among the 417 researchers, consequently, there is a predominance of weak ties, which leads to structural gaps in the formation of the researchers' networks, thereby generating structural holes, this situation impacts the internal cohesion of the scholars' social networks and directly influences the flow and exchange of communication among the authors, as well as the informational and knowledge transfer regarding the investigated topic (Santos & Farias, 2016; Grácio, 2018; Ribeiro & Souza, 2022; Ribeiro, 2024c) within the Brazilian academic context, under the perspective of journals indexed in the SPELL database.

It is also emphasized that the low density is a crucial factor affecting the scientific production on the topic of climate change within the Brazilian academic context, this occurs because the researchers are dispersed across their respective research groups, consequently, greater interaction among the authors would increase the network density and its cohesion, thereby enhancing the dissemination, circulation, and visibility of climate change research within Brazilian academia (Ribeiro, 2025a).

4.4 Social networks of (HEIs) from the perspective of betweenness centrality

Figure 5 highlights the networks of the HEIs, which were composed of 137 nodes and 246 ties. *Betweenness* centrality was also used here to emphasize the most central HEIs.

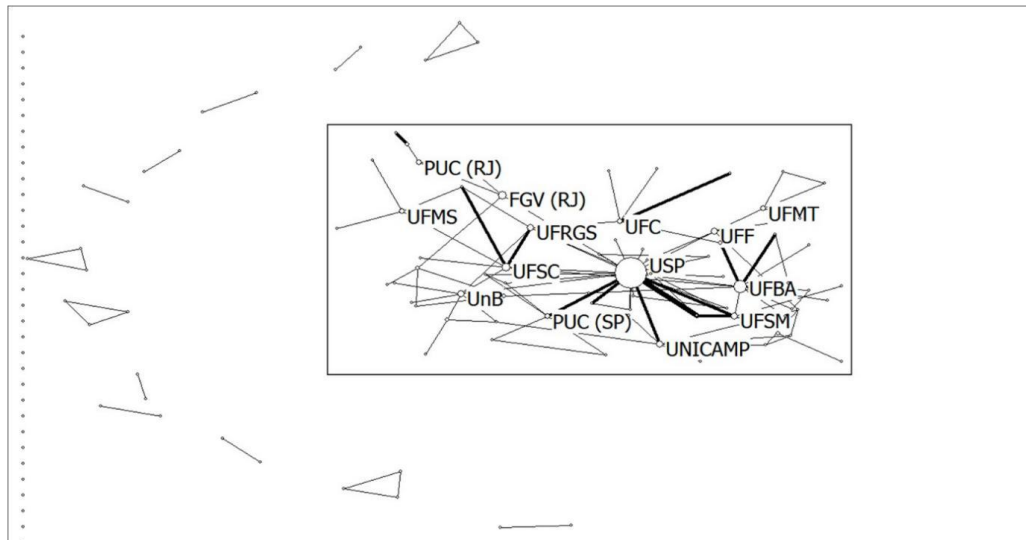


Figure 5. Social networks of the HEIs from the perspective of betweenness centrality
Source: Research data.

These HEIs, in descending order of influence, were: University of São Paulo (USP), Federal University of Bahia (UFBA), Getulio Vargas Foundation of Rio de Janeiro (FGV-RJ), Federal University of Santa Catarina (UFSC), Fluminense Federal University (UFF), University of Brasília (UnB), Federal University of Rio Grande do Sul (UFRGS), State University of Campinas (UNICAMP), Federal University of Santa Maria (UFSC), Federal University of Ceará (UFC), Pontifical Catholic University of São Paulo (PUC-SP), Federal University of Mato Grosso do Sul (UFMS), Pontifical Catholic University of Rio de Janeiro (PUC-RJ), and Federal University of Mato Grosso (UFMT).

Regarding USP, Oliveira *et al.* (2024) evaluated the evolution of scientific publications on climate change from USP between 1989 and 2022. Their main findings indicate a significant and increasing temporal distribution of publications from 2010 onward. Based on the authors' affiliations, the results show that the most important partnerships are national (67%), while international co-authorships are predominantly with research collaborators from the Global North (North America and Europe). Overall, the authors highlighted the breadth of USP's scientific output and its important role in the global context of climate change research (Oliveira *et al.*, 2024). Concerning UFBA, the study revealed the university's strong potential as a key driver of contributions to sustainable development research (Ferraz, 2023), a theme intrinsically linked to climate change (Fawzy, Osman, Doran & Rooney, 2020; Deng, Su, Liao & Wu, 2022; Oliveira, 2022).

Further analyzing Figure 5, it is evident that the density of the social network of the HEIs was measured at 0.0146, corresponding to 1.46% of the actual relationships established among the 137 HEIs identified in this study, this indicates that the cooperation network of these HEIs has a low density, thereby affecting the harmonization of the flow of dissemination of data, information, and knowledge regarding the research topic of this investigation (Santos & Farias, 2016; Ribeiro, 2024a).

In view of this, it is important to highlight that, as occurred in the co-authorship networks of this study, this low density is a *sine qua non* factor for a low academic production of studies on the topic of climate change in Brazil, since HEIs are connected through their respective researchers, when these researchers demonstrate greater cohesion, it directly influences the connectivity of the HEIs. Thus, co-authorship networks are fundamental to expanding and strengthening interaction among HEIs, which, in this study, stand out more prominently within a larger *cluster* through a giant component (Ribeiro, 2025a).

It is further noted that, despite the low density of the aforementioned social network, the giant component highlighted in Figure 5 represents the largest *cluster* within this network, helping to identify and demonstrate that this major group of HEIs exhibits greater cohesion, consequently, there is a higher propensity for collaboration among these distinct HEIs, making the giant component the most relevant element in the social network of these institutions, as the majority of HEIs are interacting directly or indirectly with one another, this, in turn, impacts the flow and exchange of scientific production related to the research topic of this study and its associated themes that support and guide it within the Brazilian scientific literature (Sampaio *et al.*, 2015; Ribeiro, 2024c).

4.5 Social networks of keywords from the perspective of betweenness centrality

Figure 6 shows the keyword networks, which were composed of 505 nodes and 2,542 ties. It is noteworthy that the 176 identified scientific articles contained a total of 505 keyword occurrences. Therefore, there were 505 unique keywords.

However, to obtain this result, the following criteria were applied: (i) uppercase and lowercase letters were not differentiated, and (ii) singular and plural forms of keywords were considered as distinct (Favaretto & Francisco, 2017).

The giant component in Figure 6 was composed of 424 nodes and 2,274 ties. It is added that the size of each keyword corresponded to its frequency of occurrence across the 176 studies analyzed; therefore, the more frequently a keyword appeared, the larger its representation in the giant component (Chen *et al.*, 2023).

It is emphasized that *betweenness* was used to identify the most central keywords. Accordingly, the keywords that stood out in terms of *betweenness*, in descending order of prominence and relevance, were: climate change, sustainability, sustainable development, climate change (alternate form), Brazil, global warming, tourism, innovation, public policies, environment, performance, environmental education, adaptation, climate risks, and Clean Development Mechanism (CDM).

It is worth noting that the keyword “tourism” was one of the most central, which may represent a relevant factor to be explored by researchers on the topic of climate change in Brazil, in other words, the term “tourism” could indicate opportunities for the creation of new interdisciplinary scientific studies, allowing the theme of climate change to be expanded more prominently into other areas of knowledge, such as Tourism. It is also highlighted that central keywords such as “adaptation” and “CDM” may represent promising areas for future studies on climate change in Brazilian academia from the perspective of the SPELL database.

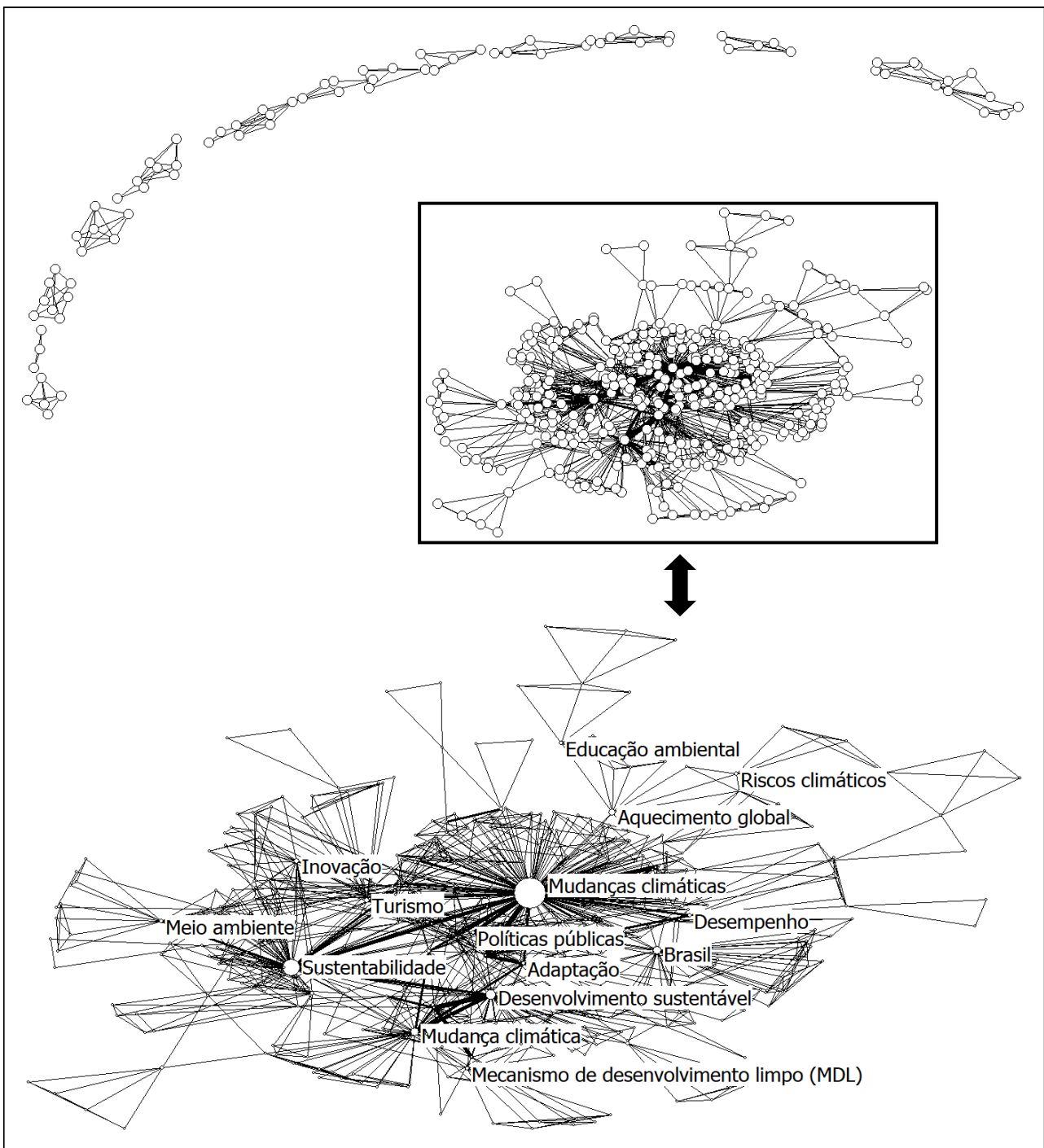


Figure 6. Keyword networks from the perspective of betweenness centrality
Source: Research data.

These keywords are similarly corroborated in the studies by Li, Wang, and Ho (2011), Freitas and Paiva (2018), Wang, Zhao, and Wang (2018), Fu and Waltman (2022), Iancu *et al.* (2022), Usta (2023), Baidya and Saha (2024), Oliveira *et al.* (2024), and Tautiva, Huaman, and Oliva (2024). Therefore, it can be observed that these most central keywords, as visualized in Figure 6, hold great significance, utility, and value for a better understanding and comprehension of the topic of climate change in Brazilian academia, this is especially relevant for researchers beginning their studies in this research area, furthermore, knowledge of these central keywords allows for the identification of the main terms found in the academic studies that comprised the sample, as well as the core themes (Ribeiro, 2024a), thus providing insight into the field of knowledge surrounding the frontiers of research and, simultaneously, the study lines (Urbizagástegui-Alvarado, 2022; Ribeiro *et al.*, 2024) on the topic of climate change in Brazilian academia, in light of the scientific journals indexed in the SPELL database.

Still regarding the most central keywords in this academic work, it can be affirmed, for this investigation, that these keywords are the most relevant in relation to the publication of scientific articles on the topic of climate change in the Brazilian scientific literature, moreover, these most influential keywords highlight the subjects with the greatest activity within the scientific production of the investigated topic in the Brazilian literature context, in other words, these central keywords are dominant, as they possess the “power” to guide and underpin the flow of communication, knowledge, information, and expertise (Favaretto & Francisco, 2017; Urbizagástegui-Alvarado, 2022; Ribeiro, 2024c) concerning the topic of climate change within the Brazilian scientific scenario, from the perspective of journals indexed in the SPELL electronic library.

5 CONCLUSIONS

The objective of this scientific article was to investigate the profile, behavior, and trends of the topic of climate change in Brazilian academia, from the perspective of the SPELL database and through the lens of social network analysis (SNA). Methodologically, sociometry was applied to 176 identified studies.

Thus, the findings show that 2023, 2024, 2022, 2020, 2021, 2014, 2015, 2019, 2017, 2013, and 2010 were the most central years from the researchers' perspective. In other words, these highlighted periods were the ones with the highest number of publications on climate change in the Brazilian academic literature, according to journals indexed in the SPELL database. Regarding the journals, the most central were: GeAS, RGSA, Dquestão, RAP, ReA, ABET, CEBAPE, Contextus, REGE, Reunir, Reuna, RBTUR, RPPI, CGPC, RAUSP, RUC, AOS, GD, GESTÃO.Org, and PRETEXTO. Therefore, these are the scientific journals most frequently used by authors to publish their findings and contributions on the topic of climate change in Brazilian academia, from the perspective of SPELL.

Regarding the authors, the most central were: José Célio Silveira Andrade, Sônia Maria da Silva Gomes, Mônica Cavalcanti Sá de Abreu, Clandia Maffini Gomes, Eugenio Avila Pedrozo, Ana Paula Perlin, Denise Barros de Azevedo, Pedro Roberto Jacobi, Andréa Cardoso Ventura, Victor Daniel Vasconcelos, Ana Rita Pinheiro de Freitas, Marcelo Trevisan, Isak Kruglianskas, and Vanessa Cuzziol Pinsky. Considering that *betweenness* depends on the number of partnerships an author has (Favaretto & Francisco, 2017), that is, on the number of publications a researcher has co-authored with other scholars (Ribeiro, 2024b), the most prominent partnerships in this study were: José Célio Silveira Andrade with Andréa Cardoso Ventura, who published five joint studies; Sônia Maria da Silva Gomes with José Célio Silveira Andrade; José Célio Silveira Andrade with Luana das Graças Queiroz de Farias; and Vanessa Cuzziol Pinsky with Isak Kruglianskas, all of which produced four co-authored scientific articles each.

Regarding the HEIs, the most central were: USP, UFBA, FGV (RJ), UFSC, UFF, UnB, UFRGS, UNICAMP, UFSM, UFC, PUC (SP), UFMS, PUC (RJ), and UFMT. It is also noteworthy that these HEIs are references in other fields of knowledge, such as Accounting, specifically in managerial accounting (Mineiro & Mazzer, 2020), further confirming the relevance of these institutions within the Brazilian scientific context.

Among these HEIs, USP stands out the most. In this regard, the study by Oliveira *et al.* (2024) is highlighted, which evaluated the evolution of USP's scientific publications on climate change. The authors found a growing and more significant temporal distribution of publications on climate change at USP starting in 2010. They also identified that environmental services, Atlantic Forest, tropical forest, Amazon, biodiversity, and land use are the most important research topics to which USP researchers have contributed. This evidence reinforces USP's importance in scientific production on climate change in Brazil.

Regarding the keywords, the most central were: climate change, sustainability, sustainable development, climate change singular, Brazil, global warming, tourism, innovation, public policies, environment, performance, environmental education, adaptation, climate risks, and clean development mechanism (CDM). It is worth noting that the keywords “climate change” (both plural and singular) were among the most central in this study because they were used as search terms for scientific articles on climate change in the Brazilian academic literature on the SPELL database platform. This action directly influenced their prominence in this investigation as the most central keywords of the study.

In summary, it is emphasized that the year 2023 was the most central period, and the journal GeAS was the most dominant scientific publication in this study from the perspective of two-mode networks. Regarding the one-mode networks,

José Célio Silveira Andrade was the author with the highest betweenness centrality; the University of São Paulo (USP) was the most prominent university in mediating information and knowledge on the topic of climate change in Brazil; and the most influential keywords were: sustainability, sustainable development, global warming, tourism, innovation, public policies, environment, performance, environmental education, adaptation, climate risks, and the (CDM). Concerning network densities, the one-mode co-authorship and university networks were measured at 0.73% and 1.46%, respectively, both considered low densities, directly impacting the flow and exchange of knowledge and, consequently, the dynamics of publication, dissemination, and socialization of the topic of climate change in Brazil, according to the SPELL database.

In general, the findings highlight the importance of strengthening interinstitutional cooperation through the authors, especially those with the highest betweenness centrality, influencing the smooth flow and harmonization of data, information, and knowledge exchange on the topic of climate change in Brazil. The study also emphasizes the significant role of public higher education institutions (Figure 5) as leading, legitimized, and consolidated universities in scientific research on climate change within the Brazilian academic context, from the perspective of the SPELL database. Finally, the importance of public policies is underscored for fostering scientific research and academic collaborations through researchers, study groups, and, consequently, their respective institutions, directly impacting the development, publication, dissemination, and socialization of climate change topics in the Brazilian scientific literature.

Thus, this research presents theoretical implications by highlighting the theoretical evolution, intellectual structure, and formation necessary to guide future investigations on the topic of climate change within the Brazilian scientific context, from the perspective of journals indexed in the SPELL electronic library. It is reinforced that the identification of keywords, and consequently the most relevant conceptual approaches (the most central keywords) on the subject of climate change, can be particularly significant, as they will become more widely recognized in Brazilian academia by both *senior* and early-career researchers, thereby creating opportunities for further studies and contributing to the growth of climate change research in the Brazilian scientific community.

It should also be highlighted that this study may contribute to mitigating potential research *gaps* on the topic of climate change by identifying the most central actors and their networks of study, thereby illustrating the role of these actors (authors and their respective higher education institutions) in the development, diffusion, dissemination, and socialization of the investigated theme within Brazilian academia. Regarding practical implications, this research can be utilized by both researchers and public policy makers to explore future research goals and consider the current directions of climate change studies in the Brazilian academic context, providing, for instance: (i) prioritization of funding for interinstitutional research networks, given the low density identified; (ii) potential improvements to theoretical models on climate change, impacting scientific production in the Brazilian academic context; (iii) support, guidance, or advisory to academic managers, journal editors, or research funding agencies regarding climate change research in Brazil.

The limitation of this scientific article lies in the use of a single database, SPELL, which may introduce certain biases, for instance, it could exclude researchers with few connections or disproportionately highlight certain scientific journals due to technical characteristics of the chosen database, additionally, since SPELL primarily covers the Applied Social Sciences, this limitation may affect the generalizability of the results.

Therefore, as a suggestion for future research, it is recommended to improve this study by using other national and international databases, such as *WoS*, *Scopus*, *Scielo*, *EBSCO*, *Proquest*, and *CAPES Journals*. It is also recommended to include other fields of knowledge not covered by the SPELL database, such as Environmental Sciences. Furthermore, it is advisable to expand the SNA through co-citation analysis and geospatial analysis of authors and HEIs. It is also suggested to conduct a bibliometric study on the researched topic. To carry out a Systematic Literature Review of the 176 studies to produce a thematic map of the subject within Brazilian academia; and, through qualitative studies using Content Analysis, perform a thematic or categorical analysis of the 176 investigated studies in order to enhance the interpretative depth of the findings and provide greater richness to the discussion.

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