RAINS, TRAGEDIES AND MEDIA COVERAGE: ANALYSIS OF FLOODS IN RIO GRANDE DO SUL

Felipe Moura Oliveira¹
Thiago Costa Holanda²
Ana Lidia de Oliveira Silva Ramalho³
Natalia Varella da Rocha Kloekner⁴
Italo Emmanoel Mesquita Oliveira de Moura⁵
Thiago Limoeiro Ricarte⁶
Karina Valdez Ribeiro⁷

ABSTRACT

Objective: The objective of this study is to present how the tragedy in Rio Grande do Sul is handled by the media, in order to observe whether it is being related to climate change.

Theoretical Framework: Environmental disasters have been intensifying with the great advances of human actions, which cause climate change and journalistic structures play a crucial role in shaping the public perception of natural disasters, framing them in the context of climate change.

Method: From the use of text mining techniques in reports published in Brazilian news portals about the floods in Rio Grande do Sul, a corpus of 100 texts from Google News was selected, being processed through the Voyant Tools software for extraction and analysis of textual data.

Results and Discussion: Media coverage of the tragedy in Rio Grande do Sul highlighted the social consequences and the impact on urban centers. The news simplifies the understanding of the causes of the tragedy, focusing mainly on heavy rains and neglecting factors such as global warming and El Niño. In addition, socioeconomic influences that amplify flood risks, such as poor infrastructure and housing conditions, were neglected in the discussions. The media also emphasized the importance of understanding the interaction between climate and geography to formulate strategies that minimize the effects of flooding and promote the sustainable development of the affected regions.

Research Implications: By revealing how climate change narratives are being integrated into coverage of natural disasters, this study helps to understand the role of the media in educating the public and influencing public perception of the need for climate mitigation and adaptation policies.

Originality/Value: This study examines how the Brazilian media approaches flooding in Rio Grande do Sul, highlighting the social consequences and the importance of understanding the interaction between climate and

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1 Universidade Federal do Ceará, Fortaleza, Ceará, Brazil. E-mail: felipe.moura.o@hotmail.com
Orcid: https://orcid.org/0000-0001-6604-6827

2 Instituto Federal de Educação, Ciência e Tecnologia do Ceará (IFCE), Fortaleza, Ceará, Brazil. E-mail: thiago.holanda@ifce.edu.br Orcid: https://orcid.org/0000-0002-6972-6673

3 Universidade Federal do Ceará, Fortaleza, Ceará, Brazil. E-mail: analidiaramalho@alu.ufc.br Orcid: https://orcid.org/0009-0000-9431-6564

4 Universidade Presbiteriana Mackenzie, São Paulo, São Paulo, Brazil. E-mail: natalia.kloeckner@gmail.com Orcid: https://orcid.org/0000-0001-7789-2295

5 Universidade Federal do Piauí, Teresina, Piauí, Brazil. E-mail: italoo.mooura@gmail.com Orcid: https://orcid.org/0000-0001-7827-6638

6 Universidade Federal de Sergipe, Aracajú, Sergipe, Brazil. E-mail: ricarteufc@gmail.com Orcid: https://orcid.org/0000-0002-4390-2755

7 Universidade Federal de Sergipe, Aracajú, Sergipe, Brazil. E-mail: k.valdezz98@gmail.com Orcid: https://orcid.org/0009-0000-9431-6564
geography. Using text mining techniques to analyze a corpus of news stories, the research offers a succinct and objective analysis of media coverage, contributing to an understanding of communication about extreme weather events.

**Keywords:** Floods, Climate Change, Rio Grande do Sul.

**CHUVAS, TRAGÉDIAS E COBERTURA MIDIÁTICA: ANÁLISE SOBRE AS INUNDAÇÕES NO RIO GRANDE DO SUL**

**RESUMO**

**Objetivo:** O objetivo deste estudo é apresentar de que forma a tragédia do Rio Grande do Sul é trabalhada por veículos de mídia, com o intuito de se observar se está sendo relacionada com as mudanças climáticas.

**Referencial Teórico:** Os desastres ambientais vêm se intensificando com os grandes avanços das ações humanas, que causam as mudanças climáticas e as estruturas jornalísticas desempenham um papel crucial na formação da percepção pública de desastres naturais, enquadrando-as no contexto das mudanças climáticas.

**Método:** A partir do uso de técnicas de mineração de texto em reportagens publicadas nos portais de notícias brasileiros sobre as enchentes no Rio Grande do Sul, selecionou-se um corpus de 100 textos do Google Notícias, sendo processadas através do software Voyant Tools para extração e análise de dados textuais.

**Resultados e Discussão:** A cobertura midiática da tragédia no Rio Grande do Sul destacou as consequências sociais e o impacto nos centros urbanos. As notícias simplificam o entendimento sobre as causas da tragédia, focando principalmente nas chuvas intensas e negligenciando fatores como o aquecimento global e o El Niño. Além disso, influências socioeconômicas que amplificam os riscos de enchentes, como infraestrutura precária e condições habitacionais, foram negligenciadas nas discussões. A mídia também enfatizou a importância de compreender a interação entre clima e geografia para formular estratégias que minimizem os efeitos de enchentes e promovam o desenvolvimento sustentável das regiões afetadas.

**Implicações da Pesquisa:** Ao revelar como as narrativas de mudança climática estão sendo integradas à cobertura de desastres naturais, este estudo ajuda a entender o papel da mídia em educar o público e influenciar a percepção pública sobre a necessidade de políticas de mitigação e adaptação climática.

**Originalidade/Valor:** Este estudo examina como a mídia brasileira aborda as enchentes no Rio Grande do Sul, destacando as consequências sociais e a importância da compreensão da interação entre clima e geografia. Utilizando técnicas de mineração de texto para analisar um corpus de notícias, a pesquisa oferece uma análise suscinta e objetiva da cobertura midiática, contribuindo para uma compreensão da comunicação sobre eventos climáticos extremos.

**Palavras-chave:** Enchentes, Mudanças Climáticas, Rio Grande do Sul.

**LLUVIAS, TRAGEDIAS Y COBERTURA MEDIÁTICA: ANÁLISIS DE LAS INUNDACIONES EN RIO GRANDE DO SUL**

**RESUMEN**

**Objetivo:** El objetivo de este estudio es presentar cómo la tragedia de Rio Grande do Sul es manejada por los medios de comunicación, con el fin de observar si está siendo relacionada con el cambio climático.

**Marco teórico:** Los desastres ambientales se han ido intensificando con los grandes avances de las acciones humanas, que provocan el cambio climático y las estructuras periodísticas juegan un papel crucial en la configuración de la percepción pública de los desastres naturales, enmarcándolos en el contexto del cambio climático.

**Método:** A partir del uso de técnicas de minería de textos en reportajes publicados en portales de noticias brasileños sobre las inundaciones en Rio Grande do Sul, se seleccionó un corpus de 100 textos de Google News, siendo procesados a través del software Voyant Tools para la extracción y análisis de datos textuales.
Rains, Tragedies and Media Coverage: Analysis of Floods In Rio Grande do Sul

Resultados y Discusión: La cobertura mediática de la tragedia en Rio Grande do Sul destacó las consecuencias sociales y el impacto en los centros urbanos. La noticia simplifica la comprensión de las causas de la tragedia, centrándose principalmente en las fuertes lluvias y descuidando factores como el calentamiento global y El Niño. Además, las influencias socioeconómicas que amplifican los riesgos de inundación, como las malas condiciones de infraestructura y vivienda, no se tuvieron en cuenta en las discusiones. Los medios de comunicación también destacaron la importancia de comprender la interacción entre el clima y la geografía para formular estrategias que minimicen los efectos de las inundaciones y promuevan el desarrollo sostenible de las regiones afectadas.

Implicaciones de la investigación: Al revelar cómo se están integrando las narrativas sobre el cambio climático en la cobertura de los desastres naturales, este estudio ayuda a comprender el papel de los medios de comunicación en la educación del público y en la influencia de la percepción pública de la necesidad de políticas de mitigación y adaptación al clima.

Originalidad/Valor: Este estudio examina cómo los medios de comunicación brasileños abordan las inundaciones en Rio Grande do Sul, destacando las consecuencias sociales y la importancia de comprender la interacción entre el clima y la geografía. Utilizando técnicas de minería de texto para analizar un corpus de noticias, la investigación ofrece un análisis sucinto y objetivo de la cobertura mediática, contribuyendo a la comprensión de la comunicación sobre eventos climáticos extremos.

Palabras clave: Inundaciones, Cambio Climático, Rio Grande do Sul.

1 INTRODUCTION

Climate change is a global phenomenon that reflects the complex interaction between natural processes and human activities, leading to significant changes in global climate patterns. These changes are evidenced by the increase in global average temperatures and variations in rainfall distribution and intensity (IPCC, 2014). The consequences of climate change are wide-ranging, covering significant economic and social impacts.

Specifically in the southern region of Brazil, climate change has manifested significant effects on rainfall and frequency of extreme events, impacting agriculture, one of the economic pillars of the region, and exacerbating soil erosion and degradation processes (Sanches et al., 2019). In Rio Grande do Sul, for example, studies indicate an increase in the variability of rainfall and in the incidence of extreme rainfall, which contribute towards the intensification of floods and landslides, affecting urban and rural areas. Furthermore, the increase in global temperature and the change in rainfall patterns impact on the distribution of local species and ecosystems, possibly leading to changes in the composition of Araucaria forests, which are crucial for the conservation of regional biodiversity (Behling et al., 2004).

Among these impacts, the increase in frequency and severity of extreme weather events, such as storms and floods, resulting in natural disasters with severe repercussions is observed.
Such disasters have devastating economic, social and humanitarian consequences. Economically, the damage to key infrastructure and the slowdown of local economic activities impose high costs for recovery and reconstruction. Socially and humanely, the loss of human lives and displacement of communities exacerbate the vulnerability of already marginalized populations, exacerbating social inequalities and challenging community resilience (Behling et al., 2004; Hammer & Nicolodi, 2018).

In this context, media coverage plays a key role in disseminating information during and after natural disasters. While the media is crucial for public awareness and the mobilization of aid and resources in response to these events, often the adopted narrative seems to fail to properly connect disasters to their root causes of climate change (Colombo et al., 2023). Such disconnection may limit public understanding of the root causes of disasters and, consequently, the effectiveness of policy and community responses to risk mitigation and adaptation to climate change (Sanches et al., 2019).

Thus, this research is justified by the need to understand how the Brazilian media exposes the tragedy of the floods in Rio Grande do Sul and to observe if it is being related to climate change. From this perspective, this research aims to present how the tragedy of Rio Grande do Sul is worked by media outlets. For this reason, the following research question is being posed: How do Brazilian news portals report on the tragedy of the floods in Rio Grande do Sul?

2 THEORETICAL FRAME

2.1 NATURAL DISASTER AND ITS IMPACTS

Environmental disasters have been intensifying with the great advances of human actions, which cause climate change (Ríos & González, 2021). The irresponsible use of environmental resources can cause several disasters for humanity, especially for urban areas of countries that suffer unbridled exploitation in the environment (Broto & Calvet, 2020; Yigitcanlar et al., 2022).

Motta et al. (2021) report that there are technologies that can help public management carry out a study to find areas more likely to be flooded under critical weather conditions, setting critical points for the entire city based on the history of flooding observed in previous years. Added to this, Holland et al. (2024) state that public management needs to be committed to earmarking a share of public investments for environmental management. If this does not
happen, a practice of green makeup of public tastes in environmental management takes place (Ramalho et al., 2024).

When there is an urban disaster caused by climate change crises, flooding has a cascading effect on critical infrastructure such as health services, power stations, shelters and transportation facilities (Qin et al., 2023). This causes depletion of the urban center and causes disruption in various supply infrastructure for the affected population, with extreme flood events affecting these infrastructure making even developed sites in vulnerable areas.

In addition, Duan et al. (2021) report that heat islands, which are urban areas with higher temperatures than rural areas, cannot be forgotten. Through remote sensing one notices that densely built-up urban areas tend to exhibit significantly higher temperatures compared to the surrounding rural areas. In addition, Kiran and Bindu (2022) report that there is a need for urban centers to face climate challenges and disasters, proposing urban planning that considers environmental spending as a key component to achieve population well-being (Oliveira et al., 2024). The population can participate in complaints, including using social networks to show public disregard and show environmental disasters on social networks (Yigitcanlar et al., 2022).

For a strategy for climate change mitigation to be valid, several actors need to interact with each other, this collaboration must be mutual and with a common goal (Agrawal, 2020). Existing urban plans contain deficiencies that could be avoided if climate risk mitigation, adaptation and integration strategies with society were integrated. The economic and climate plans should be aligned in order to efficiently integrate the resources needed to minimize impacts on urban centers and ensure the minimum possible climate impacts (Sudhipongpracha & Dahiya, 2019).

Coastal cities also suffer from the impacts of climate change. Murali et al. (2020) studied the vulnerability of the city to dangers such as sea level rise, storms, floods and coastal erosion, and concluded that in Mumbai, a city in India, 24% of the metropolitan region is at risk, with significant concerns about the built-up areas, which comprise 35% of vulnerable regions.

Abdel-Mooty et al. (2021) inform that to improve disaster management strategies and risk mitigation measures, not only the hydrological characteristics of floods should be considered, but also the long-term damage and recovery time of urban centers and affected populations. The authors highlight the need for planning that more effectively integrates community robustness and speed of recovery, contributing to more resilient, data-driven policies. There is an urgent need to build more stringent and adaptive water management.
policies to address the identified challenges and protect the water resources of the province (Abdel-Mooty et al., 2022).

Urban planning can be used as a tool for reducing the risk of urban disasters, mainly related to floods, given the need to incorporate sustainable and adaptive urban planning practices to deal with natural risks exacerbated by climate change and rapid urbanization (Joshi et al., 2022). Ruiz-González and Mack-Vergara (2022) propose the use of resilience and sustainability indicators for urban housing to address the effects of climate change. These indicators serve to try to minimize environmental impacts and improve the quality of life of the population, maximizing environmental gains.

The irregular growth of urban centers generates social inequalities and these inequalities are enhanced with natural disasters, mainly by floods, which can cause part of the poor population to suffer displacement of their homes, total loss of property and even life (Dintwa et al., 2018). Malji et al. (2022) discuss the risks of political violence associated with climate change, particularly around climate-disaster-induced migration. They highlight the complexity of domestic and cross-border climate migration and the potential conflicts that may arise, especially in areas with limited resources and pre-existing political tensions. With this, politicians must invest effectively to combat climate change and must not loosen laws to combat environmental disasters.

Christian et al. (2021) report that there are factors capable of increasing the perceived impacts on floods, one of them being the issue of income. According to these authors, families led by women tend to suffer even more from environmental impacts, and when schooling is lower, there is still greater concern about perceived impacts, thus increasing the vulnerability of those affected. However, in contrast to the situations of floods, the natural disasters that cause drought, also have severe social impacts. Cassey et al. (2024), drought also affects women in rural areas, emphasizing how slow violence and climate challenges are exacerbated by policies that ignore local specificities and knowledge of traditional peoples.

Rana et al. (2020) report that the risk perception of floods by the affected population showed influence by past experiences and proximity to areas of imminent danger. In places where severe flooding is less frequent, risk perception is relatively low compared to areas that have a high risk of facing devastating floods more recently.
2.2 THE ROLE OF THE MEDIA IN THE FACE OF NATURAL DISASTERS

As the media sector takes a significant position in the context of globalization, the topics addressed by journalism tend to be perceived as significant by the public, many of whom lack alternative sources of information.

According to Ewart and McLean (2019), there are notable distinctions in the way a disaster is reported by international media compared to national and local media. According to Perez-Lugo (2004), local media was identified as playing a crucial role in promoting a sense of community by offering connections, emotional assistance, companionship and information.

Journalistic structures play a crucial role in shaping public perception of natural disasters, framing them in the context of climate change (Pinto et al. 2022). These structures exist within a cognitive realm that connects scientific information, media representation, and public awareness (Gibson et al., 2016).

Schudson (2008) argues that, in major national tragedies, journalism has the opportunity to exercise greater creative freedom and escape from productive routines, allowing a greater focus on the human and emotional aspects of events. Some studies have placed emphasis on the way in which the media has been reporting on these events.

The study by Sampaio et al. (2017) aimed to conduct an initial assessment of the main frameworks available in a mix of media outlets about the Mariana tragedy. According to the results of the research, even with the highlights of the environmental damage, the texts linked in the media did not, in the last instance, deal with those directly affected by the tragedy.

Koelzer and Bousfield (2020), in regards to the social representations of socio-environmental disasters in the media, observed an evolution in the approach to disasters over the decades, with an increasing consideration of the social and governmental roles, highlighting political and social issues. However, there is a need to discuss the social aspect more deeply and frequently in order to avoid its oblivion. In addition, there is a cultural tendency to attribute most natural disasters solely to natural causes, ignoring social, political and cultural influences.

3 METHODOLOGY

This study applies text mining techniques to evaluate how Brazilian news portals report to their public the tragedy caused by the floods in Rio Grande do Sul, the tragedy of the floods in Rio Grande do Sul. The investigation focused on the period from 01/05/2024 to 11/05/2024, which corresponds to the start of flooding until the data collection date. As presented in Figure
1, the methodology included several key data mining steps: (1) prior selection of relevant content; (2) preliminary processing to remove scores and non-essential words, such as conjunctions and verbs of connection; (3) identification of significant characteristics, such as the frequency of keywords; (4) modeling for grouping and association analysis of identified words; and (5) visualization of results in a clear and accessible way (Oliveira et al., 2023).

Figure 1
*Data Mining Steps*

To ensure the accuracy and relevance of the data, the corpus of the study was carefully composed of 100 news articles taken from Google Notícias, which met specific inclusion and exclusion criteria. These criteria ensured that the selected news was directly related to the floods, was of a journalistic nature (excluding opinion pieces), was not duplicated and was available free of charge.

The work also involved the application of advanced language processing techniques through the *Voyant Tools* software for the extraction and analysis of textual data, which allowed a deeper understanding of the narratives and the predominant themes in media coverage (Hetenyi et al., 2019; Sampsel, 2018; Welsh, 2014). This analysis helped identify both the frequency of certain terms and the emergence of thematic standards, which can offer insights into when the media sector takes a significant position in the context of globalization, where it serves as a hub for various speeches from various fields.
4 RESULTS AND DISCUSSIONS

The analysis of the word cloud, according to Figure 2, generated from a set of news about floods in Rio Grande do Sul, reveals a strong presence of terms such as "People", "State", "Rains" and "Floods". These terms not only highlight the primary causes of the events - the heavy rainfall - but also underline the serious consequences for the local population. In this case, it should be noted that news items tend to over simplify the complexity and the interconnection between the factors that caused this tragedy, discussing only one or two causes in each article. Among these, the most frequently cited cause was the heavy rains. Other relevant factors that may help in a more complete understanding of the tragedy, such as global warming and phenomena such as El Niño, have been few explored.

Figure 2
Word Cloud

The media tends to treat the high levels of precipitation as a sudden and unexpected occurrence, attributing most of the attention and blame to the weather phenomenon itself, while neglecting certain socioeconomic influences that amplify flood risks. These factors include inadequate infrastructure and maintenance, as well as substandard housing conditions (Henrique & Tschakert, 2019; Huq et al., 2007). This highlight suggests an urgent need to develop and implement effective disaster mitigation and preparedness strategies for extreme weather events (Kiran & Bindu, 2022; Agrawal, 2020).
In addition, the recurrence of terms such as "Civil Defense" indicates the role of emergency response agencies. The frequent highlighting of this term points to a line of research, which could assess the effectiveness of emergency responses and preventive measures already in place. This aligns with the need to strengthen communities’ resilience to natural disasters (Ruiz-González & Mack-Vergara; 2022).

The specific sites mentioned, "Porto_Alegre" and "Guaíba", repeatedly highlighted, are identified as areas significantly impacted by floods. These locations are presented by the media as points that have exhausted structures for receiving people, establishing economic activities, providing energy and drinking water, as well as being presented by the work of Qin et al. (2023), in other words, the urban center collapses. It is worth noting that of the 497 municipalities that make up Rio Grande do Sul, more than 400 were impacted, however, the main attention of the news and updates is centered on the state capital, with other localities being generically called "municipalities".

This focus suggests an opportunity for studies on the impact of urbanization and river management practices in these locations on the frequency and severity of floods, as well as the impacts that floods cause on the infrastructure of urban centers. In addition, it is necessary to understand the needs also of the surrounding areas and peripheral municipalities. These regions often face unique challenges in terms of infrastructure, disaster response capacity, and resources available for mitigation. Therefore, investigations into how floods affect these areas can provide crucial insights into planning and developing policies that aim to reduce damage caused by extreme events.

The terms "Taquari" and "Rio" highlight the importance of the bodies of water in the region, pointing to them as critical elements in the reports of floods and as vital points for studies of river basin management. Rana et al., (2020) report that severe rainfall presents high flood risks, requiring the population to prepare to face the possible social, economic and environmental consequences of this scenario. In addition, Abdel-Mooty et al. (2022) state that it is necessary to understand the water structure of the rivers of the region to carry out assertive planning against the events of climate change.

The words "Tragedy" and "Affected" reinforce the seriousness of the situations and the profound impact on local communities. However, the contextualization of the event by the media points to a lack of depth in their reports, limited to recapitulating the facts instead of presenting new data or information that deepens the public debate about the tragedy. Therefore, these terms can be used to initiate discussions about the human and economic costs of flood
events, as well as to outline more effective policy recommendations or mitigation practices (Ruiz-González & Mack-Vergara, 2022; Christian et al., 2021).

**Figure 3**

*Relationship between terms*

Figure 3 reveals the key relationships between terms associated with the floods in Rio Grande do Sul. The centrality of the term "people", linked to "millions", "tragedy", and "died", highlights the human impact of the floods, highlighting both the vast number of affected and the fatalities that ensue. This connection underlines the seriousness of the tragedy and the human losses involved. Added to this, the literature shows that there are factors that may increase the severity of the impacts of climate change tragedies on society, such as low income (Christian et al., 2021) or even families composed of women (Cassey et al., 2024).

The "Civil Defense" appears as a node directly connected to "millions" and "affected", showing its fundamental role in disaster response and victim support. The presence of this connection emphasizes the importance of the responsiveness of government institutions in crisis situations. The Civil Defense has shown itself to be active in updating the numbers on mortality, missing persons, affected localities, among other relevant information. The terms "Rain" and "Rain" are associated with "strong", "tragedy", and "Rio_Grande_do_Sul", reflecting the cause
of the floods and the intensity of the rainfall that led to such events. Malji et al. (2022) state that the state has to observe policies to assist the process of assistance to the population.

Rio_Grande do Sul, as the epicenter of the events, is connected to key elements such as "rain", "tragedy", and "shelter", illustrating the geographical breadth of the impact of the floods and the emergency measures adopted, including the need for shelters for the homeless. The term "Shelters" is linked to "state" and "Rio_Grande_do_Sul", suggesting the infrastructure response and the need to welcome people affected by floods in safe places. It is worth noting the limited discussion about the government actions implemented to deal with the consequences of this disaster, with a generic focus only on rescue operations, relocation of affected individuals in shelters and soliciting donations to those in need, without much detail of the measures being taken.

Figure 4

Integrated storytelling

Figure 4 illustrates an integrated narrative, where climate change and heavy rainfall interact significantly with the geographical context of Rio Grande do Sul, leading to human tragedies and socioeconomic challenges. This pattern suggests a clear interdependence between climatic, geographic and human elements, highlighting the complexity of floods in the region and the importance of integrated approaches to their understanding and mitigation.

It is observed that the frequency of the term "rainfall" (green line) and "clim^k" (blue line) tend to follow similar patterns along the segments, with peaks that coincide in segments 1, 7 and 10. The term "Rio_Grande_do_Sul" (orange line), although showing a trend of decline from the middle of the segments, remains as a constant background throughout the discussion, indicating that the geographical scenario is central to understand the dimension and impact of
the floods described. The "tragedy" (yellow line) progressively increases to segment 7, which coincides with the "rains" and "weather" peaks, illustrating how extreme weather events culminate in tragic consequences.

5 CONCLUSION

The tragedy that occurred in Rio Grande do Sul is a result of climate change, intensified by the uncontrolled human exploitation of natural resources and by environmental devastation. In this context, the media plays a crucial role in raising public awareness, especially by elucidating the consequences of these changes for society and fostering a collective mobilization to face these challenges.

The media coverage of the tragedy in Rio Grande do Sul presented a coverage that covered the consequences for society, especially for the most vulnerable people, the collapse in the structures of urban centers, as well as presenting the need to understand and preserve the local geography. However, the news has simplified understanding of the causes of the tragedy, focusing primarily on heavy rainfall and neglecting factors such as global warming and El Niño. In addition, certain socioeconomic influences that amplify flood risks, such as substandard infrastructure and housing conditions, were neglected in the discussions.

Therefore, understanding the interactions between climate, geography and human impact is crucial to develop effective strategies that minimize the effects of floods, safeguard lives and sustain the socio-economic development of the most vulnerable regions. Such strategies are essential in the face of the growing challenges presented by an increasingly volatile climate.

In short, the observations of Marcelo Dutra da Silva, "we need to understand that this was not the work of chance" (Adital, 2024), capture the essence of the tragedy. They highlight that previous research had already warned of the risks of heavy rainfall in urban centers and its disastrous consequences. Unfortunately, these alerts have often been ignored by both the population and government authorities, culminating in the dramatic manifestation of this problem.

This study contributes, by making an analysis of the media coverage of a natural disaster, in this case, the floods in Rio Grande do Sul, and its relationship with climatic changes. While many studies examine the interaction between climate change and natural disasters in a broad context, this research focuses on how this relationship is communicated by Brazilian media outlets at a specific event. In addition, the use of advanced text mining techniques to
analyze a news corpus adds a layer of originality, providing a more subtle and objective understanding of journalistic coverage. This approach allows a more comprehensive and granular analysis of patterns and trends in the way the media portrays the interconnection between extreme weather events and climate change, thus contributing to the advancement of knowledge in this emerging field.

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