

Constructing Climate Realities: A Computational and Discursive Approach to Institutional Authority, Algorithmic Mediation, and Social-Psychological Identity Dynamics in Climate Communication



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ABSTRACT

Climate change constitutes not only an environmental crisis but a fundamentally communicative phenomenon, whose meaning, urgency, and political salience are constructed through the discursive practices of heterogeneous media environments. This dissertation interrogates how climate discourse is produced, circulated, and interpreted across institutional news media, digitally networked platforms, and online deliberative forums, organised along three analytically discrete dimensions—political, structural, and psychological—to provide a multi-level account of climate communication in contemporary media ecologies. The first study employs critical discourse analysis of a corpus of 19,676 articles drawn from Chinese party-sponsored and non-party-sponsored newspapers spanning 2000 to 2020, drawing on a purposively sampled subset of 100 articles for close textual analysis, and demonstrates that institutional media systematically deployed discursive strategies—including expertise attribution, moralisation, and self-euphemization—to align coverage with state environmental policy and consolidate governmental hegemony across three temporally distinct phases. The second study draws on network analysis and Actor-Network Theory to examine Weibo discourse during the 2021 Henan floods, revealing a stratified and highly modular network architecture in which institutional actors consolidated narrative authority, grassroots participants achieved disproportionate engagement through content resonance, and algorithmic mediation produced asymmetries between structural centrality and interactional influence. The third study integrates latent Dirichlet allocation with compositional regression to analyse 10,401 Reddit comments across climate-focused subreddits, finding that evaluative bias is selectively activated in discursive layers characterised by instrumental and moralised comparison, while scientific and systemic framing functions to stabilise deliberation. By situating empirical investigation within environment-specific analytical frameworks, this dissertation advances climate communication scholarship through a rigorously multi-dimensional account of how discursive authority, platform infrastructure, and social identity collectively shape the articulation and reception of climate change across contemporary media.

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1

Introduction: Climate Change as a Communicative Phenomenon

1.1 CLIMATE CHANGE IN PUBLIC COMMUNICATION

Climate change has emerged as one of the most pressing challenges confronting contemporary societies, encompassing environmental, economic, and social dimensions. While the physical manifes-

tations of climate change—such as rising global temperatures, extreme weather events, and altered hydrological cycles—pose direct threats to natural and human systems, these phenomena are rarely experienced directly by the majority of the public. Consequently, public understanding of climate change is profoundly mediated through communicative processes, whereby information, interpretation, and evaluative framing are socially constructed and transmitted (Silverstone, 2005; Couldry, 2012). In this sense, climate change is simultaneously an environmental and a communicative phenomenon: its significance and urgency are constituted not only through scientific measurement but also through language, representation, and discursive practice.

The mediation of climate change occurs across a variety of communicative channels, ranging from institutional news media and policy discourse to digitally networked platforms and online discussion communities. Institutional news media, for instance, not only inform audiences about climate events but also selectively frame risk, responsibility, and national positioning, thereby shaping perceptions of legitimacy and authority in environmental governance (Boykoff, 2008). Similarly, digitally networked platforms enable widespread circulation and interaction around climate content, while the affordances of algorithms and platform infrastructures shape visibility, engagement, and relational influence, highlighting the structural contingencies of contemporary discourse (Schäfer, 2012). Online discussion forums provide further complexity, as interpretive and deliberative practices are filtered through participants' social identities, cognitive frames, and moral evaluations, producing patterns of alignment, contestation, and bias.

Discursive representations are central to rendering climate change meaningful. Lexical choice, narrative construction, and thematic emphasis collectively shape understandings of risk, urgency, and potential action, while simultaneously mediating affective responses and moral judgement. Through communication, climate change is socially constructed as a phenomenon with specific dimensions, actors, and responsibilities, rather than merely an abstract environmental process (Nisbet, 2009). Within this process, different communicative environments foreground distinct elements:

institutional media may consolidate authority and legitimise national or political agendas; digital platforms channel content according to algorithmic affordances and relational resonance; and online deliberative spaces structure engagement around identity, evaluation, and social accountability.

Understanding climate discourse therefore necessitates careful attention to the diversity of communicative environments in which it is produced, circulated, and interpreted. By examining institutional news media, digitally networked platforms, and online discussion forums, this monograph foregrounds the heterogeneous mechanisms through which climate change becomes intelligible, salient, and socially consequential, setting the stage for the empirical investigations that follow.

1.2 CLIMATE COMMUNICATION ACROSS MEDIA ENVIRONMENTS

Climate communication unfolds across a heterogeneous set of media environments, each with distinctive mechanisms that shape the production, circulation, and reception of climate discourse.

Traditional news media remain central to public engagement with climate issues, as newspapers and broadcast outlets continue to structure attention, provide interpretive frames, and situate environmental phenomena within national and international political contexts. Research demonstrates that media framing plays a critical role in determining which aspects of climate change are emphasised, which actors are rendered salient, and which courses of action are considered legitimate (Nisbet, 2009). National newspapers operate as influential social institutions that selectively legitimise specific interpretations of climate risk, often aligning coverage with prevailing policy priorities, political ideologies, and cultural norms. Through lexical choices, thematic emphasis, and narrative construction, news media mediate between scientific knowledge and public perception, making distant or abstract environmental processes intelligible while simultaneously shaping the perceived credibility of governmental and scientific actors. Within these environments, discursive strategies such as quantification, dramatization, moral evaluation, and selective expert attribution serve to consolidate

interpretive authority and guide the interpretation of climate events.

Digitally networked platforms introduce a distinct communicative ecology in which content production, circulation, and engagement are co-constituted by algorithmic affordances, user participation, and network structure (Chadwick, 2013; Bruns, 2008). Algorithmic mediation shapes the visibility and prioritisation of climate content, amplifying particular narratives while attenuating others, and fostering patterns of engagement that are unevenly distributed across participants. The structural configuration of these networks, including centralised and bridging nodes, contributes to the differential mobilisation of attention and influence. Users occupy heterogeneous positions, ranging from institutional actors and automated accounts to grassroots participants, whose interaction patterns determine the circulation, resonance, and relational dynamics of climate discourse. Event-driven surges in attention, such as those triggered by floods or extreme weather events, further illustrate the fluidity and temporal contingency of discourse on digital platforms, revealing how structural, relational, and algorithmic forces interact to shape both visibility and engagement.

Online discussion forums represent yet another communicative environment, characterised by interpretive and deliberative processes that are closely entwined with social identities, group norms, and moral frameworks. In these contexts, participants' contributions are shaped by prior beliefs, evaluative commitments, and identity-protective cognition, producing discourse that varies in salience, affective intensity, and alignment with collective norms (Hargittai et al., 2010; Van Zoonen et al., 2017). Discussions frequently address questions of responsibility, legitimacy, and accountability, encompassing both technical and moralised evaluations. Layered patterns of engagement emerge as participants navigate complex epistemic, ethical, and social considerations, with deliberation often structured around group-oriented comparisons, cooperative reasoning, or contestation of out-group positions. The heterogeneity of perspectives, combined with the affordances of forum architectures, highlights the interpretive complexity and identity-laden nature of climate discourse in online deliberative spaces.

Collectively, these communicative environments illustrate the diversity of contexts in which climate discourse is articulated. Institutional news media, digital platforms, and online discussion forums each produce distinctive modes of visibility, participation, and meaning-making, demonstrating that climate change is not simply transmitted but actively constructed, interpreted, and contested across communicative ecologies. This pluralistic perspective establishes the foundation for subsequent empirical investigation, allowing for the observation of both commonalities and divergences in the articulation of climate discourse across heterogeneous media contexts.

1.3 PURPOSE AND SCOPE OF THE MONOGRAPH

This monograph seeks to examine climate discourse as it is articulated across multiple media environments, recognising that each environment produces distinctive patterns of communication, interpretation, and engagement. While previous sections have outlined the diversity of communicative contexts—ranging from institutional news media and digitally networked platforms to online discussion forums—the present work adopts an empirical approach to investigate how these contexts shape climate discourse, without attempting to construct a unified explanatory model. By focusing on three distinct communicative environments, the monograph foregrounds the complementary insights each affords, emphasising observational analysis over causal inference.

The first focus of the monograph is the articulation of climate discourse within traditional news media. This environment is characterised by institutional authority, editorial conventions, and alignment with broader political and policy frameworks. News coverage selectively frames climate risks, responsibilities, and solutions, and discursive strategies such as expertise attribution, quantification, moralisation, and self-euphemization shape public understanding of both the phenomenon and the actors involved. Within this context, climate discourse is entwined with national agendas and institutional legitimacy, reflecting the consolidation of authority and the mediation of policy

priorities. This perspective will be referred to as the “Political” dimension, highlighting the observation of governance, legitimacy, and discursive authority within institutionalised media.

From another perspective, digital platforms constitute a communicative environment in which the structural position of actors, algorithmic affordances, and networked interaction govern circulation and engagement. These platforms enable heterogeneous participants—ranging from institutional actors to grassroots mobilisers and automated accounts—to generate, amplify, or attenuate climate content. Visibility, influence, and recruitment are co-constituted by both relational and algorithmic dynamics, illustrating how platform infrastructures mediate attention and interaction. This environment is characterised as the “Structural” dimension, capturing the organisational and technological constraints and opportunities that shape discourse without implying normative evaluation.

Finally, online discussion forums provide a site for interpretive and deliberative engagement, in which participants’ social identities, evaluative frameworks, and group affiliations influence the formation of climate discourse. Debate, contestation, and bias emerge through identity-oriented mechanisms, including comparative evaluation, moralised reasoning, and strategic framing. These interactions reveal the psychological and cognitive processes through which individuals negotiate meaning, responsibility, and legitimacy. This environment is addressed as the “Psychological” dimension, emphasising the micro-level interpretive and evaluative dynamics that characterise participatory discourse.

Together, these three perspectives provide a multi-dimensional view of climate communication, capturing the interplay between authority, structural mediation, and interpretive engagement. By examining climate discourse through Political, Structural, and Psychological lenses, the monograph offers a descriptive mapping of communicative practices, highlighting both the diversity and the complementarity of discursive environments. This approach allows for a nuanced understanding of climate discourse without presupposing hierarchical or causal relations between the three dimen-

sions, thereby establishing a coherent foundation for the empirical studies that follow.

Notably, a pattern of discursive stratification is observed across all three environments examined in this monograph, albeit produced through distinct mechanisms in each case: institutional authority in news media, network positioning on digital platforms, and identity salience in deliberative forums each appear to organise participation and shape the distribution of visibility and evaluative intensity. This observation is noted descriptively rather than as a causal claim, and is revisited in the concluding chapter.

1.4 ORGANISATION OF THE STUDY & OVERVIEW OF THE THREE STUDIES

The monograph is structured around three empirical investigations, each examining climate discourse within a distinct communicative environment. These studies are organised along the Political, Structural, and Psychological dimensions, reflecting the environment-specific mechanisms that shape climate communication. The objective is not to establish causal linkages between the dimensions but to provide complementary observational insights into the articulation of climate discourse across heterogeneous contexts. Each study employs methodological approaches tailored to its environment, generating empirical observations that illuminate patterns of framing, mediation, and engagement.

1.4.1 POLITICAL DIMENSION: CLIMATE DISCOURSE IN INSTITUTIONAL NEWS MEDIA

The first study examines the articulation of climate discourse in Chinese newspapers over the period 2000–2020, focusing on how institutional media mediate public understanding and align coverage with state environmental policy. This study employs a critical discourse analysis (CDA) framework combining textual and contextual analysis. Textual analysis focused on lexical choices, thematic em-

phasis, formal features such as genre and article length, and the deployment of discursive strategies including expertise, quantification, dramatization, moralisation, mystification, self-euphemization, other-condemnation, and denial. Contextual analysis considered both synchronic comparisons across multiple newspapers and diachronic developments over time.

The empirical corpus comprised 19,676 articles from People's Daily ($n = 11,874$) and Guangming Daily ($n = 7,802$), supplemented by reference analyses of non-party-sponsored newspapers including Beijing News, Southern Weekend, and Caixin Weekly. Findings indicate a systematic alignment of party-sponsored newspapers with national policy objectives, employing discursive strategies to consolidate interpretive authority, mitigate perceived risk, and reinforce governmental hegemony. Coverage evolved across three temporal phases: early reporting (2000–2006) gradually introduced climate issues while downplaying uncertainty; the mid-period (2007–2014) reflected rising attention to policy shifts and international scrutiny, employing euphemisation and moralisation to foreground China's leadership; the later period (2015–2020) emphasised global positioning and leadership narratives, with intensified moral framing following geopolitical tensions such as the U.S. withdrawal from the Paris Agreement. Non-party-sponsored newspapers exhibited partial diversification, focusing on economic and human-interest angles, yet largely mirrored dominant policy-aligned discourses.

This study contributes to understanding how institutional news media function as political actors in climate communication, demonstrating the alignment between media discourse, policy priorities, and the construction of national and international legitimacy. Observations reveal the role of newspapers in shaping public interpretations of climate risks, actors, and solutions, while maintaining stability in alignment with state objectives.

1.4.2 STRUCTURAL DIMENSION: CLIMATE DISCOURSE ON DIGITAL PLATFORMS

The second study investigates climate discourse on the Chinese social media platform Weibo during the 2021 Henan floods. This environment exemplifies the Structural dimension, wherein algorithmic mediation, network configuration, and actor position co-determine visibility, engagement, and recruitment. The study combines network analysis, Actor-Network Theory (ANT)–informed interpretation, and temporal dynamics to capture how relational, structural, and algorithmic forces interact in the circulation of climate content.

The dataset comprises posts and interactions surrounding the Henan floods, analysed using k-core and PageRank measures to assess structural centrality, betweenness centrality to identify bridging nodes, and community detection via modularity to reveal meso-level segmentation. Engagement and recruitment metrics were calculated to evaluate interactional resonance and mobilization potential. Temporal analyses compared network configurations pre-event, during the event, and post-event, capturing the evolution of structural consolidation and algorithmic amplification.

Findings demonstrate a highly stratified network architecture. Institutional actors occupied central positions, consolidating narrative authority within cohesive communities. Grassroots participants, often producing multimedia content, achieved high engagement despite lower structural embedding, highlighting the dissociation between network position and interactive influence. Bridging nodes, though few, were essential for cross-community translation, and algorithmic processes amplified visibility in ways not strictly correlated with structural centrality. Network modularity increased over time, reflecting segmentation into cohesive but externally insulated clusters. The environmental shock of the floods acted as a cosmopolitical actant, generating surges in digital traces and prompting network reconfiguration.

This study provides empirical insight into the structural mediation of climate discourse on digital platforms, illustrating how human actors, environmental events, and algorithmic affordances

co-produce patterns of visibility, engagement, and circulation. Observations highlight the differentiated roles of central, bridging, and peripheral nodes in shaping discourse without asserting causal hierarchies between network properties and engagement outcomes.

1.4.3 PSYCHOLOGICAL DIMENSION: CLIMATE DISCOURSE IN ONLINE DISCUSSION FORUMS

The third study examines climate discourse on Reddit, focusing on interpretive and identity-oriented dynamics in online deliberative communities. This environment exemplifies the Psychological dimension, in which social identity, group norms, and cognitive framing shape participation and evaluative discourse. Data comprised 10,401 comments across 65 posts in climate-related subreddits, analysed using Latent Dirichlet Allocation (LDA) for topic identification and a compositional regression framework to examine the relationship between discursive layers and bias expression.

Topics were organised hierarchically into five layers (A–E) representing varying degrees of identity salience. Lower layers, such as Identity Suspension (Layer A) and Strategic Social Creativity (Layer D), stabilised discourse by anchoring discussions in scientific or technical evaluation and temporally contingent reasoning. Intermediate layers, Instrumental Comparison (Layer B) and Moralised Comparison (Layer C), were associated with heightened evaluative bias, reflecting competition, comparative evaluation, and moralisation. The highest layer, Meta-Identity Breakdown (Layer E), represented the collapse of deliberative exchange, with discourse shifting toward status, geopolitical framing, and epistemic cynicism.

Regression analyses revealed that shifts from systemic abstraction to evaluative or comparative layers selectively activated bias, while other layers maintained discourse stability. These findings underscore the centrality of identity and interpretive framing in online deliberation, demonstrating how micro-level cognitive and social processes shape the circulation, tone, and evaluative content of

climate discourse in participatory platforms.

1.4.4 SUMMARY

Collectively, the three studies provide complementary observational perspectives on climate discourse. The Political dimension captures institutional alignment and discursive authority; the Structural dimension elucidates algorithmic and networked mediation; and the Psychological dimension highlights interpretive, identity-oriented processes in deliberative settings. By maintaining independent observation within each environment, the monograph maps the diversity of climate communication across heterogeneous media ecologies, establishing the foundation for integrative reflection in the concluding chapter, where a cross-cutting pattern of discursive stratification is identified across all three environments.

1.5 CONTRIBUTIONS AND STRUCTURE

The monograph provides a multi-dimensional analysis of climate discourse across institutional news media, digitally networked platforms, and online deliberative forums. By situating each empirical study within a specific communicative environment, the work offers complementary insights into the mechanisms through which climate change is articulated, circulated, and interpreted. The contributions of this research can be classified along empirical, analytical, and methodological lines, corresponding to the Political, Structural, and Psychological dimensions introduced in the preceding sections. These contributions collectively establish a comprehensive observational account of climate communication, highlighting both the heterogeneity and the complementarity of discursive processes across media environments.

1.5.1 EMPIRICAL CONTRIBUTIONS

Within the Political dimension, the monograph demonstrates how institutional news media shape the public articulation of climate discourse. The critical discourse analysis of Chinese newspapers from 2000 to 2020 reveals that party-sponsored outlets systematically employed discursive strategies—such as expertise attribution, quantification, dramatization, moralisation, self-euphemization, and condemnation of others—to align reporting with state environmental policy and consolidate interpretive authority. Non-party-sponsored newspapers exhibited partial diversification, introducing economic and human-interest perspectives while generally reflecting dominant policy-aligned narratives. These observations provide robust empirical evidence of the role of institutional media in legitimising political authority and constructing national and international environmental identities. They highlight the capacity of newspapers to mediate public understanding of climate risks, responsibilities, and solutions through discursive strategy and narrative construction, offering an empirically grounded account of how climate issues are rendered socially and politically meaningful.

In the Structural dimension, the study of Weibo discourse during the 2021 Henan floods elucidates the interplay of network position, algorithmic mediation, and actor heterogeneity in shaping visibility, engagement, and mobilisation. Analyses of PageRank, k-core, betweenness centrality, and modularity reveal a stratified network architecture in which institutional actors consolidate authority within cohesive clusters, grassroots participants achieve high engagement through content resonance, and bridging nodes facilitate cross-community translation despite structural scarcity. Temporal analysis demonstrates the dynamic reconfiguration of networks during pre-event, event, and post-event phases, illustrating how environmental shocks interact with algorithmic and structural processes to shape discourse circulation. These findings empirically substantiate the influence of digital platform infrastructures and network structures in mediating climate communication, highlighting patterns of amplification, segmentation, and relational resonance without implying

causal hierarchies.

The Psychological dimension contributes a micro-level empirical understanding of identity-oriented processes in online deliberative forums. Analysis of Reddit comments using hierarchical topic modeling and compositional regression reveals that climate discourse is stratified according to identity salience, with evaluative bias emerging selectively in intermediate layers characterised by instrumental and moralised comparisons. Lower layers stabilise discourse through scientific and systemic framing, while meta-identity breakdown layers reflect deliberative collapse and epistemic cynicism. These observations provide empirical evidence of how social identity, cognitive framing, and group-oriented reasoning structure climate discourse in participatory forums, highlighting mechanisms of bias escalation and discourse stabilisation.

1.5.2 ANALYTICAL CONTRIBUTIONS

Analytically, the monograph foregrounds the distinct but complementary logics of climate discourse in each dimension. The Political dimension underscores the interpretive and legitimising functions of institutional media, demonstrating how discursive strategies are aligned with policy frameworks to structure public understanding. The Structural dimension highlights the relational and algorithmic processes that mediate visibility and interaction, revealing patterns of network segmentation, actor differentiation, and algorithmic amplification. The Psychological dimension captures interpretive and evaluative dynamics, showing how identity salience and layered discursive structures govern bias, moral evaluation, and deliberative engagement. Collectively, these analytical perspectives illuminate the diversity of mechanisms through which climate discourse is socially and cognitively constructed, illustrating the multifaceted nature of communicative processes across media environments.

1.5.3 METHODOLOGICAL CONTRIBUTIONS

Methodologically, the monograph demonstrates the application of rigorous, environment-specific approaches to capture the complexity of climate discourse. In the Political dimension, critical discourse analysis combining synchronic and diachronic perspectives allows for the identification of discursive strategies across time and across institutional actors. In the Structural dimension, network analytical techniques, coupled with ANT-informed interpretation, provide a nuanced account of algorithmically mediated relational dynamics and the roles of structurally embedded, bridging, and peripheral nodes. In the Psychological dimension, hierarchical topic modeling integrated with compositional regression enables the capture of layer-specific discursive dynamics and their relationship to evaluative bias. By tailoring methodological tools to the affordances and constraints of each communicative environment, the monograph offers a replicable framework for multi-environmental analysis of climate discourse, demonstrating how complementary methods can generate a coherent observational account across diverse media ecologies.

1.5.4 STRUCTURE OF THE MONOGRAPH

The monograph is organised into five chapters. Chapter 1 introduces climate discourse as a mediated phenomenon, establishing the relevance of institutional media, digitally networked platforms, and online discussion forums, and providing the conceptual framework for subsequent empirical investigation. Chapter 2 focuses on the Political dimension, presenting the study *Climate Change in Chinese Newspapers 2000–2020: Discursive strategies of consolidating hegemony*, and detailing the articulation of climate discourse within institutional news media, including methods, findings, and observed discursive strategies. Chapter 3 addresses the Structural dimension, reporting on *Floods, Algorithms, and Actors: Mapping Influence and Mobilization in China's Digital Climate Discourse*, and examining how digital platform structures, algorithmic mediation, and actor

heterogeneity shape visibility, engagement, and mobilisation. Chapter 4 examines the Psychological dimension through the study Social identity dynamics drive escalation in online climate change debates: Evidence from topic modeling of digital discourse, highlighting interpretive and identity-oriented mechanisms that influence evaluative discourse and bias in online deliberative communities. Chapter 5 provides a synthesis and conclusion, integrating empirical observations across the three dimensions, reflecting on theoretical implications for multi-dimensional climate communication, and outlining avenues for future research.

In sum, the monograph advances understanding of climate discourse by providing complementary empirical, analytical, and methodological observations across Political, Structural, and Psychological dimensions. By maintaining independent focus within each environment while situating findings within a multi-perspective framework, the work offers a coherent and descriptive account of how climate change is communicated, interpreted, and contested across contemporary media ecologies.

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2

Climate Change in Chinese Newspapers

2000–2020: Discursive strategies of consolidating hegemony

2.1 INTRODUCTION

Climate change is a complex phenomenon connected to a series of environmental hazards, which constitute a major threat to the planet (IPCC, 2021). Inevitably, threats to the ecological environment bring multi-layered changes both to society and individuals, such as in global or domestic climate change policies, economic development strategies, social structures, culture, energy development, or resource allocation (cf. Dryzek et al., 2011). As the hazards of climate change are mainly invisible to humans, most people access relevant information through the media. Therefore, in this era of unprecedented environmental change, the issue of how change is constructed in media and communicational practices has become significant. A parallel challenge is how to mediate the world under the impact of climate change.

Ever since anthropogenic climate change first appeared in public agendas in the mid-1980s, questions about climate change communication and how to effectively communicate this issue to the public have increased considerably (Moser, 2010). Since the mid-1990s, research about climate change communication has appeared in academic journals. Communication scholars have begun to study how climate change can be given meaning through language, discourse, and media technol-

ogy, as it mediates people's thoughts and behaviors. Initially, the research mainly focused on the public's understanding of climate change and risks, and then gradually expanded to a wider range of research fields, such as rhetorical analysis, explanatory qualitative research, and quantitative investigation and experimentation (Chadwick, 2017). Among these studies, a large number focus on content analysis of media news reports to determine themes and frames (e.g., Schäfer & O'Neill, 2017; Spence & Pidgeon, 2010; Vu et al., 2019); observe newsrooms and study news norms reflected in media reports (e.g., Boykoff & Boykoff, 2007; Schäfer & Painter, 2021); or explore information design and persuasiveness (e.g., Bolsen & Shapiro, 2017; O'Neill, 2020).

China has become the world's largest emitter of CO₂ annually since 2006, and climate change has seriously affected its ecological environment (Third National Assessment Report, 2015). Gilley (2012, p. 287) defines China's environmental policy as top-down "authoritarian environmentalism", in which, as Lynch (1999) argues, political propaganda influences communication about climate change in China's controlled media environment. Thus, investigating climate change news reporting in the Chinese context is a valuable exercise. Wang (2021) investigated 81 Chinese studies on climate change communication and found that they mainly focused on media content and discourse frameworks, and public awareness strategies analysis adopting primarily content analysis methods and approaches (e.g., Han et al., 2017; Xie, 2015).

To add to the existing literature from a critical perspective, this article adopts Critical Discourse Analysis (CDA), combining textual and contextual analysis to investigate how the Chinese Press reported on, and discursively constructed, climate change, through the employment of a series of discursive strategies from 2000 to 2020. The findings indicate that news reporting on climate change was in consistent alignment with the ruling Communist Party's environmental policies during these twenty years, facilitating the consolidation of the government's hegemony.

2.2 CLIMATE CHANGE POLITICS AND MEDIA IN CHINA

The media plays a central role in terms of informing public knowledge. Reporting on the environment and on climate change is challenging for journalists and news media, as it involves communicating “risk in the context of uncertainty” (Painter, 2013, p. 31). The challenges relate to the complex nature of the climate change phenomenon, the high degree of uncertainty, the difficulty of communicating scientific information, and sometimes the journalists’ lack of adequate knowledge (Boykoff & Boykoff, 2007; Moser, 2010; Painter, 2013; Schäfer & O’Neill, 2017; Schäfer & Painter, 2021). These challenges impact journalists’ ability to evaluate information properly, which makes them dependent on their sources for the evaluation of information, increasing the risk that journalists adopt specific aspects and interpretations that promote certain economic interests and political agendas on environmental issues.

In China, where the state controls the media, climate change news reporting seems to have been supporting the Chinese government’s political project of maintaining its hegemony. The literature shows that the media in China have followed the prioritizations in the environmental policy set by the state. China ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1993, and since then the Chinese government has commemorated the “China Environment Centennial Journey” to support media reports on environmental issues, sponsoring also reporters to conduct investigations on selected environmental topics (Yang & Calhoun, 2007). During the same period, the Chinese media gradually began to pay some attention to environmental issues, and the number of pertinent news reports showed a mild increase.

Although China signed the Kyoto Protocol in 1998, its policies did not show any positive intent to protect the environment until 2007 due to the country’s economic development priorities (Kwon & Hanlon, 2015). At the Kyoto conference, the Chairman of the Committee on International Relations of the U.S. House of Representatives, Benjamin Gilman, described China’s posi-

tion on climate change as a “Three Nos” policy, in which China would have a) no obligations, b) no voluntary commitments, and c) no binding negotiations in the future (Zhang, 2013). While international media were fairly critical of China’s policy (Rauchfleisch & Schäfer, 2018), the Chinese media in this period were very cautious when reporting climate change issues (Ji & Dan, 2017).

After the United Nations Climate Change meeting held in Bali in 2007, China promised energy-saving and emission reduction measures. At the Copenhagen Summit in December 2009, the Chinese government faced severe criticism for its delaying tactics and refusal to support mandatory targets. From 2010, China’s position gradually changed to take voluntary and effective actions to adapt to climate change and to work with Western countries on this issue. In addition, China began to support the least developed countries, in Africa and Asia, in climate change adaptation and migration (Zhang, 2013). The “Twelfth Five-Year Plan” (2011–2015) signaled China’s policy shift to a new low-carbon development model (Li & Wang, 2012).^{*} This shift was reflected in the Chinese media coverage, as climate change was no longer treated as a politically sensitive topic (Ji & Dan, 2017), receiving increased media coverage and attention.

Before elaborating on the theoretical and methodological foundations of this study, it is important to briefly address the specificities of the Chinese media system. China’s media environment is characterized by an elaborate system of control, supervision, and censorship (Tang & Iyengar, 2011). The Chinese Communist Party (CCP) uses the media as a propaganda apparatus, limiting dissent (Zhu, 1990), by formulating political discourse agendas, publicizing official policies, monitoring public opinion, and obtaining political support from the press (Tang & Iyengar, 2011).

The state supervises the media through a management pyramid structure, in which the Standing Committee of the Political Bureau of the Central Committee is at the highest level and supervises media propaganda strategies. The Publicity Department of the Central Committee supervises the operation of various media (Tang & Iyengar, 2011), while party-sponsored newspapers such as the

^{*}The Thirteenth Five-Year Plan aims for the development of the national economy from 2016 to 2020.

People's Daily and Guangming Daily set the agenda for other media. After the Chinese economic reforms of the 1970s, China's media industry began to be commercialized and decentralized. The cultural system reform in 2003 enabled some media to gain economic autonomy (Sukosd & Wang, 2013). Market-oriented news outlets, such as the Caixin Weekly, emerged and developed. However, the CCP's close supervision and control of the media has not been abolished and is still operative.

2.3 EXPLORING HEGEMONY THROUGH CRITICAL DISCOURSE ANALYSIS

Climate change communication takes place in an environment of pressures and influences by domestic environmental policies, international relations, and corporate interests. As already mentioned, environmental communication takes on specific characteristics in China, being influenced by the country's political, social, and cultural specificities, and the state's control of the media's environment. All of these enable China's leadership to use climate change communication in the political project of maintaining its hegemony.

Hegemony, a broadly used concept with Gramscian foundations in its applications in political studies, and in communication and media studies, relates to the consolidation of systems of power and domination in broad socio-political environments (Bates, 1975; Scott, 2001). Scholars exploring the concept emphasize the role of consent in securing hegemony, but also the role of culture, and its institutions, through which consent is largely orchestrated and operationalized (Dow, 1990; Reese, 1990; Scott, 2001). As struggles over hegemony take place in the social realm, they are never finalized and resolved (Fairclough, 1992), even in political systems of tight control. Renewing consent and approval for policies and governance is important, which is the case also in the Chinese context of the single communist party rule.

Part of these struggles of securing or renewing consent take place in the field of media and are of a discursive nature. Discourse as a concept has been used in diverse ways, ranging from narrow

linguistic micro-textual to broad macro-textual and contextual approaches (see Carpentier & De Cleen, 2007). This study aligns with critical approaches to discourse that move beyond the micro-textual and micro-contextual frames of reference and look into how meaning and ideological messages are constructed and communicated in texts and social practices. Consistent with this standpoint, is critical discourse analysis (CDA) (Fairclough, 1989; 1992; van Dijk, 2001; Wodak & Meyer, 2001), which forms the foundation of this study. Discourse in CDA is a language form of social interaction that is embedded in the social context. In CDA, discourse is defined as social practice (Fairclough, 1989; 1992). Therefore, when conducting CDA, researchers focus not only on the text itself but also on the relationship between the text and social conditions.

In CDA, ideology, critique and power are key interrelated components, to explore and address. Ideology consists of “mental representations, convictions, opinions, attitudes and evaluations” about the social world and its optimal organization, shared by members of a specific social group (Reisigl & Wodak, 2009, p. 88). Textual messages often bear traces of different ideological positions and can be considered as a discursive battlefield (Reisigl & Wodak, 2009) where these positions are negotiated, legitimated, contested, or reconfigured. As CDA aims to reveal both the obvious persuasive and hidden manipulative intentions in the practice of discourse, it critically analyzes the language use of those in power and is concerned with issues of explicit and hidden domination, discrimination and control, embedded and mediated in discourse (Ietcu, 2006, p. 75; Wodak & Meyer, 2001). Thus, CDA is an appropriate research tool to explore “the role of discourse in the production and reproduction of power abuse or domination” (van Dijk, 2001, p. 96), as well as the potential of resistance, the overthrowing of hegemonies, and the consolidation of new ones.

2.4 METHODOLOGY

The present study undertakes a textual and contextual analysis inspired by the principles and tools of critical discourse analysis (Fairclough, 1989; 1992; van Dijk, 2001; Wodak & Meyer, 2001) examining how the Chinese newspapers reported on, and discursively constructed climate change, through a series of discursive strategies, between 2000 and 2020.

The analysis of this research is inspired by Carvalho's (2008) framework of textual and contextual analysis, which is adjusted to serve the purposes of this study. Textual analysis in this study focuses on analyzing discursive strategies, lexical choices, thematic focus, and certain formal features, such as genre and text length. The contextual analysis was carried out along two axes: Comparative-synchronic analysis (simultaneous description of the problem in various newspapers) and historical-diachronic analysis (time series and evolution)

The research has a special focus on discursive strategies, and how they are implemented in the news in order to propose specific ideas, suggest specific interpretations, legitimize or delegitimize certain ideological positions (Doudaki & Boubouka, 2020; Van Leeuwen, 2007). These strategies can be both text-specific and broader, pertaining to the selection of specific themes, aspects, actors, sources, within texts but also across texts, time, or media.

Among the discursive strategies that have been identified by scholars engaging in critical analyses of discourse, of high relevance for this study, are the following: expertise (use of experts in the news to provide special knowledge or frameworks of interpretation); quantification (use of data and numbers as tools of persuasion); dramatization (use of emotional language aimed to communicate urgency or intensity); moralization (use of language evoking values, morality or immorality); mystification (use of generalizations and abstraction, creating a vague, opaque environment, helping to conceal practices and information); euphemization/valorization (emphasizing values and merits, and creating a positive image) of self; condemnation (blaming, accusing, creating a negative im-

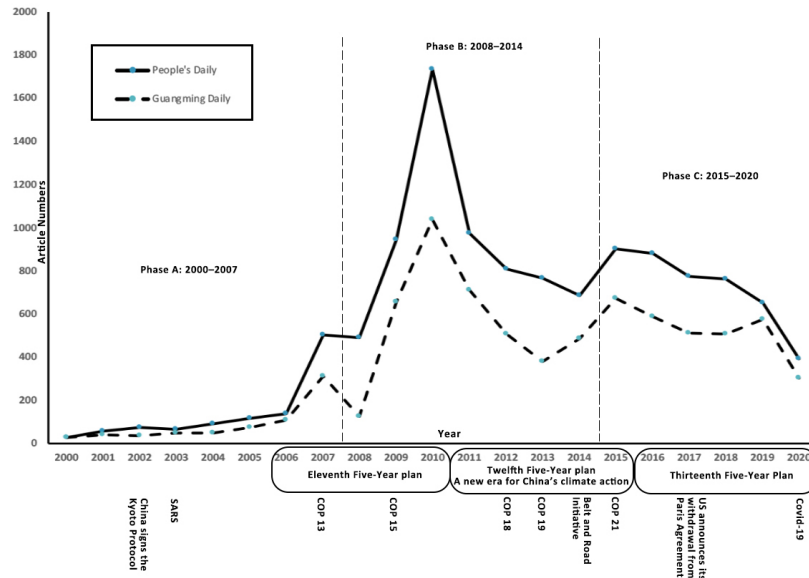


Figure 2.1: Distribution of articles from People's Daily and Guangming Daily on climate change, 2000–2020.

age) of the other; and, denial (denying the existence of a phenomenon, an attitude or an attribute) (Doudaki, 2018; Doudaki & Boubouka, 2020; Fairclough, 1989; van Dijk, 1992; Van Leeuwen, 2007; Van Leeuwen & Wodak, 1999; Wodak, 2015).

This study analyzed climate change news articles in People's Daily and Guangming Daily from 2000 to 2020 (news reports on this topic were rare before 2000). Both newspapers are considered Chinese organ newspapers; they represent the propaganda intention and direction of the Chinese Communist Party and set the agenda for other media (Chan, 2007). The analysis also included a small sample of non-party-sponsored newspaper articles, published in the same period, to facilitate the contextual analysis component of the study.

News samples were gathered from the WiseSearch database[†] by entering the following keywords:

[†]WiseSearch is a continually expanding media database, known for its comprehensive coverage and data

climate change, global warming, climate risk, and low carbon, which resulted in a corpus of news articles (N=19,676) from the People's Daily (n=11,874) and the Guangming Daily (n=7,802) addressing climate change in 2000-2020 (see Figure 1 for a graph of their distribution over time). As indicated in Figure 1, three main phases were identified: 2000–2006, 2007–2014, and 2015–2020. In 2007, the level of news on climate change began to rise significantly, reaching a peak in 2009–2010. The three identified periods are in line with the time nodes of important climate change events, both domestic and international, such as the annual United Nations Climate Conferences (1997-onwards) and the promulgation of the Chinese government's climate policy (2010-onwards). Figure 1 highlights the dates of these climate change events.

Among the corpus of news articles (N= 19,676), a sample of articles of the People's Daily (n=35) and the Guangming Daily (n=35) were subjected to CDA. The sample was spread across the three periods (2000–2006: n=10; 2007–2014: n=30; 2015–2020: n=30) and was selected by topic relevance, popularity, newspaper layout, news article length and source of information.

As it concerns the analysis of the non-party-sponsored newspapers, it focused on three outlets, the “outspoken media outlets” (Zhao, 2008, p. 93) Beijing News (n=10) and Southern Weekend (n=10), and the market-oriented Caixin Weekly (n=10). The criteria used to select and analyze the articles from these outlets were the same as for the articles from the People's Daily and the Guangming Daily. It shall be noted that the focus of this study is on party-sponsored media, given their prominence in the Chinese context, and the complementary analysis of the non-party-sponsored outlets facilitates the contextual analysis of the media environment and adds to the broader reflective analysis of the study. Its aim is not to serve as a comparative study of party and non-party sponsored media. Thereby, non-party-sponsored newspapers are only selected for reference in a small number of instances based on the number of articles in each of the three periods and the time when each

integrity. The database comprises 1,500 printed media and over 10,000 web media news and is updated promptly. Accessed from: <https://lib.tsinghua.edu.cn/info/1184/3788.htm> Tsinghua University

outlet was established (2000–2006: n=4; 2007–2014: n=16; 2015–2020: n=10).

2.5 MEDIATING CLIMATE CHANGE UNDER A CHANGING CONTEXT

2.5.1 2000–2006: UNCERTAINTY AND RISK ARE BEING DOWNPLAYED

China has experienced remarkable economic growth since the 1990s. Coal consumption doubled between 2002 and 2008 (Stensdal, 2012), which caused carbon dioxide emissions in 2008 to be more than double compared to 1990 (Wang, 2012). In 2004, former president Hu Jintao promulgated a change of economic development policy. Aiming to better balance economic development and environmental protection, Hu proposed the “Scientific Outlook on Development” (Communist Party Member website, 2017). Still, before 2009, China’s leadership viewed economic benefits as an important driving force for climate change formulation and consequently climate change policies were practically absent (Weiner, 2008).

Although China signed the Kyoto Protocol in 1998, it did not promise emission reduction as part of the Protocol, and its policies had almost no investment plan to reduce carbon emissions (Ji & Dan, 2017). The Kyoto Protocol, with all its limitations, officially came into effect in 2005. Yang and Calhoun (2007, p. 211) describe the concomitant transformation of environmental discourses in China in the early 2000s as a “green sphere”. In direct contrast to Mao’s “war against nature”, this new type of rhetoric emphasized China’s responsibility to protect a fragile environment. In 2005 and 2006, terms such as risk and disaster began to appear in the media frequently. The People’s Daily (14.12.2006) was the first to employ the term environmental refugees in a report named “What is an environmental refugee?”.

The Chinese newspapers analyzed during this first period under study aligned with the official approach to climate change and tended to downplay uncertainty when describing climate risk, using several discursive strategies. This finding echoes Geall’s (2018, p. 6) observations that, “top-down

approaches to climate change in China tend to underplay incertitude or incomplete knowledge” .

The first identified discursive strategy is quantification: the instrumental use of data as a means of persuasion. Hence, the discussion on climate change was only based on past data to explain the seriousness of the problem, instead of future forecast data. For example, in the article “Our country’ s meteorological experts analyze the root causes of severe high temperature and drought in Chongqing and Sichuan, global warming causes frequent disasters” (People’ s Daily, 30.08.2006) data measured in the past 100 years was used to explain the negative impact of climate change.

The second strategy involved downplaying risk through expertise, which consists of the strategic presence of experts in the news, whose specialized scientific knowledge can ease concerns about future developments. During this first period, the newspapers often included suggestions and evaluations by domestic experts in news articles containing uncertain information about the environment. As the following article emphasizes, “Experts pointed out that although there are still major disputes on the ecological and environmental impact of super large reservoirs in the world, in the general view, there is no obvious evidence showing that reservoirs impact the climate” (People’ s Daily, 30.8.2006). The reference to experts combined with the abstract phrase “in the general view” are used in the article to ease environmental concerns and downplay uncertainty.

The third discursive strategy, which was already introduced in the previous example, was mystification. General and abstract references are often used to alleviate readers’ worries about climate risks, as becomes evident in the following article excerpts: “This impact can be minimized through technological improvements and increased adaptability” , and “In the next few decades, climate change will not have a major impact on my country’ s food security” (People’ s Daily, 31.12 . 2003).

The fourth strategy aimed at downplaying risk involved counterbalancing or overshadowing risk and uncertainty by valorizing and praising China’ s key ecological protection projects. For example, the article “Xinjiang: Seeing Again the Clear Streams in Shahe” (People’ s Daily, 14.12.2003)

described how the Chinese government was spending 10.74 billion RMB to solve the ecological deterioration of the Tarim River Basin. This news article is relatively long (2,986 words), but only about 200 words were used to explain the negative impact of climate change. Instead, the article mainly focused on euphemizing the Chinese policy of ecological protection.

Since there were no market-oriented media during this period, the study examined for reference newspapers such as the Beijing News and Southern Weekend, both of which have relatively left-leaning political views. Although these media do not use overly politicized words, their content is very close to the party-sponsored media. For example, in the following Southern Weekend (22.9.2005) news article, the discursive strategy of euphemization was adopted, praising a national project to downplay risks:

the government's 'lighting project' brings solar products and technology to thousands of households in remote pastoral areas in Xinjiang [...] after a long period of worshipping nature, human beings discovered that it is better to create a sustainable solar energy source than to follow the example of Kuafu chasing the Sun.

In citing the mythical story of Kuafu, who symbolizes the desire of the ancient Chinese to conquer nature, the report conveys the government's confidence in climate change governance. The two newspapers also contain some popular science content, which is not included in the party-sponsored newspapers of the same period, as in the article "How do we mitigate climate change?" (Southern Weekend, 22.9.2005).

Between 2000 and 2006, climate change appears gradually in the news, however, it is not clearly labeled as an issue of public concern. The discursive construction of climate change into a public risk is contrary to the government's economic development strategy at this time, and scientific uncertainty is used in the news to maintain the government's value stance.

2.5.2 2007 – 2014: POLITICAL EVENTS DRIVE REPORTING TO SHAPE THE NATIONAL IMAGE

Figure 1 demonstrates that news reports on climate change have experienced significant growth since 2007, a watershed year in China's climate change policy. Since the Eleventh Five-Year Plan (2006-2010) for the development of the national economy introduced renewable energy and air pollution goals, China's climate policy started to develop rapidly (Stensdal, 2012, p. 4). The Twelfth Five-Year Plan (2011-2015) contained, as Kwon and Hanlon (2015) emphasize, ambitious environmental goals and is widely regarded as the most environmentally friendly of the previous five-year plans, setting goals to reduce the consumption of fossil fuels and improve energy efficiency.

It was during this period that the 17th National Congress of the Communist Party of China, held in October 2007, proposed the construction of an ecological civilization. At the same time, the 2007 United Nations Climate Change Conference was held in Bali, in December. These major climate events prompted the publication of news reports on climate change, by Chinese media.[‡] The terms emission reduction (first appeared in 2007) and low carbon (first appeared in 2009) began to gradually appear in the media during this period.

Driven by major climate events, news articles during this period were related to political events, both international and domestic. China appeared in the news as showing a positive attitude towards the mitigation of climate change at a global level, especially in 2007. For example, the article “Wen Jiabao [the then Prime Minister of China] talks with Japanese Prime Minister Yasuo Fukuda” (People's Daily, 29.12.2007) appeared on the news page with a broad picture of the two leaders' meeting. Similarly, the article “Xi Jinping Meets British Guests” (People's Daily, 20.12.2007)

[‡]In 2007, a series of major events took place in the field of environmental protection both within China and internationally. China established the National Leading Group for Addressing Climate Change, issued the “China National Plan for Addressing Climate Change”, and put forward the requirements for controlling greenhouse gas emissions in the “Eleventh Five-Year Plan” for National Environmental Protection. The Chinese Academy of Sciences also released the National Climate Change Assessment Report.

reported on the meeting between the Chinese President Xi Jinping and Britain's Prime Minister David Cameron, emphasizing cooperation on climate change issues. The party-sponsored newspapers' coverage of climate risks during this period appeared to echo the political leadership's strategy of building China's national image and international reputation through the communication of its climate change policy, frequently using the discursive strategy of euphemization.

A noteworthy aspect is that after the 2009 United Nations Climate Change Conference (COP 15), China received considerable negative coverage around the world (Rauchfleisch & Schäfer, 2018). This was addressed by the Chinese party-sponsored newspapers with the implementation of the two interconnected main strategies of euphemizing the self and condemning the other. The first strategy consisted of the continuous representation of China's positive image, through the reporting of the cooperative attitude described above. The second strategy's focus was the fight back against international negative coverage by attempting to de-legitimize the accusations, sometimes also by reversing blame and re-attributing the critiques back onto Western countries, such as the USA. The news articles by the party-sponsored newspapers did not omit the international negative coverage against China, but instrumentally included parts of it, in order to challenge and delegitimize it. For example, *Guangming Daily's* article "China's performance on climate change is commendable" (25.12.2009) stated that "the British and American media recently hyped China's 'hijacking' of the COP 15. This conference was a failure, and the failure was attributed to China." This news article quotes Professor Lin Zhicong (Ateneo University, Philippines) confirming that China is to be commended on the issue of climate change. The undermining and de-legitimization of the western accusations are put to effect through the use of verbs such as "hyped" and "'hijacking'" (the latter put in quotation marks, which adds to the de-legitimization of the western media's claims).

The use of experts is again instrumental. For example, in the article "The international community positively evaluated the Copenhagen Accord" (*People's Daily*, 24.12.2009), Knut Alfsan,

director of the Norwegian Climate Research Centre, was cited as saying he believed that the accusations against China were “unfair” and that “China has done much better than the United States.” This is an example of combined expertise, denial, and moralization, where an expert denies the accusations against China, labeling them as “unfair” .

During this period, the non-party-sponsored newspapers gradually began to pay more attention to the issue of climate change, following the general trend. In the following example, quantification, euphemization and condemnation are used as discursive strategies to demonstrate China’ s positive attitude towards climate change governance:

China can easily surpass the 2020 wind and solar energy targets and may even triple these targets [...] a large share of the government’ s ‘ 4 trillion [RMB] economic stimulus program’ is allocated for low-carbon projects. 210 billion [RMB] will be used for environmental protection and greenhouse gas emission reduction (Southern Weekend, 25.6.2009).

The article then adopts an accusatory tone: “In fact, to achieve these goals, China needs more technical and financial support, but Europe has not yet reached an agreement on the amount of aid. The EU’ s assistance to China’ s environmental funds is not unconditional” (ibid.)

Compared with party-sponsored newspapers, non-party-sponsored newspapers are more likely to adopt a human-interest framework (Luther & Zhou, 2005; Yang, 2009). The Beijing News and Southern Weekend’ s climate change news articles were no longer limited to popular science or political issues; instead, they tried to report climate risk from an economic perspective, as indicated by the following article, which encouraged low-carbon and environmentally friendly lifestyles: “Low-carbon households share their books and discuss energy-saving coups to support 21 households to carry out energy-saving renovations such as with water and electricity” (Beijing News, 20.11.2011). Still, these news articles, even if they expanded the range of genres and thematic angles, did not di-

verge from the official policy' s prioritizations and representations.

In summary, the national and international agendas of climate change politics moved forward in 2007 and gave considerable impetus to the news coverage of the issue. The Chinese media seemed to align with the country' s strategy in using the climate change policy as a means of building its national image as environmentally conscious and responsible.

2.5.3 2015–2020: A NEW LEADER OF CLIMATE CHANGE IN THE WORLD

The Paris Agreement was adopted at the 2015 United Nations Climate Change Conference (COP 21). Chinese paramount leader Xi Jinping delivered a speech at the opening ceremony of the Paris Conference entitled “Work Together to Build a Win-Win, Equitable and Balanced Governance Mechanism on Climate Change” . This was the first time a Chinese paramount leader attended the UN Climate Conference. In this period, China' s Thirteenth Five-Year Plan (2016–2020) was also initiated.⁵ In the State Council' s notice on the Thirteenth Five-Year Plan regarding the Control of Greenhouse Gas Emissions (gov.cn, 2016), it was clearly stated that 2015 was a crucial year for the negotiation of the United Nations Framework Convention on Climate Change (UNFCCC) and that it was necessary to insist on “common but different responsibility” .

Figure 1 shows that the number of news articles on climate change began to level off from 2009 to 2015. The third period from 2015 to 2020 is similar to the second in terms of volume but also in that political events, such as climate conferences and government reports, drove the news stories. However, a key difference is that the main focus of the newspapers' coverage during this period was to demonstrate China' s leadership in the world.

China issued the “China–Africa Policy” in 2006, which aims to strengthen cooperation with African countries, and according to which China is committed to establishing a new type of strategic partnership with Africa (Ajakaiye, 2006), which includes environmental aspects. Correspond-

⁵The Thirteenth Five-Year Plan aims for the development of the national economy from 2016 to 2020.

ingly, China–Africa relations feature in the news during the same period. As one article mentions, reflecting the idea of China’ s international leadership, “China provides tangible support to African countries (...) for addressing climate change” (People’ s Daily, 7.12.2015).

During the tenure of U.S. President Donald Trump, relations between the United States and China deteriorated sharply. After the U.S. announced its withdrawal from the Paris Agreement in 2017, the image of joint Chinese-American efforts portrayed by the Chinese media was deeply disrupted. At the same time, Chinese media began to refute the “China threat theory”, consistently employing the discursive strategies of positive self-image representation and negative other-image representation by reversing and re-attributing responsibility and blame to the USA. As the image of China as a world leader in climate change policy began to develop, the portrayal of the relationship between China and the U.S. changed from collaborative to antagonistic. While in 2013, news articles would stress that “China-U.S. relations maintain a positive and stable development trend” (People’ s Daily, 16.11.2013), in 2018 they would emphasize that “The U.S. leaders stigmatized China in their speeches and deliberately labeled China’ s diplomacy as ‘expansionism’ ... all absurd statements full of arrogance and hypocrisy” (Guangming Daily, 18.10.2018).

The news sampled from this period shows that moralization was applied frequently as a discursive strategy, following President Xi’ s advocacy for the “Community of Common Destiny”, when reporting on the issue of climate change. Statements such as “We call on people from all over the world to work together to build a community with a shared future for mankind” and “We must adhere to environmental friendliness, cooperate in tackling climate change, and protect the earth” repeatedly appeared in the news (People’ s Daily, 28.10.2017).

Self-euphemization combined with expertise was also used as a discursive strategy, to defend the Communist Party’ s political hegemony. For example, on 8.4.2018, Guangming Daily reported on the Chinese Academy of Sciences’ work on carbon sequestration in China’ s terrestrial ecosystems. The article concluded that the research “supports China’ s international negotiations on climate

change and provides enlightenment for other countries. It conveys Chinese wisdom in coping with global climate change” .

After 2015, Caixin News Corporation gradually began to gain influence and became a representative of market-oriented news media. This research analyzed news (after 2015) from Caixin.com and Caixin Weekly. Similar to the party-sponsored news media, Caixin’ s news coverage hardly talks about the actual climate change crisis and its related disasters. However, in a unique way, Caixin did discuss low-carbon development and green energy in an economic frame. For example, in a Caixin.com (26.8.2019) news article, the following sentences arouses people’ s attention to climate change:

The overemphasis on the market makes people ignore and underestimate the impact of climate change. Economists regard climate change as an external problem or market failure, which means people cannot fully realize that it is a matter of life and death.

In this example, which uses the strategy of dramatization to enhance the sense of urgency, while there is no direct critique addressed towards the state, criticism is orientated towards business and economic activity.

In conclusion, during the 2015–2020 period, international political events such as the signing of the Paris Agreement and the United States’ exit from the Agreement, largely drove the media’ s news agenda on climate change. In China, climate change was used as a political slogan for shaping China’ s image through the news media, as a world leader in environmental protection.

2.6 CONCLUSIONS

In today’ s mediated and mediatized world, news media performs a key role in the mediated journey of climate change. Over time, climate change has gradually transformed from an early public debate

within the scientific community to a political issue and a global crisis discussed widely by the media (Lester & Cottle, 2009).

This article studied how Chinese newspapers covered the issue of climate change between 2000 and 2020. Following the principles of critical discourse analysis and combining textual and contextual analysis, the study explored how the Chinese news coverage of climate change evolved in the 20-year research period, following broader socio-political trends, but more importantly, aligning with the Chinese government's shifting attention toward the issue. In the early 2000s, the issue of the environment and climate change began to appear in Chinese media. However, until 2006, newspapers downplayed the risks and uncertainties of climate change by reporting highly praised environmental protection projects and criticizing climate change mitigation efforts in Western countries. Since 2007, the news media's agenda has been strongly influenced by political events, such as climate conferences, international cooperation, and national policies. There are very few news reports on the actual climate change risks and threats. After 2015, the newspapers studied used climate change to demonstrate China's leadership in the world.

As the analysis showed, climate change communication is operative in the realm of political struggles for the consolidation of disparate ideological positions. The news coverage of climate change in China by the party-sponsored newspapers has been in consistent alignment with the official state environmental policy over the issue, facilitated by the use of specific discursive strategies, such as expertise, self-euphemization, and other-condemnation. The non-party-sponsored newspapers' coverage points to a slightly diversified media environment, which might be raising some critical issues in relation to environmental risks, but is still not directly critical towards the state, following the official agenda trends. The news coverage of climate change, which would be expected to include diverse and comprehensive reporting on this complex phenomenon, appears to be in the service of the official communication of China's environmental policy both domestically and internationally. The state uses the media coverage to build China's image as a major actor in global

climate governance and to consolidate the Chinese government' s hegemony.

This research provides empirical insight into changes in climate change news reporting by Chinese newspapers. However, it must be acknowledged that one of the limitations of this study is that the analysis focuses on newspapers. It shall be mentioned that from 2008 to 2011 the internet – and especially social media – played an active role in Chinese politics and public life. Mainstream newspapers such as the People' s Daily and the Guangming Daily started to use the internet to disseminate their news, including setting up accounts on social media platforms. An exploration in the context of multiple and hybrid media could therefore provide a productive direction for further research. At the same time, focusing on party-sponsored media given their prominence in the Chinese context is considered valuable, despite the limitations.

In conclusion, this study explored the discursive construction of a complex phenomenon that deals with change. The media under study mediate change through the reporting of climate change-related news. While mediating change, they construct change as a phenomenon with dimensions, risks, actors, failures, and successes. At the same time, the mediation of change is put in the service of maintaining stability. There is consistency across time as it concerns the deployment of discursive strategies through which climate change news coverage is set in alignment with the state environmental policies and the preferred way of their communication. This consistent alignment serves to maintain the status quo, by consolidating the Chinese government' s hegemony, in this case through the construction of the country' s image as a global leader in climate change policy and management.

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3

Floods, Algorithms, and Actors: Mapping Influence and Mobilization in China's Digital Climate Discourse

3.1 INTRODUCTION

The increasing centrality of social media platforms in shaping public discourse has transformed the landscape of crisis communication, particularly during environmental disasters that provoke rapid societal attention and mobilization (Starbird & Palen, 2011; Bruns & Burgess, 2012). Platforms such as Weibo function as complex socio-technical environments where narratives, actors, and information interact dynamically, producing visibility patterns that cannot be fully understood through linear communication models (Helmond, 2015). In the context of environmental crises, extreme events such as floods catalyze intensive digital engagement, enabling a wide range of heterogeneous actors—including governmental agencies, grassroots users, non-governmental organizations, and automated accounts—to coalesce around shared information flows and emergent mobilization strategies (Castillo, Mendoza, & Poblete, 2011; Corvey, Vieweg, Rood, & Palmer, 2010; Palen et al., 2020). The 2021 Henan floods provide a particularly salient case, as unprecedented rainfall and infrastructural disruption were accompanied by swift digital responses, revealing the intricate interplay of human and non-human actants. The floods began on 17 July 2021, causing catastrophic disruption across Henan Province—including hundreds of fatalities and millions of affected resi-

dents(see Section 3.4.2 for detailed figures) —and triggering an immediate surge of digital engagement on Weibo.

Platform algorithms further shape visibility and engagement patterns within these crisis-driven digital environments, highlighting the complex socio-technical dynamics of online discourse (Gillespie, 2014; Bucher, 2018). Despite the growing literature on digital crisis networks, prior research has largely privileged either structural analysis—focusing on metrics such as modularity and centrality (Newman, 2010; Cinelli et al., 2021)—or content-driven perspectives emphasizing virality and engagement, yet seldom integrates both approaches to examine how power and influence are distributed across heterogeneous actors. Studies of climate communication in China exemplify this tendency, as governance-centric analyses (Han, Sun, & Lu, 2017; Engels, 2018; King, Pan, & Roberts, 2017; Roberts, 2018) emphasize the role of state-aligned media narratives and institutional directives while often neglecting the relational and temporal dynamics through which networks reconfigure in response to sudden events. This focus on censorship and policy alignment, while informative, fails to capture the mechanisms by which structurally peripheral actors or algorithmically mediated processes contribute to visibility, attention, and mobilization. Moreover, existing work provides limited insight into cross-community translation and the role of bridging nodes, leaving unexamined how information flows across segregated clusters and which actants function as high-capacity translators. These gaps underscore the need for a relational approach that accounts for both human and non-human actants, bridging structural topology, temporal evolution, and interactional influence within digital crisis networks.

Actor-Network Theory (ANT) offers a conceptual framework suited to this relational perspective(Latour, 2005; Callon, Law, & Rip, 1986), enabling symmetric analysis of human and non-human actors. Central to ANT are concepts such as translation, whereby actors enroll others and stabilize networks, and black-boxing, the process through which internally coherent clusters limit external contestation. The agency of nonhuman actants such as environmental events and platform

algorithms in shaping network alignments, while distinctions between structural and relational power allow for the examination of both meso-level topology and micro-level engagement. Applying ANT to the 2021 Henan floods allows the exploration of how institutional, grassroots, and automated actors co-produce visibility, influence, and mobilization outcomes, while accounting for the emergent effects of algorithmic and environmental forces within the digital public sphere (Couldry & Hepp, 2017).

Weibo, as one of China's largest social media platforms, offers rich digital traces of multi-actor discourse encompassing government bureaus, automated accounts, grassroots participants, and NGOs. The flood acted as a nonhuman actant, driving network expansion, surges in engagement, and reconfiguration of relational alignments. Examining this case permits analysis of both topological segmentation and temporal evolution, as well as the patterns of cross-community translation that emerge in response to an extreme environmental event. By situating the network within its broader mediated and governance-centric ecosystem, this study elucidates how visibility, attention, and influence are distributed across diverse actants under conditions of high stakes and rapid information flows.

This study investigates how heterogeneous human and non-human actants co-produce visibility, mobilization, and network stability within a digitally mediated climate controversy on Weibo during the 2021 Henan floods. In doing so, it contributes to scholarship by integrating structural network analysis, engagement patterns, and algorithmic mediation within a crisis context, highlighting the differentiated roles of human institutional actors, grassroots participants, and automated or non-human actants. It demonstrates how cross-community translation relies on a limited set of strategic "fragile interfaces," and elucidates the relational mechanisms through which environmental events co-produce network segmentation, relational power, and discourse stabilization. By situating the 2021 Henan floods within both the socio-political and algorithmic infrastructures of Weibo, this research advances theoretical understanding of digital crisis networks and provides a nuanced account

of how complex, heterogeneous actor networks operate under conditions of managed pluralism, algorithmic super-agency, and temporal evolution.

3.2 LITERATURE REVIEW

3.2.1 CLIMATE COMMUNICATION IN CHINA: GOVERNANCE FRAMEWORKS AND THEIR LIMITS

The escalating urgency of climate communication reflects the accelerating trajectory of global warming, which manifests through rising temperatures, extreme weather events, and cascading ecological disruptions that exacerbate socio-economic disparities and threaten human well-being (IPCC, 2021; Stern, 2007). Climate communication is not merely an informational exercise but a political and social process that shapes collective perception and mobilizes action. In China, rapid industrialization and economic expansion have contributed disproportionately to the global carbon footprint, compelling the state to pursue emissions reduction, sustainable development policies, and international climate commitments (IEA, 2021; NDRC, 2021). Yet, the efficacy of climate communication in this context is deeply contingent upon understanding the interplay of domestic political priorities, international positioning, and the technological infrastructures through which public discourse is mediated.

China's climate change mitigation and adaptation strategies exemplify a highly politicized environmental domain, where policy alignment, legitimacy concerns, and international signaling intersect (Engels, 2018; Held et al., 2011). Initially hesitant to undertake stringent emissions reductions, the state embraced such policies by 2010, incorporating them into long-term economic planning and global development initiatives, including investments in Africa and other developing regions. Within this geopolitical landscape, China navigates its emerging economy status, global climate obligations, and domestic expectations against a backdrop of U.S. withdrawal from the Paris Agreement

and the rise of global populism (Held et al., 2011; Falkner, 2016; Lockwood, 2018). Han, Sun, & Lu's (2017) analysis identifies that while environmental and human impacts are prominent in Chinese climate reporting, the discourse is heavily structured by attribution of responsibility and global collaboration frames. This suggests that climate change in Chinese mainstream media is framed not merely as an ecological issue, but as a domain for global collective governance and strategic alignment of information sources, supporting the view of a governance-mediated communicative framework.

Scholars highlight that China's low-carbon policies often respond to a convergence of domestic pressures rather than solely environmental imperatives (Engels, 2018). Critical drivers include energy security imperatives, public health and legitimacy concerns arising from air pollution, and structural constraints in the prior economic growth model. Consequently, state-aligned media narratives, while ostensibly promoting climate awareness, primarily enact policy reinforcement and domestic stabilization. This orientation foregrounds the need to understand climate communication as a site where policy, media, and technological infrastructures coalesce to structure discourse, rather than as a neutral transmission of scientific information.

Yet, these governance-centric analyses tend to treat institutional actors —state agencies, official media, and policy-aligned organizations —as the primary, if not exclusive, agents of climate communication, thereby systematically overlooking the potential roles that grassroots participants and automated accounts may play in shaping the contours of public discourse.

3.2.2 FROM CENSORSHIP TO PLATFORMIZED GOVERNANCE

Central to this structuring is the Chinese media ecosystem, shaped by a long-standing ideological and institutional commitment to information control (Tai, 2014). The Communist Party of China (CPC) has historically subordinated media output to state interests, privileging governance and social stability over diversity, transparency, or normative deliberation. In digital contexts, these gover-

nance mechanisms extend through platforms such as Sina Weibo, which hosts over 500 million users (CNNIC, 2022). As a central node in the Chinese digital public sphere, Weibo functions both as a site of social interaction and as a governance apparatus (van Dijck, Poell, & de Waal, 2018), where content visibility, trending topics, and user engagement are tightly coupled with policy objectives and censorship frameworks. However, the specific dynamics of climate discourse on Weibo remain underexamined, representing a critical gap in understanding how controversies emerge, circulate, and are contained within a highly governed digital environment.

China's censorship system operates as a hybrid, socio-technical network integrating state directives, platform protocols, and user behaviors. Under the oversight of the Publicity Department of the CPC Central Committee, the media landscape is regulated across hierarchical administrative layers, including the State Council and local governments, each of which contributes to content monitoring and policy implementation (Yang, 2009: 114). Importantly, this system is not static; it adapts to emergent forms of digital activism, leveraging institutional expansion, target differentiation, and procedural innovation to maintain stability and manage public discourse. Internet censorship in China encompasses both infrastructural isolation—through the Great Firewall—and content moderation, whereby foreign websites are blocked, and domestic platforms are required to preemptively filter politically sensitive topics (Taneja & Wu, 2014; Xiao, 2011). The resulting governance apparatus is marked by complexity, overlapping responsibilities, and occasional inconsistencies, creating a dynamic interplay between predictable administrative control and contingent technological enforcement (Feng & Guo, 2013)

While this body of scholarship productively reconceptualizes censorship as a dynamic, socio-technical governance apparatus rather than a fixed structural imposition, it provides limited insight into how these governance mechanisms dynamically reconfigure in response to sudden disruptive events—such as extreme weather disasters—that compress public attention, accelerate content circulation, and place exceptional pressure on the coherence of platform control.

3.2.3 RELATIONAL POWER THROUGH ALGORITHMIC SUPER-AGENCY AND MEDIATION

Self-censorship functions as an integral component of this mediated governance, representing a soft form of social control embedded within platform logics (Chen et al., 2022). Users participate in content moderation voluntarily, aided by platform protocols and keyword filtering mechanisms formulated by the State Council's News Office. Platforms deploy human editors alongside algorithmic filters to ensure compliance, reflecting the distributed enactment of censorship across both human and non-human actants (Bamman, O' Connor, & Smith, 2012). Empirical analyses indicate that a significant portion of content is removed; for instance, 16% of a random sample of 1.3 million Weibo posts were deleted (Bamman, O' Connor, & Smith, 2012), and deleted posts are more likely to provoke collective action (King, Pan, & Roberts, 2012).

These mechanisms illustrate a paradigmatic shift from traditional censorship to platformized governance (Roberts, 2018; Plantin, Lagoze, Edwards, & Sandvig, 2018) characterized by algorithmically mediated visibility, distributed content moderation across human and non-human actors, and the prioritization of platform design and engagement metrics in shaping what users see and interact with. Rather than merely suppressing speech, contemporary control operates through algorithmically mediated visibility: what is promoted, trending, or highly ranked is as consequential as what is censored. Platform features—including trending topics, hashtag prominence, and interaction weighting—mediate the circulation of climate narratives, privileging certain voices and perspectives over others (Plantin et al., 2018; Poell, 2020). This reflects the “algorithmic super-agency” of social media platforms, where automated systems and interface design jointly enact governance outcomes (Gillespie, 2014; Bucher, 2018). In this relational view, power is not a unilateral top-down imposition but an emergent effect arising from the alignment of human actors (government agencies, media, platform operators) and non-human actors (algorithms, interface design, content

moderation tools). The efficacy of political control depends upon maintaining the stability and coherence of these socio-technical networks, aligning with ANT perspectives that situate power as relational and enacted rather than inherent (Latour, 2005; Callon, Law, & Rip, 1986).

Emotional or affective dynamics further amplify these governance mechanisms, referring to how climate narratives elicit responses such as nationalistic pride, resentment toward perceived foreign bias, and moral positioning of environmental stewardship. These dynamics reinforce state legitimacy and influence content visibility through algorithmic amplification (Bucher, 2018). Algorithms preferentially amplify content with high affective intensity, prioritizing emotional resonance over rational deliberation, creating an economy of visibility in which affective circulation mediates prominence (Bucher, 2018). This dynamic contributes to the production of managed pluralism, where certain narratives attain structural dominance not solely through coercion but via the combined action of algorithmic mediation, user engagement, and administrative guidance.

3.2.4 IDEOLOGICAL CLUSTERING AND STRUCTURAL UNTRANSLATABILITY

Media and institutional actors employ pre-emptive framing to shape public discourse, anticipating that certain narratives may not easily translate across distinct social circuits within China's highly mediated digital ecosystem (King, Pan, & Roberts, 2012). Public discourse is segmented into discrete circuits, often aligned with ideological or network-based affinities, even under seemingly uniform censorship regimes (King, Pan, & Roberts, 2012). Asymmetric visibility emerges as a core feature: official narratives gain disproportionate prominence across Weibo, independent of organic engagement levels, creating a visible but managed pluralism. These mechanisms foreshadow the empirical findings of this study, highlighting the interplay of platform mediation, relational power, and political objectives.

By foregrounding platformized governance and algorithmic mediation, this literature review positions climate controversy in China not as absent but as dynamically reconfigured. Controversial

discourse exists within structured constraints, emerging where human and non-human actants interact to negotiate visibility, attention, and narrative framing. Digital platforms, despite restrictive political environments, remain sites of contestation and reconfiguration, where the alignment of political intent, algorithmic affordances, and user action collectively constitutes the climate communication network.

What remains unaddressed, however, is precisely how these patterns of segmentation and asymmetric visibility are structurally produced and sustained: existing research does not trace the specific mechanisms—including the role of bridging nodes, fragile interfaces, and algorithmically enforced boundaries—through which information may traverse, or systematically fail to traverse, the divides between distinct discursive communities.

3.2.5 RESEARCH GAP: A RELATIONAL APPROACH TO CLIMATE CONTROVERSY

Taken together, the four preceding sections reveal a persistent and consequential bifurcation in the existing literature. Studies operating within governance-centric frameworks—those foregrounding state narratives, censorship architectures, and policy alignment—have advanced our understanding of how authoritarian platform governance structures the conditions of public discourse, yet they treat power as emanating downward from institutional centers and remain inattentive to the relational, emergent dimensions of networked communication. Conversely, platform-level analyses that foreground algorithmic mediation, affective circulation, and the co-constitution of technology, politics, and public discourse illuminate the socio-technical mechanisms through which visibility is produced and contested, but they rarely engage with the structural topology of networks, the temporal transformations wrought by acute disruptions, or the heterogeneous actor configurations—spanning institutional actors, grassroots participants, and automated accounts—that together constitute a climate controversy. Neither tradition, taken alone, is capable of integrating structural topology, temporal evolution, and interactional influence simultaneously across heterogeneous ac-

tors under conditions of algorithmic governance and event-driven disruption. This study proceeds from the conviction that such integration is not merely desirable but theoretically necessary: it is precisely at the intersection of deliberative fragmentation, managed pluralism, and platformized governance that the dynamics of climate controversy become most analytically tractable—and most consequential for understanding how digital publics form, fracture, and stabilize under conditions of authoritarian platform governance.

A first and consequential gap concerns the temporal dimension of networked climate discourse. Existing research tends to analyze digital public spheres as cross-sectional configurations, capturing the structural properties of networks at a single moment rather than tracing how those properties are transformed across the arc of an unfolding event. This limitation is particularly acute in the context of extreme weather disasters, which impose sudden, intense, and temporally bounded demands on both users and platform infrastructures. As established in Section 3.2.2, platformized governance is best understood not as a static regulatory settlement but as a dynamic socio-technical apparatus that must continuously adapt to emergent forms of digital activism and public attention—an adaptability whose mechanisms become especially visible under conditions of acute disruption. Section 3.2.3 further establishes that algorithmic mediation continuously reshapes the landscape of visibility and participation, privileging affective intensity, reconfiguring trending dynamics, and redistributing attention in ways that are sensitive to the volume and velocity of incoming content. Yet no existing study traces how these combined forces—the disruptive event itself and the platform infrastructure through which it is processed—jointly govern the temporal evolution of a climate issue network: how network composition shifts, how community boundaries contract or dissolve, and how the disaster timeline itself becomes a structural force. This gap motivates the first research question: How does the network dynamically reconfigure over the disaster timeline, and what observable roles do the flood event and platform infrastructure play in shaping these changes? (RQ1)

A second gap concerns the relationship between structural position and interactional influence

—a relationship that the existing literature leaves underspecified and, in important respects, misconstrues. Governance-centric analyses, as established in Section 2.1, treat institutional actors as the primary, if not exclusive, agents of climate communication, effectively presupposing that structural centrality and communicative dominance coincide. This presumption forecloses inquiry into the conditions under which grassroots participants achieve disproportionate interactional resonance despite occupying structurally marginal positions, or under which automated accounts accumulate structural centrality without generating substantive engagement. Section 3.2.3’s account of algorithmic super-agency and the relational view of power drawn from ANT perspectives challenges precisely this presumption: if power is emergent and enacted through the alignment of human and non-human actants rather than inherent in any one category of actor, then the relationship between structural position and interactional influence must be treated as an open empirical question rather than a theoretical given —one whose underlying mechanisms, and the actor-level and network-level conditions that govern them, remain to be specified. This gap motivates the second research question: How is influence distributed among heterogeneous actors—including institutional, grassroots, and automated nodes—and under what conditions does structural centrality diverge from interactional resonance? (RQ₂)

A third gap concerns the meso-level architecture of the climate issue network—the community-scale topology that mediates between individual actors and the network as a whole. As established in Section 3.2.4, Chinese digital discourse is characterized by ideological clustering, pre-emptive framing, and the structural untranslatability of narratives across discrete discursive circuits. Official narratives achieve asymmetric visibility not through organic engagement but through the combined action of administrative guidance and algorithmic amplification, producing a managed pluralism in which segmentation is simultaneously obscured and enforced. Yet, as Section 3.2.4 makes explicit, existing research identifies these patterns as outcomes without tracing the structural mechanisms through which they are produced: the role of bridging nodes in enabling or constraining cross-

community information flow, the fragile interfaces through which translation between discursive circuits may occasionally occur, and the algorithmically enforced boundaries that render certain community divides structurally stable. Without an account of these mechanisms, the literature can describe the fact of deliberative fragmentation but cannot explain how it is structurally reproduced or where it remains vulnerable to disruption. This gap motivates the third research question: How is the issue network structured at the community scale (i.e., the meso level: the community-scale topology between individual actors and the overall network), and what patterns of segmentation, internal cohesion, and cross-community translation facilitate or constrain information flow? (RQ₃)

These three gaps are not independent: they converge on a shared theoretical deficit —the absence of a framework capable of holding together the structural, temporal, and relational dimensions of climate controversy under conditions of authoritarian platform governance. Addressing them in concert requires precisely the relational approach that this study advances, one that takes seriously the co-constitution of technology, politics, and public discourse and treats the network not as a backdrop to communication but as its medium and outcome. The overarching question that integrates all three dimensions is therefore: How do heterogeneous human and non-human actants — including institutional actors, grassroots participants, automated accounts, and platform infrastructures —co-produce visibility, mobilization, and network stability within a digitally mediated climate controversy under conditions of algorithmic governance and event-driven disruption? This question is pursued empirically through the case of climate-related discourse during the 2021 Henan floods on Sina Weibo, a site that condenses, with unusual clarity, the tensions between platformized governance, event-driven disruption, and networked public engagement that the preceding gaps have identified. The theoretical framework and methodological operationalization through which these questions are pursued are elaborated in Section 3.3 and 3.4.

3.3 THEORETICAL FRAMEWORK

Actor Network Theory (ANT) emerged from Science and Technology Studies (STS) as a relational approach that refuses to privilege human intention over the agency of non humans in explaining social phenomena. ANT posits that entities do not pre-exist their relations but are constituted through networks of associations; actors—whether human, technical, or material—are co-constitutive of social outcomes (Latour, 1996, 1999; Law, 1992). This material semiotic approach foregrounds the emergent, contingent formation of networks, tracing how heterogeneous elements become aligned, stabilized, or dissolved through processes of translation and association (Latour, 1988; Law & Hassard, 1999). ANT's foundational premise is that social phenomena are produced through the interaction of assemblages of human and non human actants, a perspective that enables empirical tracing of relational dynamics rather than a priori structural explanations (Latour, 1993; Sayes, 2014).

ANT's methodological orientation emphasizes the empirical tracing of network formation—following actors and tracing their associations in and through controversies. Conceptually, this involves recognizing non humans, such as technologies, algorithms, and environmental events, as actors whose interactions are as consequential as those of humans in shaping discourse and outcomes (Latour, 1999; Sayes, 2014). Within climate change communication studies, ANT provides tools for analyzing how both human agency and technological mediation interplay to shape narrative production, circulation, and contestation across platforms such as Weibo.

3.3.1 TRANSLATION AND THE FOUR MOMENTS OF NETWORK BUILDING

Central to ANT is the concept of translation, a process that makes networks possible by negotiating, aligning, and stabilizing interests among diverse actors (Callon, 1984). Scholarly treatments describe translation as covering four analytical moments—problematization, interessement, enrolment, and

mobilization—each capturing a distinct phase in how actors become networked and how networks gain stability (Callon, 1984; Law, 1992).

PROBLEMATIZATION

Problematization is the moment in which a problem or crisis is framed in a way that positions certain actors as indispensable to its resolution (Callon, 1984). This establishes an Obligatory Passage Point (OPP)—a critical node or bottleneck through which all actors must pass to participate in the network. The OPP concept, introduced by Callon, highlights that network formation is not an open field of relations, but one structured by negotiated conditions that define who matters and how interests are aligned (Callon, 1984).

In climate change controversies on Weibo—such as debates surrounding the 2021 Henan floods—problematization varies across actor communities. Official accounts may frame the floods as governance and policy challenges, invoking scientific expertise to define the crisis. Independent scholars may problematize the same event as indicative of broader climate change impacts requiring systemic adaptation. Grassroots users, including nationalist “Little Pink” communities, might frame it through affective, identity driven narratives that emphasize resilience, foreign media biases, or political legitimacy. These divergent framings illustrate that problematization is not a singular, universal process but multiple, overlapping negotiations shaped by interests, interpretive frames, and mediated visibility.

Importantly, these negotiations are not purely discursive; they are mediated by platform algorithms and interface constraints that determine which framings become visible and which stay peripheral. Visibility rules, trending lists, and moderation policies function as structural conditions that shape whose problem definitions are amplified, highlighting the interplay of human and non human mediation in setting the terms of network participation.

On Weibo, official narrative templates, trending topic algorithms, and moderation policies col-

lectively function as OPPs: only content conforming to these structural conditions—whether in narrative framing, linguistic markers, or policy compliance—can gain broad visibility, while actors whose contributions fail to pass through these points remain peripheral.

INTERESSEMENT

Interessement refers to the mechanisms by which actors are locked into positions defined during problemtization (Callon, 1984). It operates through negotiation, incentives, or constraints that stabilize potential interactions. On Weibo, interessement occurs through both sociotechnical and algorithmic modalities. Algorithmic features such as Hot Search Lists, recommendation logic, and PageRank like post weightings act as technical incentives, channeling user attention toward certain posts while marginalizing others. These features are not passive; they act as non human mediators, structuring participation and influencing how actors engage with content.

Platform affordances (e.g., hashtag functions, trending algorithms) compel users to orient their contributions around specific terms or referents, effectively shaping the contours of the controversy and the actors who engage within it. This mode of influence aligns with ANT's notion that non human actors materially participate in the constitution of networks, shaping not just content circulation but patterns of attention and engagement (Latour, 1996; Sayes, 2014).

However, algorithmic segregation can short circuit interessement. Polarized communities, such as those of Little Pink users and intellectual publics, may be exposed to different sets of algorithmically amplified posts, resulting in partial or asymmetric alignment. This underscores that interessement is not merely a social negotiation but a distributed process shaped by algorithmic mediation and interface design.

ENROLMENT

Enrolment concerns the formalization of roles and the alignment of actors' interests within the network (Callon, 1984). On Weibo, roles are assigned through both social positioning (verified accounts, expert spokespeople) and technological constraints (API limitations, character limits, moderation protocols). The structure of enrolment shows how non human constraints shape participation: posts that violate platform rules or exceed interface limits may be truncated or removed altogether, limiting the capacity of remote or marginalized actors to participate fully.

In ANT, distinguishing between actants and actors is crucial: an actant is any entity that makes a difference in the network, while actors are actants that take on a role within the network through translation (Latour, 1996). This conceptual framing allows for both humans and non humans—whether interfaces, algorithms, or material events—to be seen as shaping the network by defining who participates, how they participate, and under what conditions.

Crucially, decisions about data cleaning—such as removing bots, duplicates, and water army content—must be theorized as a translation of exclusion. Determining what counts as an “authentic” digital trace enacts a form of exclusion that shapes the ontology of the observable network. In ANT terms, such exclusionary processes define which actors are counted as legitimate and which are rendered invisible.

MOBILIZATION

Mobilization refers to the capacity of spokespeople or intermediaries to act on behalf of broader actor groups and ensure network coherence (Callon, 1984). Within the Weibo climate network, mobilization occurs when verified accounts or algorithmically amplified posts articulate positions that circulate widely across user clusters. Yet mobilization is uneven: algorithmic curation may elevate low engagement official posts while suppressing organically popular citizen generated content.

Such asymmetry demonstrates how algorithms function as biased mediators, shaping who can successfully represent or articulate collective interests across the network (Latour, 2005).

Extending this analysis, Bucher (2012) conceptualizes algorithms as enforcers of the “threat of invisibility,” highlighting the political stakes embedded in algorithmic curation. In the Weibo climate network, algorithms exercise power by granting or withholding the “right to appear,” effectively determining which actors are visible and which are rendered digitally absent. Posts that are suppressed or demoted do not merely fail to reach audiences; they are subjected to a form of exclusionary agency that forces certain actors into a state of digital non-existence. This framework emphasizes that algorithmic suppression is not a passive filtering process but an active intervention in the constitution of the network, shaping both the composition of public discourse and the legitimacy of those permitted to speak.

This dynamic reflects the fragility of network coherence under digital mediation: it is not enough for actors to be present; their voices must be translated across algorithmic boundaries to achieve network wide resonance. When algorithmic segregation isolates clusters—such as between nationalist Little Pink users and intellectual commentators—mobilization falters, and network-level coherence is undermined. The combination of biased amplification and the threat of invisibility thus underscores the co-constitutive role of algorithms as both political actors and mediators, actively shaping the contours of climate change communication on Weibo.

3.3.2 ALGORITHMIC SUPER AGENCY AND PLATFORM MATERIALITY

ANT’ s generalized symmetry principle asserts that human and non-human actants are equally capable of shaping outcomes (Callon, Law, & Rip, 1986; Latour, 1996). Algorithms epitomize this symmetry: rather than neutral intermediaries, they function as biased mediators whose outputs are not equivalent to their inputs but transform engagements, effectively shaping network topology (Latour, 2005). Weibo’ s recommendation logic, trending algorithms, and interaction metrics

(likes, reposts, comment visibility) exercise what can be termed super agency, a form of selective amplification that privileges certain actors and narratives while suppressing others.

Building on Latour's conceptualization, Gillespie (2014) emphasizes that algorithms are not merely technical filters but political actors that enact decisions about relevance. In the context of Weibo, recommendation algorithms actively delineate what constitutes a "public" by promoting some posts, hashtags, or narratives while marginalizing others. This curation shapes perceptions of importance, visibility, and authority: high-engagement grassroots content may be algorithmically suppressed, whereas low-engagement official content can achieve disproportionate prominence. Gillespie's framework underscores that algorithmic selection is inherently value-laden, entangled with social, cultural, and political logics. Accordingly, the super-agency of Weibo's algorithms cannot be understood as neutral mediation alone; it constitutes a form of digital politics that both constructs and constrains network participation, shaping which voices are recognized as legitimate and which are rendered peripheral.

Platform affordances further instantiate material agency. Drawing on affordance theory (Gibson, 1977 ; Hutchby, 2001) and sociotechnical perspectives in digital media studies, interface features such as 140 character limits, hashtag systems, and "view full text" buttons structure how content is produced, circulated, and perceived. These affordances do not merely constrain activity; they actively shape it, guiding which forms of translation are feasible and which are precluded by design specifications. Combined with algorithmic curation, these material features influence the stabilization of climate discourse on Weibo by determining which posts can circulate widely, which actors gain attention, and how networked positions are reinforced or fragmented. In this sense, both algorithmic and interface-mediated forces operate as non-human agents that co-constitute the topology and political dynamics of digital climate controversies.

3.3.3 POLITICIZED BLACK BOXES AND STRUCTURAL UNTRANSLATABILITY

ANT conceptualizes black boxes as stabilized networks whose internal components recede from view once heterogeneous elements have been successfully aligned (Latour, 1999). In classical formulations, black boxes appear durable yet ultimately fragile: they can reopen when controversies resurface and previously aligned actors defect (Latour, 1988). In the Chinese digital context, however, black boxes are not merely the contingent outcomes of past translations; they are continuously produced and administratively maintained through platform moderation, algorithmic filtering, and censorship infrastructures. These mechanisms do not simply conceal internal complexity. They actively organize visibility, filter participation, and regulate the circulation of content, thereby sustaining the stability of dominant alignments. During disruptive events such as the Henan floods, moderation systems filtered content categorized as “unstable,” curtailed the spread of posts that diverged from official narratives, and preserved the coherence of authorized interpretations. Black boxes, in this context, operate less as passive containers of stabilized relations than as dynamically maintained configurations whose closure is technically and institutionally enforced.

Pasquale’s (2015) account of the “Black Box Society” sharpens this analysis by grounding platform opacity in institutional strategy. For Pasquale, black-boxing is not a neutral byproduct of technical complexity but a structural condition in which algorithmic systems render the mechanisms of power illegible to those they govern. Applied to Weibo’s moderation and recommendation systems, this framework clarifies how opacity functions as a strategic maneuver. The criteria by which posts are demoted, deleted, or amplified remain undisclosed; the weighting logics that rank content on Hot Search Lists are shielded from public scrutiny; and the thresholds that trigger content suppression are inaccessible to ordinary users. This institutionalized opacity stabilizes authority by preventing actors from fully tracing how decisions are made. This asymmetry reflects what Pasquale (2015) famously terms “one-way transparency,” in which platforms render users fully

visible to algorithmic scrutiny while shielding their own decision-making processes from reciprocal visibility. The black-boxing of censorship and moderation therefore operates as a political technology: by obscuring the operational logic of filtering, it limits contestation and sustains administrative resilience. During the Henan floods, the endurance of official narratives did not depend solely on persuasive alignment among human actors. It relied on an opaque maintenance system that shielded its internal operations from inspection while systematically removing disturbances. In this sense, black boxes persist not only because translations succeed, but because mechanisms of visibility and invisibility continuously secure their closure.

This dynamic diverges from Latour's emphasis on the inherent fragility of black boxes (Latour, 1988). Rather than reopening under pressure, black boxes in this environment display political resilience. Algorithmic governance enforces continuity by preemptively neutralizing disruptive associations before they can destabilize the network. Censorship infrastructures, recommendation algorithms, and moderation protocols function as a distributed maintenance system: they detect, classify, and expel elements that threaten alignment. Non-human actors—ranking formulas, automated detection tools, content review interfaces—act directly on the network by filtering relational pathways and recalibrating visibility. Through these interventions, the official network retains structural coherence even during crises that might otherwise provoke fragmentation. Black-box stability thus emerges as an ongoing administrative accomplishment rather than a temporary equilibrium.

Structural untranslatability arises when these same mechanisms prevent meaningful translation between actor clusters. Translation in ANT presupposes the possibility that actors can be enrolled into shared problem definitions and aligned through negotiated passage points. On Weibo, however, algorithmic segregation often channels users into discrete visibility circuits. For example, Little Pink communities and intellectual publics may engage with the same climate-related event, yet recommendation logics and moderation boundaries isolate their interactions. Posts circulate intensively within clusters while rarely crossing algorithmic thresholds that would expose them to alter-

native publics. This condition does not reflect an absence of potential connections; rather, platform mediation actively restricts the pathways through which translation could occur.

In this configuration, untranslatability is structural rather than accidental. Algorithms mediate exposure, rank interactions, and delimit searchable content, thereby shaping the relational architecture within which actors encounter one another. Human actors generate posts, comments, and reposts, but non-human actors configure the conditions under which these traces become visible across clusters. The resulting fragmentation illustrates the co-constitutive role of human and non-human actors in shaping discursive coherence. Structural untranslatability therefore names a state in which translation is systematically short-circuited by algorithmic borders. Networks persist, but they do so in parallel formations whose boundaries are reinforced by opaque systems of moderation and ranking. In such circumstances, politicized black boxes and algorithmic segregation converge: one stabilizes authorized alignments through maintained opacity, while the other restricts cross-cluster translation, together shaping the contours of climate controversy on Weibo.

3.3.4 MAPPING AS MICRO TRANSLATION ANALYSIS

Mapping, understood as an ontological reconfiguration rather than mere visualization, operationalizes ANT in the digital domain (Marres & Rogers, 2005). Tools like Gephi allow for the identification of modularity classes, which serve as proxies for micro translations—localized relational maneuvers in which clusters of actors are absorbed, aligned, or isolated.

Mapping makes visible the hidden structure of digital controversies. Each cluster represents not just a set of interactions but the outcome of mediated associations shaped by algorithms, interface affordances, and human practices. For example, algorithmically amplified official posts may cohere into densely interconnected modules, while marginalized citizen content remains isolated, visually reflecting asymmetric translation in the network.

Mapping thus captures both the materiality of interactions and the relational processes that con-

stitute controversy, revealing how climate discourse is assembled, negotiated, and contested across algorithmically mediated landscapes, and providing the methodological bridge through which the ANT-informed framework developed here is operationalized in the analysis that follows.

3.4 METHODOLOGY

3.4.1 CONTROVERSY MAPPING

Climate change, as a multidimensional and societally salient phenomenon, exhibits the hallmark characteristics of social controversies, encompassing diverse actors, persistent debates, and inherently unstable knowledge formations (Venturini, 2010). Rather than merely representing disagreement, controversies in Science and Technology Studies (STS) signify processes through which knowledge, practices, and social orders are destabilized and subsequently reconfigured (Callon, Lascoumes, & Barthe, 2009). Within this perspective, controversy is an empirical object to be traced, mapped, and reassembled, rather than a conceptual label imposed a priori. Scientific claims and technological infrastructures often function as “black boxes,” whose inner workings are opaque to the broader public; it is precisely when these black boxes are challenged or ruptured that controversies emerge and become methodologically tractable (Latour, 1988; Sismondo, 2009).

The methodological practice of Controversy Mapping entails following actors—human and non-human—through the networks they form, observing how claims, artifacts, algorithms, and social entities interact and transform one another (Venturini, 2010). In digital settings, these actors include not only social media users, journalists, and policymakers, but also platform algorithms, interface affordances, and automated content moderation systems. Controversy Mapping thus operationalizes the tracing of heterogeneous associations, allowing researchers to observe network formation, stabilization, and dissolution in real time. Each post, repost, like, or comment is treated as a trace of translation—a moment when an actor succeeds or fails in mobilizing others (Callon, 1984).

By reconstructing these interactions, we can discern the relational power of nodes, the influence of non-human actants, and the dynamics of public discourse.

Climate change controversies are particularly amenable to this approach due to their inherent “shared uncertainty” and public visibility (Latour, 2007; Venturini, 2010). They resist closure because they involve contested scientific models, emergent climatic events, and urgent socio-political implications. The opacity of climate science, combined with media amplification and societal stakes, produces what Latour (1988) describes as a fertile space for tracing controversies. Digital platforms, particularly social media, provide extensive empirical traces that allow the researcher to capture both stabilized networks—where claims and actors are successfully recruited—and unstable configurations, in which translations fail or are contested. These digital traces function as observable markers of ongoing network processes, rendering visible the otherwise hidden alignments and frictions of a controversy.

Following the principles outlined by Marres and Moats (2015), controversy mapping in digital contexts combines computational extraction with qualitative reassembly. The process encompasses identifying relevant actors and issues, collecting digital traces, and constructing networks that reveal both relational structures and power asymmetries. By employing this methodology, we aim to capture climate change as a dynamic, networked phenomenon, where human, technological, and natural actants co-constitute the unfolding debate. Social media, as a repository of both structured and emergent communication, provides an especially productive site for this investigation (Rieder, 2013; Marres & Moats, 2015).

3.4.2 THE 2021 HENAN FLOODS CASE

The 2021 Henan floods serve not merely as a temporal or newsworthy context but as a disruptive nonhuman actant, a rupture point that destabilizes existing socio-technical configurations (Law, 2008). Beginning on 17 July 2021, Henan Province experienced continuous and unprecedented

precipitation, resulting in catastrophic flooding that affected 14,531,600 individuals, caused 302 confirmed deaths, and left 50 people missing. Zhengzhou, the provincial capital, recorded a peak hourly rainfall of 201.9 millimeters. The floods' scale and intensity rendered visible the previously obscured infrastructures of social communication, including the Weibo platform, algorithmic sorting mechanisms, official narratives, and emergent public sentiment. As non-human actants, the floods themselves displaced networks, provoking intensified debate and revealing latent socio-technical relations. This constituted a climate controversy in the STS sense—a moment in which knowledge claims about extreme weather, infrastructure, and governance were simultaneously exposed and contested across heterogeneous actors on Weibo (Venturini, 2010; Callon, Lascoumes, & Barthe, 2009).

This event was selected as the focal empirical case for several methodological reasons. First, its severity and abrupt onset generated a surge of digital traces on Weibo, producing an observable configuration of interactions that is typically dispersed and ephemeral. Second, the floods exposed the interplay between natural events, state communication, and public discourse, allowing us to study climate change as a mediated controversy. Third, the proximity of other hydrological extremes, such as the 2021 European floods and anomalous flooding in the Taklimakan Desert, further amplified climate-related discourse, producing comparative digital traces that highlight issue salience and network formation. By treating the Henan floods as an actant that actively shapes controversy, rather than as a passive backdrop, we foreground the relational nature of events, actors, and platformized mediation in the construction of public knowledge.

For the purposes of this study, the disaster timeline is operationalized into three analytical stages grounded in the meteorological chronology of the event, anchored by the peak rainfall record on 20 July 2021:

- Early stage (14–16 July 2021): baseline climate discourse on Weibo prior to flood onset.

- Peak stage (17–23 July 2021): onset of heavy rainfall on 17 July, reaching peak intensity on 20 July (201.9 mm/hour in Zhengzhou), encompassing the period of maximum disruption and digital mobilization.
- Post stage (24 July –1 August 2021): receding floodwaters, official damage assessment, and consolidating digital discourse.

3.4.3 DATA ACQUISITION AND PLATFORMIZED MEDIATION

Weibo itself functions as a networked assemblage of non-human actants that shape the observability of controversy. Platform affordances—post length limits (140–2000 characters), “show full text” toggles, likes, comments, and reposts—act as obligatory passage points (Latour, 2005), structuring the manner and extent to which digital traces can be mobilized. Hashtags operate as aggregated assemblages that stabilize community-level debates, while keywords function as dispersed traces capable of capturing otherwise disconnected conversations (Rieder, 2013; Marres & Moats, 2015).

Data were collected using a Python-based web scraper applied to Weibo’s publicly accessible web interface, given the absence of an official open API. The sampling strategy combined event-specific terms (e.g., #Flooding in the Taklimakan Desert#, #Causes of floods and rainstorm in Henan#) with broader climate terms (e.g., #Global Warming#, #Climate change#) to ensure comprehensive coverage of the controversy across multiple scales and communities. Figure 3.1 demonstrates the logic of this combined hashtag and keyword sampling strategy.

The collection process was operationalized in two stages. First, hashtags and keywords were used to identify target posts. Each post was harvested with its textual content, emojis, user ID, timestamp, engagement metrics (reposts, comments, likes), and client platform metadata. Second, all associated reposts and comments were captured, including metadata and engagement. Liked posts were also traced where visible, acknowledging platform constraints. Data collection was conducted

Table 3.1: Hashtags and Keywords for Data Collection (Translated Version)

Hashtag	Keywords
#Flooding in the Taklimakan Desert#	Global warming
#Global Warming#	Climate change
#Climate change#	Floods + climate change
#Causes of floods and rainstorm in Henan#	Floods + global warming; Zhengzhou rainstorm + global warming; Henan rainstorm + global warming

between 14 July and 1 August 2021, yielding a total of $N=687,391$ posts, including 5,997 original posts, 326,407 reposts, 40,210 comments, and 314,777 likes.

These procedures reflect an ANT-informed understanding of platformized mediation: algorithmic sorting, user interface affordances, and engagement metrics actively shape what is visible, which posts circulate, and which actors are recruited. Capturing likes, comments, and reposts constitutes empirical evidence of translation success and network mobilization, revealing how controversies expand and stabilize through heterogeneous interactions. From this perspective, data collection is understood not as passive gathering but as nodal harvesting: identifying points at which actors and actants converge, tracing how digital inscriptions circulate, and capturing moments of translation within the controversy.

3.4.4 DATA CLEANING AND ANALYTICAL SCOPE

Data cleaning in this study was reframed as an exercise in identifying stabilized networks, rather than eliminating “invalid” information. Posts with fewer than ten reposts were removed, not because they lacked relevance, but because they did not demonstrate successful translation of content to other actors (Callon, 1984). Repeated posts, often generated by commercial “water armies,” were combined or filtered to highlight the nodes that exerted genuine relational influence.

Algorithmic filtering, platform limitations, and self-censorship contributed to governance-

induced data gaps (Chen et al., 2022; King, Pan, & Roberts, 2012). For instance, some posts were only visible to followers, while the Weibo algorithm displayed likes selectively, creating a managed pluralism in the observable network. These gaps were treated methodologically as reflections of socio-technical constraints and power relations, rather than mere noise, since they indicate how networks are actively shaped by non-human actants, including platform algorithms, interface design, and regulatory systems.

Through these sanitization procedures, the dataset was rendered analytically tractable while preserving the key structural properties of the controversy network. Cleaning thus operationalized the identification of stabilized actor-worlds, where actors—human and non-human—succeeded in recruiting and aligning others. This approach highlights the interplay between platform governance, algorithmic mediation, and actor-network formation in digital climate change discourse.

3.4.5 NETWORK METRICS AS RELATIONAL POWER PROXIES

Quantitative network metrics were employed to operationalize relational power within the controversy. All network analyses, including the calculation of PageRank scores, were conducted primarily in R, ensuring reproducible and scriptable computation. PageRank, originally developed by Brin and Page (1998) for recursive link-based ranking of web pages, has been widely adapted for directed social network analysis to measure nodal influence (Gleich, 2015). Rather than counting incoming links alone, PageRank weights each link by the structural authority of its source, such that endorsement from a highly connected node contributes more to a node's score than endorsement from a peripheral one. This recursive logic makes PageRank particularly well suited to repost networks on platforms such as Weibo, where influence reflects not merely how many users repost a given account, but who reposts it and how structurally embedded those actors are. In the context of ANT-informed controversy mapping, PageRank serves as a proxy for translation capacity: nodes with higher PageRank scores occupy positions through which more relational pathways pass, in-

dicating a greater potential to stabilize discourse and recruit other actants (Callon, 1984; Latour, 2005). PageRank was used not merely as a visualization tool, but as a measure of a node's capacity to mobilize other actants through successful translation. Nodes with higher PageRank values indicate greater influence within the network, reflecting the ability of users, posts, or content types to attract engagement and propagate discourse. Gephi was subsequently employed solely for the purpose of visualizing the network structure and making the relational patterns interpretable.

Network visualization was conducted using Gephi's OpenOrd layout, with node size proportional to PageRank and node color indicating community membership. This configuration allows for the empirical identification of clusters or actor-worlds, representing stabilized networks and ideological enclaves. Communities are understood as relational constructs, emerging from the repeated alignment of human and non-human actants rather than pre-defined social categories.

By combining PageRank with OpenOrd visualization, we empirically trace both the structural and functional properties of the controversy. Metrics reveal patterns of recruitment, translation success, and the influence of platformed non-human actors—such as algorithms and interface design—on the visibility of climate-related discourse (Bucher, 2012; Plantin et al., 2018). The methodological integration of these quantitative proxies with the qualitative tracing of posts, comments, and multimedia content ensures that the analysis captures both the stability and fluidity of the digital controversy network.

3.5 RESULTS

3.5.1 DYNAMIC RECONFIGURATION & EVOLUTION (RQ1)

The temporal analysis in this section follows the three-stage periodization introduced in Section 3.4.2. The early stage (14–16 July 2021) captures baseline climate discourse prior to flood onset; the peak stage (17–23 July 2021) covers the period from the onset of heavy rainfall on 17 July through

peak intensity on 20 July (201.9 mm/hour in Zhengzhou); and the post stage (24 July –1 August 2021) encompasses the period of receding floodwaters, official assessment, and consolidating digital discourse. This periodization is anchored by the meteorological chronology of the disaster, with 20 July 2021 serving as the empirical reference point for peak disruption. The flooding event did not merely increase network size; it reorganized relational alignments and progressively transformed a loosely connected discussion space into a highly consolidated configuration of insulated communities. This transformation is captured most clearly in the dramatic shift of Modularity from 0.03728905 (early stage) to 0.67343296 (peak stage), and ultimately to 0.94188943 (post stage).

Table 3.2: Topological Evolution and Descriptives of the Weibo Network across Event Stages

Stage	Nodes	Edges	Modularity
Early stage	2,231	2,213	0.03728905
Peak stage	13,265	13,360	0.67343296
Post stage	5,324	5,372	0.94188943

In the early stage, the network comprised 2231 nodes and 2213 edges, with Modularity at 0.03728905. Such a low value indicates minimal community differentiation. Structurally, the network resembled a loosely articulated discussion field in which ties were sparse and clusters weakly defined. Actor-networks had not yet crystallized into stable blocs; rather, they formed a shallow, fluid configuration characterized by limited Recruitment Capacity and low density of reciprocal inscription. From an ANT perspective, controversies had not yet been “problematized” into durable alignments. Institutional actors, grassroots commentators, and automated accounts coexisted within a relatively undifferentiated topology.

The flooding event functioned as a nonhuman actant in this transformation. As a non-human force—material, environmental, and infrastructural—it disrupted existing alignments and compelled heterogeneous actors to reconfigure their positions. The event generated a surge in participation: during the peak stage, the network expanded to 13265 nodes and 13360 edges, and Modu-

larity rose sharply to 0.67343296. This quantitative expansion signals mass mobilization, but more importantly, the increase in Modularity indicates the rapid formation of distinct communities.

The rise from 0.03728905 to 0.67343296 reflects the translation of environmental disruption into discursive polarization. Actors did not simply converge around a shared problem; instead, they aligned into differentiated clusters structured by institutional affiliation, epistemic authority, and platform-mediated visibility. The institutional mobilizer 1202968283 (乐天凌), with Recruitment Capacity of 4.76427898 and PageRank of 0.06256542, exemplifies how political and infrastructural framing was rapidly amplified within aligned communities. Its capacity to convert structural influence into high Engagement (median 1858) facilitated the stabilization of a discursive bloc oriented toward official narratives.

Simultaneously, the automated account 1294811905 (大海故乡 PMPMB), possessing the highest PageRank (0.129145166) but minimal Engagement (8), remained structurally central yet interactionally weak. During the mass mobilization stage, such infrastructurally embedded nodes contributed to maintaining algorithmic circulation pathways even as substantive engagement concentrated elsewhere. In contrast, the grassroots science communicator 3296569781 (风云梦远), with minimal PageRank (0.00002682651) but maximum Engagement (8763), exemplified an alternative mobilization logic: high interactive resonance without deep structural embedding. The flood, as nonhuman actant, therefore intensified both recruitment and differentiation, exposing the visibility politics embedded within platform affordances.

As the network matured into the peak stage configuration, K-core stratification deepened. Although the maximum k remained 6, the concentration of k=6 nodes in Community 16—dominated by localized environmental bureaus—became more pronounced as institutional actors reinforced internal reciprocity. National-level agencies and local environmental bureaus did not operate identically: the latter formed dense reciprocal loops, stabilizing administrative coherence within geographically bounded clusters. This sub-type granularity demonstrates that institutional alignment is

layered rather than monolithic.

The most dramatic transformation, however, occurred in the post stage. Following the immediate crisis, the network contracted to 5324 nodes and 5372 edges. Yet instead of dissolving into cohesion, Modularity escalated to 0.94188943. This value approaches structural partition saturation, indicating that community boundaries became almost impermeable. The contraction of node count alongside the rise in Modularity reveals a process best described as the “Consolidation of Black-boxes.” Rather than maintaining the fluid cross-community interactions characteristic of early mobilization, actors retreated into tightly bounded clusters—digital fortresses sustained by dense internal connectivity and minimal external exchange.

This consolidation is consistent with the earlier E-I Index of -0.9604895, where 98.0% of ties are internal. In the post stage, the structural logic of insulation intensified. Cross-community bridges, such as 1609358735 (金芝), with Betweenness of 1225 and PageRank of 0.0091484726, became even more critical yet structurally vulnerable. As “The Fragile Interface,” this node’s brokerage capacity connected otherwise isolated clusters, but the near-saturation Modularity implies that such translation pathways were sparse and potentially fragile. Similarly, 1689147222 (CYCAN), embedded in Community 16 with Betweenness of 198, represented controlled permeability within an otherwise highly reciprocating institutional enclave. The secondary bridge 1065190973 (济宁环境), with Betweenness of 61, reinforced intra-institutional articulation rather than expanding boundary openness.

The post stage configuration therefore did not reflect consensus formation. Instead, it signaled the stabilization of multiple internally coherent actor-networks whose boundaries hardened over time. The flood, initially a cosmopolitical disruptor that forced heterogeneous actors into confrontation, ultimately accelerated segregation. Environmental disruption triggered mobilization, but the long-term effect was segmentation.

Platform governance further mediated this evolution. Character limits, algorithmic ranking, and

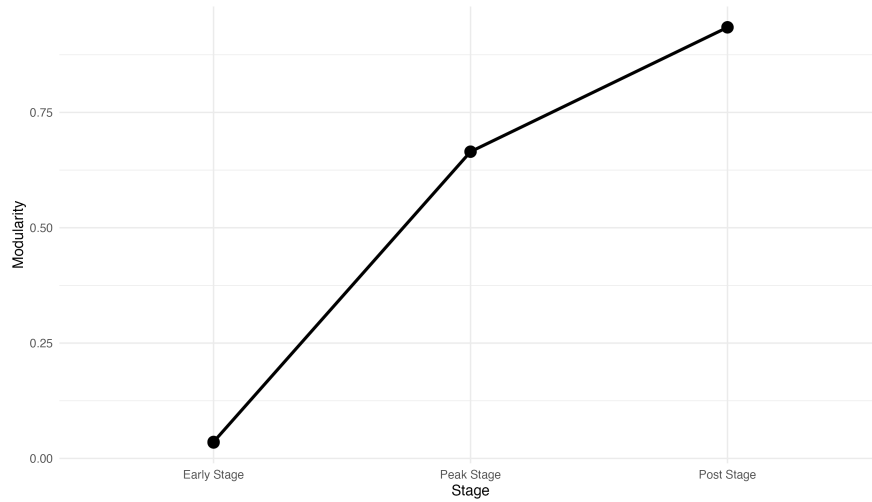


Figure 3.1: Temporal evolution of network modularity across three analytical stages. Modularity increases monotonically from the early stage (0.037) through the peak stage (0.673) to the post stage (0.942), indicating progressive community consolidation and increasing structural fragmentation following the flood event.

potential content removals—understood here as Governance-induced data gaps—operated as non-human actants shaping visibility and persistence. The fact that 19,476 users recorded zero Engagement and that PageRank remains extremely skewed (Min = $2.683e-05$; Max = 0.129) suggests that the consolidation of black boxes was co-produced by algorithmic amplification and infrastructural filtering. Platform sovereignty did not simply host the controversy; it structured which alignments became durable and which dissipated.

Figure 3.3 illustrates this temporal trajectory. As shown, modularity increases monotonically across the three stages, with a steep ascent from the early stage (0.037) to the peak stage (0.673), and a further rise to the post stage (0.942) despite declining node counts.

This divergence between volume and segmentation encapsulates the core finding of RQ1: issue intensification does not necessarily yield integrative deliberation. Instead, under the joint influence

of cosmopolitical disruption and platform-mediated visibility, the network reorganizes into stabilized yet insulated constellations.

In sum, the flood functioned as a nonhuman actant that catalyzed rapid mobilization and differentiation. The initial expansion fragmented into distinct communities, and over time these communities underwent a Consolidation of Black-boxes, retreating into internally coherent yet externally segregated formations. The dynamic reconfiguration from 0.03728905 to 0.94188943 thus captures the transformation of a fluid discussion space into a highly partitioned topology, where relational power, translation capacity, and platform governance collectively shape the long-term architecture of climate-related controversy.

3.5.2 IDENTIFYING HETEROGENEOUS ACTANTS AND RECRUITMENT CAPACITY (RQ₂)

The flooding-related discourse network on Weibo exhibits extreme heterogeneity in both structural influence and interactive performance, revealing a highly asymmetric distribution of visibility and mobilization power. PageRank, used here as a measure of structural influence or Nodal Influence, is markedly skewed. The minimum, 1st quartile, median, and 3rd quartile all converge at $2.683\text{e-}05$, while the mean is $4.970\text{e-}05$ and the maximum reaches 0.129. This compression of the distribution's lower range, coupled with a single node occupying an order-of-magnitude higher value, indicates that the overwhelming majority of actants remain structurally peripheral.

Engagement follows a similarly concentrated pattern. The median Engagement is 0, the 3rd quartile is 0, and 19,476 users record zero engagement. The mean is 1.793, while the maximum reaches 8763. A log-log scatter plot of PageRank against Engagement shows a strong monotonic relationship, quantified by Spearman's $\rho = 0.917$, indicating that at the macro level structural centrality and interactional performance move together. However, this high correlation masks critical micro-level divergences. Although the correlation is extremely high, this consistency breaks among the Top

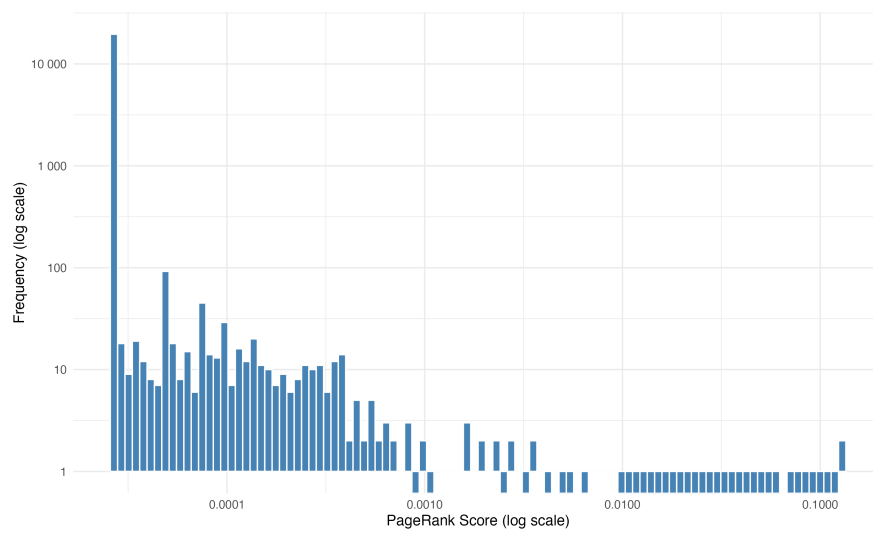


Figure 3.2: Distribution of PageRank scores across the Weibo climate discourse network (log-log scale). The leftmost bar represents nodes at the minimum PageRank value ($2.683e-05$), comprising the overwhelming majority of actors in the network ($n > 10,000$). The long tail extending toward 0.1 reflects the concentration of structural influence among a small minority of nodes. Note: Both axes are presented on a logarithmic scale to accommodate the extreme range of values.

10 nodes; for example, 1294811905 exhibits a notable divergence between high structural degree and low engagement, revealing the macro-level order maintained by the algorithm while micro-level visibility distribution is uneven. This pattern illustrates what can be termed visibility politics (Gillespie, 2014): while the overall architecture rewards structurally embedded nodes, the distribution of interaction is uneven and mediated by platform affordances.

The contrast between 1202968283 and 1294811905 exemplifies this heterogeneity. The account 1202968283 (乐天凌) is a human institutional redistributor affiliated with official media channels. It combines a relatively high PageRank of 0.06256542 with a substantial median Engagement of 1858 and the highest observed Recruitment Capacity of 4.76427898. Within an ANT framework, this node operates as a high-capacity translator (Callon, 1984): it does not merely occupy a structurally central position but actively converts infrastructural visibility into recruitment power. Recruitment Capacity here reflects the ability to mobilize other nodes into interactional alignment, and 1202968283's profile demonstrates a rare convergence of structural influence, engagement, and network expansion. Its political and hard infrastructure-oriented content further suggests alignment with institutional discourse, allowing it to stabilize and circulate dominant narratives within the network.

In contrast, 1294811905 (大海故乡 PMPMBA), identified as a likely automated account based on manual content inspection, occupies the highest PageRank position at 0.129 but registers a median Engagement of only 8 and a Recruitment Capacity of 0.70959189. The account's posts displayed a systematic absence of logical coherence between textual and visual content: text segments showed no internal narrative continuity, while accompanying images were thematically aligned with official policy messaging without direct correspondence to the text—a pattern of machine-generated text paired with contextually mismatched yet politically aligned imagery consistent with bot-like behavior documented in prior research (Varol et al., 2017; Shao et al., 2018; Bolsover, 2017). This configuration—maximal structural centrality coupled with minimal interaction—indi-

cates infrastructural embedding rather than discursive authority. Its influence derives from network positioning rather than sustained relational reciprocity. The content characteristics of fragmented narratives and tactical hashtag usage (e.g., instrumental deployment of policy-related tags) suggest a “punctualized” algorithmic actant: a node whose presence is amplified through structural circulation mechanisms rather than dialogic exchange. Quantitatively, the disparity between 1202968283 and 1294811905 demonstrates that a lower PageRank (0.06256542 vs. 0.129145166) can nonetheless yield substantially higher Recruitment Capacity (4.76427898 vs. 0.70959189) when supported by interactional reciprocity. This divergence foregrounds the distinction between structural influence and effective mobilization.

The visibility gap becomes even more pronounced when comparing 1294811905 to the grassroots viral human user 3296569781 (风云梦远), a science communicator in meteorology. Despite an almost minimal PageRank of 0.00002682651, 3296569781 records the highest Engagement in the dataset at 8763 and a Recruitment Capacity of 0.2111363. The ratio between structural influence and engagement is inverted relative to 1294811905: while the latter commands algorithmic centrality without interaction, the former generates substantial interaction despite structural marginality. Such outlier configurations illustrate how platform affordances manage the visibility of controversy. Although the overall correlation between PageRank and Engagement remains high ($\rho = 0.917$), individual nodes reveal that structural centrality does not guarantee interactional resonance, and conversely, grassroots mobilization can momentarily exceed infrastructural constraints. In ANT terms, the relational power of 3296569781 emerges from successful translation of meteorological expertise into a shareable inscription that recruits dispersed publics.

Beyond these two poles, hybrid mobilizers such as 1765373140, 1709157165, and 1649173367 demonstrate intermediate configurations. Their PageRank values range from 0.005743611 to 0.008231775, with Engagement between 37 and 58 and Recruitment Capacity between 0.26587783 and 0.32577129. These nodes are human actors who bridge institutional discourse

and grassroots participation. They illustrate how moderate structural embedding combined with consistent interaction can sustain mid-level mobilization without achieving the exceptional Recruitment Capacity of 1202968283 or the viral engagement of 3296569781. Their position underscores that mobilization is not a binary distinction between core and periphery but a graded continuum shaped by translation capacity.

The extreme concentration of zero-engagement nodes—19,476 users—further highlights the asymmetry of participation. Nodes with the minimum PageRank ($2.683e-05$) dominate the distribution, indicating that the majority of actants remain structurally and interactionally peripheral. This pattern cannot be reduced to user behavior alone. Platform governance must be treated as a non-human actant that enforces platform sovereignty. Character limits, algorithmic recommendation systems, and censorship erasures generate governance-induced data gaps, shaping which inscriptions circulate and which disappear. These constraints structure Recruitment Capacity by regulating exposure and circulation, thereby mediating the translation process between actants.

In sum, RQ2 reveals a network in which heterogeneity is not merely categorical but relational. Structural influence, Engagement, and Recruitment Capacity are unevenly distributed, with a small minority of nodes exercising disproportionate Nodal Influence. The comparison between 1202968283 and 1294811905 demonstrates that algorithmic centrality does not automatically translate into mobilization, while the case of 3296569781 shows that grassroots engagement can temporarily bypass structural marginality. The strong macro-level correlation (Spearman's $\rho = 0.917$) coexists with micro-level ruptures that expose the politics of visibility embedded in platform infrastructures. Through an ANT lens, both human and automated accounts, as well as the Weibo platform itself, participate in shaping the recruitment and stabilization of climate-related discourse, producing a stratified field of relational power defined by both infrastructural embedding and interactive translation.

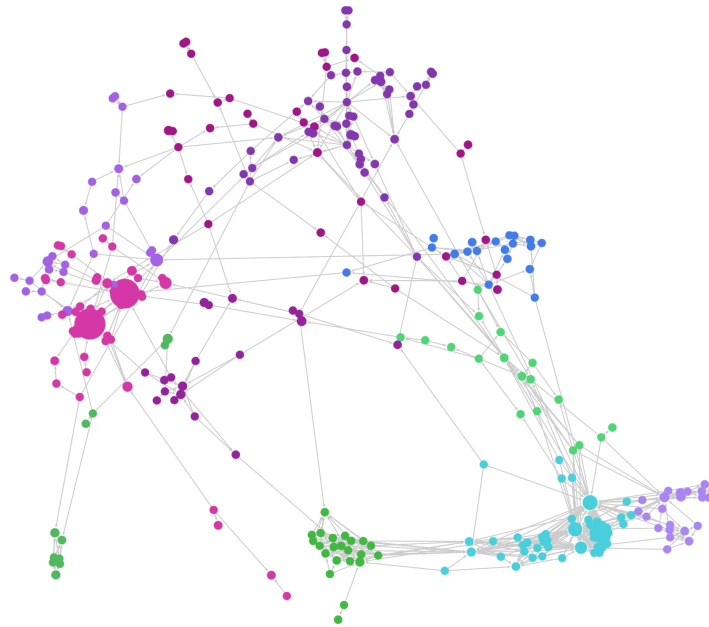


Figure 3.3: Core structure of the Weibo repost network related to climate change discussions. Note: Nodes represent users and directed edges represent repost relationships between users. Node size corresponds to PageRank centrality, indicating the relative influence of users in the diffusion network. Node colors indicate communities detected using the Louvain modularity algorithm. To improve visualization clarity, a k-core filter ($k \geq 2$) was applied, resulting in a subgraph of 875 nodes and 1,695 edges representing the structural backbone of the network.

3.5.3 MAPPING THE ISSUE NETWORKS & TOPOLOGICAL DYNAMICS (RQ3)

If RQ2 established that recruitment capacity is unevenly distributed among heterogeneous actants, RQ3 shifts the analytical lens to the meso-level topology of the issue network. Here, the focus is not on individual nodal influence alone, but on how relational power is stabilized—or fragmented—through community structure, boundary density, and cross-cluster translation. The empirical configuration reveals a highly segmented yet internally cohesive topology, consistent with echo chamber dynamics (Cinelli et al., 2021), as indicated by a Modularity of 0.6406222 (computed on the aggregated full-period network, distinct from the peak-stage value of 0.67343296 reported in Section 3.5.1, which was computed on the peak-stage subnetwork alone) and an E-I Index of -0.9604895.

The overall community architecture is strikingly fragmented. A total of 236 communities were detected. While three large clusters dominate in size (Community 1 with 5531 nodes, Community 4 with 5439 nodes, and Community 7 with 2745 nodes), the majority of communities consist of only 2–10 nodes. This uneven size distribution indicates a dual structure: a small number of expansive, semi-stable discursive blocs alongside numerous micro-clusters operating at the periphery. The Modularity value of 0.6406222 confirms that these clusters are not artefacts of random density fluctuations but represent statistically robust partitions in the relational fabric (Newman, 2006). In ANT terms, these partitions mark zones where translation chains have stabilized into relatively coherent actor-networks—each cluster operating as a provisional “black box” in which internal alignments are maintained and external contestation is minimized.

This insulation becomes quantitatively visible through the E-I Index. With an E-I value of -0.9604895, internal edges account for 98.0% of all connections, while only 2.0% are external. Such extreme internal connectivity implies that once actors are enrolled into a community, their subsequent interactions overwhelmingly reinforce intra-group circulation rather than cross-boundary exchange. The issue network therefore does not function as a deliberative arena characterized by

pluralistic interaction. Instead, it resembles a constellation of densely connected internal circuits with minimal permeability. From an ANT perspective, this reflects a stabilization of translation chains within bounded collectives: each community reproduces its own inscriptions while limiting exposure to alternative alignments. K-core decomposition further clarifies the depth of internal stabilization. The distribution is sharply hierarchical: 19,247 nodes reside at $k=1$, 735 at $k=2$, 101 at $k=3$, 11 at $k=4$, 10 at $k=5$, and only 18 nodes at $k=6$. Crucially, all 18 nodes at $k=6$ are concentrated in Community 16. This concentration signals not merely structural density, but a localized core-periphery consolidation. Community 16 operates as the only fully stabilized inner core within the entire network. Its $k=6$ nodes are dominated by localized government environmental accounts (e.g., 曲阜环保, 泗水环境), indicating that this cluster represents a tightly reciprocating institutional network rather than a diffuse public sphere.

The internal reciprocity within Community 16 is particularly significant when disaggregating “official” actors into sub-types. Rather than treating institutional presence as monolithic, the k -core concentration suggests a local bureaucratic ecosystem composed of municipal and county-level environmental bureaus, operating in dense mutual endorsement. These accounts repost, reference, and reinforce one another’s communications, generating a closed loop of validation. In topological terms, Community 16 embodies a high-density, low-permeability enclave. In ANT terms, it exemplifies black-boxing: institutional actors achieve stability not by expanding outward recruitment, but by intensifying internal circulation and mutual inscription.

Yet the very existence of such insulated cores raises the question of boundary maintenance. If 98.0% of ties are internal, how does information traverse communities at all? Here, betweenness centrality (Freeman, 1977) becomes analytically decisive. The node 1609358735 (金芝) exhibits the highest Betweenness centrality (1225), while maintaining a moderate PageRank of 0.0091484726 and belonging to Community 3. Structurally, this node does not dominate through visibility or mass recruitment; rather, it occupies strategic articulation points between otherwise segregated

clusters. In ANT vocabulary, 1609358735 operates as a translation interface—a mediator that temporarily connects heterogeneous actor-networks.

The disproportion between its Betweenness (1225) and its PageRank (0.0091484726) underscores this distinction. Unlike high-PageRank nodes whose influence stems from recursive endorsement within dense clusters, 1609358735 derives relational power from its positional brokerage. It is structurally peripheral to dominant cores but indispensable for cross-community traversal. This configuration justifies conceptualizing it as “The Fragile Interface”: fragile because its removal would drastically reduce inter-cluster connectivity; interface because it performs the rare work of translating inscriptions across otherwise insulated collectives.

A secondary bridging node, 1689147222 (CYCAN), located within Community 16, exhibits Betweenness of 198 and PageRank of 0.0011425671. As an NGO organization embedded inside the institutional core cluster, 1689147222 introduces limited boundary permeability into an otherwise closed bureaucratic enclave. Its presence suggests that even highly black-boxed communities maintain selective articulation points—controlled openings through which specific non-governmental actors are enrolled. The contrast between 1609358735 (Community 3) and 1689147222 (Community 16) highlights two distinct modes of translation: one external, bridging macro-clusters; the other internal, moderating intra-institutional closure.

The third notable bridge, 1065190973 (济宁环境), with Betweenness of 61 and PageRank of 0.0013830071, reinforces institutional circulation pathways rather than disrupting them. As a government official account, its brokerage does not generate heterogeneity but instead sustains administrative coherence across localized clusters. Together, these three nodes reveal that cross-community translation capacity is highly concentrated and unevenly distributed. Relational power does not scale linearly with visibility (PageRank) but depends on positional articulation within modular partitions.

The coexistence of high modularity (0.6406222), extreme internal density ($E-I = -0.9604895$),

and sharply concentrated $k=6$ cores suggests a structurally stable yet segmented topology. Stability here does not imply consensus. Rather, it reflects the endurance of multiple internally coherent actor-networks that reproduce themselves with minimal external disturbance. The flood event, as a non-human actant, triggered mass mobilization (as shown in RQ1), but at the structural level examined here, the network quickly reorganized into insulated clusters characterized by internal reinforcement and limited translation.

Finally, the topology must be understood in relation to governance-induced data gaps. The Weibo platform—through character limits, algorithmic ranking, and potential content erasures—operates as a non-human actant shaping which cross-community ties become visible or durable. The extremely low proportion of external edges (2.0%) may not merely reflect user preference but also infrastructural constraints that privilege in-group circulation. In this sense, modularity is co-produced by human alignment and platform sovereignty. Community boundaries are not purely emergent social formations; they are stabilized through socio-technical arrangements that regulate recruitment, visibility, and cross-boundary inscription. In sum, the issue network exhibits a high degree of topological segmentation combined with concentrated bridging power. Community 16 stands out as the only fully consolidated $k=6$ core, representing a localized bureaucratic enclave stabilized through dense internal reciprocity. Cross-community translation is performed by a very small number of fragile interfaces, most prominently 1609358735. The network is therefore neither atomized nor integrated; it is a constellation of internally coherent black boxes connected by sparse and structurally vulnerable translation nodes.

3.6 DISCUSSION

3.6.1 FLOOD EVENT AND NETWORK RECONFIGURATION

The 2021 Henan floods functioned as a nonhuman actant, driving rapid reorganization of the Weibo network (Callon, 1984; Latour, 1999). Temporal analysis indicates a pronounced trajectory in both network expansion and structural consolidation. Early stage, the network comprised 2,231 nodes and 2,213 edges, with minimal community differentiation (Modularity = 0.03728905). Such low modularity reflects a weakly articulated discussion field, in which clusters were shallow, relational alignment was limited, and Recruitment Capacity remained low. Actor-networks were diffuse and loosely connected, representing a relatively unproblematic discursive space (Starbird & Palen, 2011; Palen et al., 2010).

During the event, the network expanded dramatically to 13,265 nodes and 13,360 edges, with Modularity rising sharply to 0.67343296. This phase corresponds to mass mobilization, characterized by the emergence of distinct communities, including both institutional enclaves and grassroots clusters. Nodes such as 1202968283 effectively leveraged recruitment capacity to stabilize aligned communities, while 3296569781 mobilized high engagement across structurally peripheral nodes. Despite increased activity, the E-I Index (-0.9604895) and internal edge prevalence (98%) indicate that interactions largely occurred within clusters, reflecting the persistent compartmentalization of discourse. The flood, as a non-human actant, catalyzed both expansion and differentiation, translating environmental disruption into network segmentation without promoting integrative connectivity (Starbird & Palen, 2011; Kim & Hastak, 2018).

Post stage, the network contracted to 5,324 nodes and 5,372 edges, while Modularity further escalated to 0.94188943. This stage exemplifies the “Consolidation of Black-boxes” : communities stabilized into highly internally cohesive yet externally insulated formations. Bridging nodes such as 1609358735 (Betweenness = 1,225; PageRank = 0.0091484726) maintained sparse cross-

community connectivity, though the network's structural fragility was accentuated. Institutional nodes within Community 16 retained dense internal reciprocity, reinforcing localized bureaucratic enclaves, while grassroots bridges facilitated limited inter-cluster translation. The combination of network contraction and modularity increase reflects a trajectory from an open, fluid early stage field to a post stage topology defined by stabilized boundaries, concentrated relational power, and minimal permeability (Starbird & Palen, 2011; Kim & Hastak, 2018).

ANT-informed interpretation positions the flood as an active non-human agent reshaping relational alignments. It provoked reconfiguration by generating a surge of digital traces, prompting actors to occupy new structural positions and facilitating selective mobilization. While mass participation expanded the network during the crisis, the eventual consolidation post stage demonstrates that external shocks can restructure networks without integrating them more broadly. The empirical pattern aligns with prior studies of echo-chamber dynamics in digital media (Cinelli et al., 2021), illustrating how environmental disruptions can produce both mobilization and segmentation simultaneously. The trajectory of Modularity from 0.037 to 0.673 to 0.942, alongside shifts in node and edge counts, captures the co-production of network structure through environmental stimulus, human interaction, and platform-mediated visibility.

This trajectory diverges from existing crisis communication research, which tends to characterize digital mobilization as integrative —bringing dispersed publics into shared discourse (Starbird & Palen, 2011; Palen et al., 2010). The present findings suggest the opposite dynamic: environmental disruption accelerates not convergence but segmentation, as actors retreat into algorithmically reinforced enclaves rather than converging around a shared crisis frame. This implies that ANT's emphasis on translation as a network-building process must be complemented by attention to the conditions under which translation systematically fails —a dynamic this study terms the consolidation of black boxes.

3.6.2 INSTITUTIONAL ACTORS AND STRUCTURAL POWER

The analysis of the 2021 Henan floods discourse on Weibo demonstrates that institutional actors occupy structurally prominent positions within the network while exhibiting relatively limited direct interaction. This pattern is exemplified by the automated account 1294811905 (大海故乡 PMPMBA), which registers the highest PageRank in the dataset (0.129145166) but minimal median Engagement (8) and a modest Recruitment Capacity of 0.70959189. This divergence between structural centrality and interactional resonance highlights the distinct dimensions of influence within digital platforms (Callon, 1984; Latour, 1999). While this node functions as a key conduit for content circulation, its limited engagement suggests that structural embedding alone does not equate to discursive authority. In ANT terms, 1294811905 can be conceptualized as a punctualized algorithmic actant: its influence derives primarily from infrastructural positioning and the platform's algorithmic affordances rather than from sustained human relationality or persuasive communication. Its deployment of fragmented narratives and strategic hashtag usage (e.g., policy-related tags) underscores its function as a non-human actor that amplifies structural visibility without generating substantive engagement (Latour, 1999).

In contrast, human institutional redistributors such as 1202968283 (乐天凌) exhibit a distinct but complementary form of structural power. With a PageRank of 0.06256542, median Engagement of 1,858, and the highest Recruitment Capacity in the dataset (4.76427898), this node demonstrates that human-institutional actors can convert structural centrality into actionable influence through relational translation. Its content, emphasizing political and infrastructural themes, aligns closely with official narratives, enabling the account to stabilize discourse and recruit peripheral nodes into its actor-network. From an ANT perspective, 1202968283 exemplifies a high-capacity translator: it operationalizes the platform's infrastructural visibility to expand its relational power and effectively consolidate its community influence. However, as Tufekci (2017) notes re-

garding the fragility of digitally mediated mobilization, such algorithmically amplified recruitment may achieve short-term resonance but could be vulnerable under prolonged or recurring crises, raising questions about its long-term sustainability. The co-occurrence of high structural embedding and interactional resonance illustrates that human agency remains essential for mobilizing engagement, even within algorithmically structured digital spaces.

The structural prominence of institutional actors is further reinforced through k-core analysis. All 18 nodes at k=6 are concentrated within Community 16, comprising local environmental bureau accounts such as 曲阜环保 and 泗水环境. This dense internal connectivity signals intense reciprocal reinforcement among bureaucratic actors, sustaining cohesion and informational closure within the institutional enclave (Opsahl et al., 2010; Burt, 2004). The combination of k-core centrality and repeated internal interaction suggests that these accounts form tightly coupled loops of mutual validation, functioning as internally coherent black boxes that preserve institutional narratives while limiting exposure to external challenge (Latour, 1999). In ANT terms, the network position of Community 16 constitutes a form of structural power: it exerts influence through centralized visibility, internal stabilization, and the capacity to maintain enduring actor-network alignments, irrespective of cross-community engagement.

When juxtaposed with highly engaged grassroots actors such as 3296569781 (风云梦远), a science communicator in meteorology with minimal PageRank (0.00002682651) but the highest Engagement (8,763) in the dataset, the distinctiveness of institutional influence becomes evident. Grassroots actors achieve mobilization primarily through direct engagement rather than structural embedding, reflecting a mode of relational power dependent on interactional resonance and content relevance. As established in Section 3.5.2 ($\rho = 0.917$), structural and interactional prominence are generally aligned at the macro level; however, the micro-level divergences between nodes like 1202968283, 1294811905, and 3296569781 highlight that structural centrality and discursive impact operate along separate axes. Institutional actors leverage network positioning to maintain reach

and potential influence, whereas grassroots actors rely on content virality and audience responsiveness to generate effective mobilization (Tufekci, 2017).

Intermediate hybrid mobilizers further illustrate the graded continuum of influence. Accounts such as 1765373140 (PageRank = 0.006938713; Engagement = 55.5; Recruitment Capacity = 0.32577129), 1709157165 (0.005743611; 58; 0.28752915), and 1649173367 (0.008231775; 37; 0.26587783) combine moderate structural embedding with consistent interaction, bridging institutional discourse and grassroots participation. These nodes exemplify the capacity of human actors to operate across relational scales, sustaining mid-level mobilization without reaching the exceptional Recruitment Capacity of 1202968283 or the viral engagement of 3296569781. Such hybrid mobilizers underscore that influence is relationally constructed: it emerges not solely from position within the network but from the interplay between structural embedding, engagement, and the capacity to recruit other actants (Callon, 1984; Latour, 1999).

Collectively, these findings indicate that institutional nodes exercise “structural power” through network centrality, while human agency, content alignment, and relational translation determine actual mobilization capacity. The skewed distribution of PageRank (Min = 2.683e-05; Max = 0.129) and Engagement (median = 0; max = 8,763) further emphasizes the extreme heterogeneity in nodal influence. Most nodes remain peripheral both structurally and interactionally, with 19,476 users recording zero Engagement, reflecting the dominance of a small minority of influential actors. Within the ANT framework, the configuration of institutional actors, automated nodes, and grassroots mobilizers co-produces a stratified digital field where visibility, recruitment, and relational power are differentially allocated across heterogeneous actants.

This finding challenges governance-centric accounts of Chinese digital communication (Han et al., 2017; Engels, 2018), which presuppose that institutional actors dominate both structurally and discursively. The divergence between automated structural centrality (1294811905) and human interactional resonance (3296569781) suggests that structural dominance and communicative au-

thority are decoupled under conditions of platformized governance—a distinction that top-down models of information control cannot capture. An alternative explanation—that grassroots engagement simply reflects content quality rather than algorithmic bypass—cannot be fully excluded, but the extreme PageRank skew (Min=2.683e-05; Max=0.129) suggests that platform infrastructure, rather than content merit alone, governs visibility distribution.

3.6.3 CROSS-COMMUNITY TRANSLATION AND NETWORK STRUCTURE

At the meso-level, the network exhibits pronounced segmentation, characterized by highly cohesive internal clusters and sparse inter-community connectivity. The overall Modularity of 0.6406222 and E-I Index of -0.9604895 indicate that 98% of ties are internal, while only 2% traverse community boundaries, signaling an extreme echo-chamber configuration (Cinelli et al., 2021; Sunstein, 2018)—a pattern more pronounced than that documented in comparable Western platform contexts, where cross-ideological exposure, while limited, remains observable (Barberá et al., 2015). Most nodes are embedded within dense primary clusters, such as Community 1 (5,531 nodes), Community 4 (5,439 nodes), and Community 7 (2,745 nodes), whereas the majority of communities comprise only 2–10 nodes, reflecting a dual structure of dominant semi-stable blocs and numerous peripheral micro-clusters. This topology reinforces the observation from RQ2 that influence is concentrated, as few nodes possess the capacity to mediate across segregated clusters.

Cross-community translation is largely dependent on a small subset of nodes with high Betweenness centrality. The most prominent example is 1609358735 (金芝), a grassroots niche professional with Betweenness = 1,225, PageRank = 0.0091484726, and membership in Community 3. This node functions as a fragile interface, bridging otherwise disconnected sub-networks and enabling the limited flow of information between dense internal clusters. Its positional importance is disproportionate relative to its PageRank, demonstrating that relational power in cross-community translation is decoupled from structural centrality (Burt, 2004). The absence or inactivity of such

bridging nodes would drastically reduce inter-community connectivity, illustrating the vulnerability of network-wide information circulation.

Secondary bridging nodes perform more limited yet functionally critical roles. Node 1689147222 (CYCAN), an NGO embedded in Community 16, exhibits Betweenness = 198 and PageRank = 0.0011425671. Situated within a densely reciprocating institutional enclave, this node introduces controlled boundary permeability, facilitating selective interaction between a highly black-boxed bureaucratic core and external clusters. Similarly, 1065190973 (济宁环境), a government official account in Community 24 with Betweenness = 61 and PageRank = 0.0013830071, reinforces institutional circulation pathways without expanding cross-community engagement. These configurations indicate that the network's topology is both stable and segmented: internally dense communities are insulated, while a few strategically positioned nodes sustain sparse inter-community articulation (Burt, 2004; Cinelli et al., 2021).

Notably, institutional nodes such as 1202968283 and the k-core = 6 cluster of Community 16 do not function as primary cross-community translators. Their influence is realized predominantly through internal consolidation, high recruitment capacity, and repeated reciprocal reinforcement. In contrast, bridging is largely achieved by grassroots or independent actors who occupy structural interfaces between otherwise segregated communities. This distinction highlights a fundamental principle of digital controversy networks: structural centrality within a single cluster does not guarantee capacity to integrate fragmented clusters. Effective translation is contingent upon positional brokerage, relational alignment, and the ability to mediate heterogeneous inscriptions (Burt, 2004; Cinelli et al., 2021).

The cross-community structure further reflects the asymmetry of the network's topological roles. Peripheral micro-clusters, although numerous, rarely contribute to inter-cluster flow; they rely on central bridging nodes for information access. Conversely, primary clusters maintain internal cohesion, reinforcing dominant narratives and stabilizing localized discourse. In ANT terms, the

network's meso-level architecture illustrates how human and non-human actants—ranging from institutional k-core nodes to algorithmically amplified accounts—co-produce partitioned spaces in which relational power is concentrated within select actors while most nodes remain structurally peripheral (Callon, 1984; Latour, 1999). The segmentation reinforces echo-chamber dynamics: interactions predominantly circulate within communities, and cross-cluster translation is contingent upon a limited set of fragile interfaces, exposing the network to vulnerability in the event of node attrition or algorithmic alteration (Sunstein, 2018).

In sum, cross-community translation is highly uneven and localized. High structural centrality, as seen in automated or institutional nodes, does not inherently confer bridging capacity. Instead, relational power for inter-community mediation resides with actors such as 1609358735 and 1689147222, whose positions enable selective connectivity across otherwise insulated clusters. The structural implications underscore the fragility and concentration of cross-community influence, situating network topology as a critical determinant of information diffusion, controversy stabilization, and public discourse dynamics (Burt, 2004).

These findings extend Burt's (2004) structural hole theory into a platformized governance context: bridging capacity is not merely a function of individual positioning but is co-produced by algorithmic boundaries that regulate which cross-community connections can persist. Unlike open digital environments where bridges emerge organically through shared interest, on Weibo the scarcity of bridging nodes reflects active infrastructural constraint—moderation boundaries and recommendation logics that channel interactions inward. This suggests that deliberative fragmentation in authoritarian digital platforms is not simply a user-level preference for in-group communication, but a structurally enforced condition sustained by nonhuman actants.

3.6.4 ALGORITHMIC MEDIATION AND VISIBILITY DISTRIBUTION

Platform-level algorithmic mediation further shapes visibility, engagement, and mobilization within the Weibo network. Node 1202968283 (乐天凌) provides a salient example: although its PageRank (0.06256542) is lower than that of the structurally maximal 1294811905 (0.129145166), its median Engagement (1,858) and Recruitment Capacity (4.76427898) demonstrate effective audience mobilization. Algorithmic mechanisms—including feed ranking, recommendation prioritization, and content promotion—likely contribute to this amplification, allowing certain nodes to achieve high interactive resonance even without maximal structural embedding (Bucher, 2012; Helmond, 2015). Account 1294811905 (大海故乡 PMPMBA, a likely automated account), for instance, commands only 47,000 followers and a posting frequency of three posts within the observation period, yet holds the highest PageRank in the entire network (0.129) —a disparity that cannot be accounted for by organic audience accumulation or content volume alone, and instead points toward structural amplification through network positioning. By contrast, account 1649173367 (每日经济新闻, a major financial media outlet with 48.35 million followers), achieves a median engagement rate of just 0.00008% and a PageRank of only 0.008, suggesting that follower scale does not translate into network centrality within this specific controversy. Meanwhile, grassroots account 3296569781 (风云梦远, an independent meteorology science communicator with 1.54 million followers) achieves the highest engagement rate in the sample (0.569%) despite minimal PageRank (0.000027), demonstrating that interactional resonance can emerge independently of both structural embedding and follower scale.

While the macro-level correlation between PageRank and Engagement ($\rho = 0.917$) suggests a general structural logic, micro-level divergences reveal that algorithmic mediation selectively amplifies certain nodes beyond what their organic engagement would warrant. However, micro-level divergences reveal selective algorithmic amplification. For example, 1294811905 (automated) maintains

extreme PageRank (0.129145166) but generates minimal Engagement (8) and modest Recruitment Capacity (0.70959189), demonstrating that algorithmic positioning alone does not guarantee interactive success. Conversely, grassroots nodes such as 3296569781 (风云梦远) achieve extraordinary Engagement (8,763) despite minimal structural embedding (PageRank = 0.00002682651). This divergence underscores the role of algorithms as non-human actants that mediate which inscriptions become visible, circulated, and recruited by other nodes (Bucher, 2012; Helmond, 2015). From an ANT perspective, the platform itself functions as a co-actor, actively shaping the observable contours of relational power and the dynamics of controversy (Latour, 1999).

Content format and audience responsiveness interact with algorithmic mediation to influence recruitment outcomes. Nodes producing rich multimedia content—images, GIFs, or video—tend to achieve higher engagement even at moderate PageRank levels, highlighting the intersection between human content curation and algorithmic amplification (Klinger & Svensson, 2015; Golder & Macy, 2014). For hybrid mobilizers (e.g., 1765373140, 1709157165, 1649173367), consistent interaction within and across clusters is reinforced by selective algorithmic exposure, enabling these actors to sustain mid-level recruitment without dominating structural centrality.

Algorithmic processes also regulate the distribution of relational power by reinforcing platform hierarchies. Nodes embedded in algorithmically amplified positions—such as 1294811905—contribute to network circulation without necessarily eliciting engagement, while nodes strategically producing content aligned with audience expectations—such as 1202968283—translate structural opportunities into actionable influence. The result is a stratified visibility landscape in which structural, relational, and algorithmic forces intersect. ANT-informed analysis frames these processes as co-constitutive: human actors, platform design, and algorithmic sorting operate collectively to stabilize or fragment discourse, producing heterogeneous outcomes for recruitment capacity and engagement.

In sum, algorithmic mediation provides an additional pathway for influence that complements

structural embedding. Institutional nodes achieve enduring visibility and recruitment through alignment with platform infrastructures, while grassroots actors leverage algorithmic amplification and content resonance to achieve disproportionate engagement. The distribution of relational power is therefore contingent upon the interplay between structural position, interactive behavior, and algorithmic affordances, highlighting the inseparability of human and non-human actants in digital controversy networks (Bucher, 2012; Helmond, 2015).

3.6.5 PRACTICAL IMPLICATIONS FOR GOVERNANCE

The findings hold several implications for climate communication and digital governance. First, the segmentation of discourse underscores the importance of cross-community intermediaries. Nodes such as 1609358735 and 1689147222 play disproportionately critical roles in bridging isolated clusters, enabling information flow during crisis events. Governance strategies could prioritize the identification and support of such intermediaries, particularly science communicators and niche professionals, to maintain connectivity across fragmented digital spaces (Palen et al., 2010; Starbird & Palen, 2011).

Second, algorithmic mediation can either reinforce insularity or facilitate wider network integration. Platform mechanisms that prioritize internal cluster circulation may inadvertently exacerbate fragmentation. Policy interventions that adjust visibility algorithms, feed ranking, or content recommendation to enhance cross-community exposure could support broader diffusion of accurate, actionable information during emergencies. This approach aligns with ANT-informed insights: human actors, non-human platforms, and algorithmic processes collectively determine network permeability and relational power (Bucher, 2012; Helmond, 2015).

Finally, the role of institutional actors must be understood in structural terms. While k-core = 6 nodes in Community 16 and high PageRank accounts maintain reach, they are not primary translators across communities. Governance strategies that rely solely on structural authority may

fail to achieve cross-cluster dissemination. Instead, a hybrid approach that integrates institutional credibility, grassroots mobilization, and algorithmic facilitation can optimize the circulation of climate-relevant information, enhance collective situational awareness, and mitigate the risks of echo-chamber effects (Burt, 2004; Callon, 1984; Latour, 1999).

The comprehensive analysis of the 2021 Henan floods discourse demonstrates a multi-dimensional distribution of influence across the Weibo network. Institutional actors occupy structurally central positions and consolidate narratives internally, while grassroots nodes achieve high engagement through relational resonance and content virality. Bridging nodes are essential for cross-community translation, yet remain few and fragile, highlighting the network's segmented architecture. Algorithmic mediation further shapes visibility and recruitment, amplifying some nodes while leaving others structurally embedded but interactionally inert. The environmental shock of the flood acted as a non-human actant, triggering network expansion, reorganization, and subsequent consolidation into highly cohesive but insular communities. ANT-informed interpretation reveals that influence, mobilization, and information diffusion are co-produced by human actors, institutional structures, environmental events, and algorithmic affordances. Practical implications for governance include supporting bridging actors, strategically leveraging algorithmic visibility, and integrating institutional and grassroots mobilization to mitigate echo-chamber effects and enhance crisis communication efficacy.

3.7 CONCLUSION

At the micro-level, institutional, automated, and grassroots actors exhibit distinct configurations of structural and interactional influence. Node 1294811905 (大海故乡 PMPMBA) exemplifies a punctualized algorithmic actant: despite holding the maximal PageRank in the network, it generates minimal median Engagement and modest Recruitment Capacity, illustrating that structural

centrality alone does not confer discursive authority. In contrast, human institutional actors such as node 1202968283 (乐天凌) operate as high-capacity translators, converting moderate structural visibility into substantial engagement (median Engagement = 1,858) and the highest Recruitment Capacity in the dataset, thereby mobilizing peripheral nodes and stabilizing aligned communities. Grassroots actors, exemplified by node 3296569781 (风云梦远), achieve extensive interactional resonance (Engagement = 8,763) and moderate Recruitment Capacity despite minimal PageRank, demonstrating that effective mobilization can emerge independently of infrastructural embedding. These distinctions underscore the necessity of preserving the differentiation between automated, institutional, and grassroots actants, as each contributes uniquely to the network's dynamics.

At the macro-level, the temporal evolution of the network reflects the flood event as a nonhuman actant, inducing rapid reconfiguration. Early stage, the network was small-scaled with minimal modularity (0.04), representing a loosely connected and diffuse discourse. Peak stage, the network expanded substantially, with modularity rising to 0.67, as institutional and grassroots actors mobilized communities in response to environmental disruption. Post stage, the network contracted, with modularity reaching 0.94, indicating the stabilization of highly cohesive yet externally insulated clusters. This trajectory exemplifies a "Consolidation of Black-boxes," in which network expansion and actor mobilization are followed by structural closure, preserving localized narratives and limiting integrative connectivity.

In conclusion, the 2021 Henan floods discourse demonstrates that influence, engagement, and recruitment within digital networks are co-constituted by heterogeneous actants, algorithmic mediation, and event-driven dynamics. The differentiated roles of human, automated, and grassroots actors, combined with the segmented meso-level architecture and the macro-level consolidation post stage, reveal a complex interplay of structural embedding, interactional resonance, and temporal reconfiguration. ANT-informed analysis confirms that relational power is distributed unevenly across actants, with network stability and mobilization contingent upon both positional centrality and

active engagement within the digital actor-network.

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4

Social Identity Dynamics Drive Escalation in Online Climate Change Debates: Evidence from Topic Modeling of Digital Discourse

4.1 INTRODUCTION

Climate change has long ceased to be a matter of scientific consensus alone. On social media platforms, it has become a terrain of identity contestation—a space where questions of national responsibility, moral standing, and geopolitical legitimacy are negotiated alongside, and often at the expense of, empirical deliberation. This transformation is particularly visible on Reddit, a platform whose architecture of semi-anonymous, long-form argumentation within community-specific subreddits produces what scholars have described as quasi-deliberative discourse environments (Massanari, 2017). Unlike the brevity-constrained dynamics of microblogging platforms, Reddit’s capacity for extended argumentative exchange enables participants to construct, sustain, and contest complex identity positions across comment threads. Yet a closer examination of these discussions reveals a phenomenon that existing research has not adequately explained: bias in climate discourse is not uniformly distributed. Rather, it appears unevenly distributed across discursive modes, concen-

trated within specific argumentative registers rather than uniformly scaling with moral intensity. This uneven distribution of evaluative bias across rhetorical contexts constitutes the central puzzle motivating the present study. Existing theoretical frameworks, including foundational work in SIT (Tajfel & Turner, 1979) and empirical investigations of online polarization (Cinelli et al., 2021; Hornsey et al., 2016), provide essential scaffolding but do not fully account for why bias emerges so unevenly across the rhetorical landscape of climate debate.

To address this puzzle, the present study draws on SIT as its foundational framework—but with a critical elaboration. Classic SIT posits that individuals, motivated to sustain positive social identities, engage in intergroup comparison and ingroup favoritism under conditions of perceived threat (Tajfel & Turner, 1979; Turner et al., 1987). This framework has been productively applied to explain polarization, outgroup derogation, and selective information processing in political and environmental contexts. However, existing applications tend to treat identity threat and its discursive consequences as relatively stable, individual-level attributes rather than as dynamically unfolding processes. The present study reconceptualizes identity defense as a discursive practice that is situationally activated and rhetorically accomplished—that is, as something participants do through language under varying conditions of perceived threat, rather than something they simply have as a cognitive disposition. Within this dynamic framework, two mechanisms are of particular analytical importance. First, strategic buffering refers to the practice of redirecting evaluative criteria toward dimensions on which the ingroup retains comparative advantage, thereby managing identity threat without direct confrontation (Elsbach & Kramer, 1996). Second, technocratic rationalization describes the deployment of seemingly neutral, metric-driven, or efficiency-oriented discourse to perform identity-protective functions while maintaining the appearance of rational evaluation. Together, these mechanisms suggest that the most identity-laden moments in climate discourse may be precisely those that present themselves as most rational.

Despite substantial advances in both climate communication research and the computational

analysis of online discourse, three interrelated gaps remain inadequately addressed. First, existing scholarship has largely treated polarization and group-oriented bias as static outcomes—background properties of users or communities—rather than examining how these phenomena vary dynamically across different argumentative registers within the same debate (Pearce et al., 2014; Hornsey et al., 2016). The structural conditions under which discourse shifts from technical sensemaking to moral confrontation, and eventually to disengagement or fatalism, remain insufficiently theorized. Second, technocratic and instrumental framings have generally been characterized in the literature as depolarizing or bias-reducing, on the assumption that appeals to efficiency, data, and implementation capacity operate outside the domain of identity politics. This assumption warrants empirical scrutiny: organizational identity research suggests that precisely such evaluative reframings may function as identity-protective mechanisms—displacing moral conflict onto performance metrics while nonetheless activating competitive intergroup comparison (Elsbach & Kramer, 1996). Whether analogous dynamics obtain in online climate discourse has not been systematically tested. Third, while China occupies a structurally prominent position in global climate politics as a simultaneously central emitter, technological competitor, and geopolitical rival, existing research has approached China’s online image primarily through media representation or aggregate public opinion (d’Hooghe, 2015). Far less attention has been paid to how references to China function rhetorically within Reddit discussions—how invoking China serves as a discursive resource for boundary-drawing, responsibility attribution, and national framing within ongoing argumentative exchanges. This national framing dimension is not incidental to the present study; China-referencing comparative frames emerge as analytically central to understanding how national identity shapes evaluative bias in climate discourse, and their treatment must be embedded in the research design from the outset.

The present study responds to these gaps through an empirical investigation of climate change discourse on Reddit, drawing on 10,401 comments collected from four subreddits throughout

2025). The analytical strategy combines Latent Dirichlet Allocation (LDA) topic modeling (Blei, 2012) with theory-guided qualitative classification and compositional regression using additive log-ratio transformation. The study addresses these questions through an empirical analysis combining topic modeling with compositional regression, enabling the estimation of how shifts in the relative prevalence of discursive patterns correspond to systematic changes in group-oriented bias.

Taken together, these questions point toward three substantive contributions. Theoretically, the study extends SIT beyond its conventional static formulation by demonstrating that identity defense is a process that varies systematically with discursive context—different argumentative registers activate different identity-management strategies, and bias is an emergent property of this variation rather than a fixed disposition. Empirically, the study examines whether technocratic and metric-driven discourse, conventionally characterized as bias-neutral, may in fact serve identity-protective functions—and whether competence-based comparative frames engage evaluative bias differently from explicitly moralized ones. Methodologically, the integration of hierarchical discourse modeling with compositional regression provides a novel analytical framework for examining how discursive substitution effects produce variation in bias across a structured communicative environment—an approach with broader applicability to computational climate communication research (Walter & Ophir, 2019). These contributions are addressed through three interconnected research questions. The first concerns the structure of climate discourse: what discursive frames characterize climate change discussions on Reddit, and how are they organized relative to identity salience? The second concerns the distribution of bias: how do shifts in the relative prevalence of these discursive frames correspond to variations in group-oriented evaluative bias? The third concerns interpretation: how can these frame shifts be understood as situational identity-management strategies enacted under conditions of contested climate governance?

4.2 LITERATURE REVIEW

4.2.1 CLIMATE CHANGE COMMUNICATION ON SOCIAL MEDIA AND REDDIT

A substantial body of research has examined how climate change is communicated across online and social media environments (Schäfer, 2012; Williams et al., 2015). Compared to traditional media, social media platforms are characterized by lower gatekeeping thresholds, rapid diffusion of content, and heightened emotional and moral expression (Bruns & Burgess, 2015; Williams et al., 2015). These affordances have been shown to intensify polarization, amplify extreme viewpoints, and privilege conflictual framings over scientific consensus (Anderson et al., 2014; Pearce et al., 2019). Studies consistently find that climate discourse on social media is less oriented toward scientific deliberation and more toward political contestation and identity signaling (Pearce et al., 2014; Williams et al., 2015; Veltri & Atanasova, 2017). Moralized language —framing climate change in terms of blame, responsibility, and ethical failure —plays a central role in these dynamics, often displacing pragmatic policy discussion (Feinberg & Willer, 2013; Markowitz & Shariff, 2012).

Within this broader landscape, Reddit occupies a distinctive position that makes it a particularly productive site for examining how climate discourse is organized and contested. Unlike short-form platforms such as Twitter, Reddit supports longer argumentative exchanges and semi-anonymous participation, fostering what some scholars describe as quasi-deliberative or contestatory public spheres (Massanari, 2017; Moore & Tambini, 2018). Reddit's architecture —organized around topic-specific subreddits with community-level moderation practices —enables participants to construct, sustain, and contest complex argumentative positions across comment threads in ways that brief-format platforms structurally preclude. At the same time, subreddit-specific norms and moderation practices can reinforce ideological homogeneity, producing echo chambers that shape how climate-related issues are framed and debated (Cinelli et al., 2021). These features make Reddit a site where identity negotiation, argumentative strategy, and discursive dynamics are not merely ex-

pressed but actively constructed through extended interaction.

Taken together, this body of scholarship establishes that polarization, identity signaling, and moralized language are well-documented features of online climate discourse. Yet a significant limitation of this research tradition becomes apparent upon closer examination: existing studies have treated these features as relatively uniform properties of platforms or communities —observable across a discourse as background conditions —rather than as varying systematically within the same debate community across different argumentative registers. The central question of how the latent discursive landscape of a debate is itself organized along dimensions of identity relevance —and how individual comments participate in that organization to different degrees and with different identity consequences —has received comparatively little systematic attention. Existing approaches focused on message diffusion, misinformation, or aggregate sentiment polarity are not equipped to address this question, because they collapse intra-community variation in discursive form into community-level summary statistics. What remains analytically unexplained is the internal discursive structure of debate communities: how different argumentative registers vary in their relationship to identity salience, and how that variation is organized as a structural feature of the discourse rather than as an individual-level attribute of participants.

4.2.2 SOCIAL IDENTITY THEORY AND SITUATIONAL IDENTITY ACTIVATION

SIT provides the foundational framework for understanding how group affiliations shape perception, evaluation, and communication in online climate debates (Tajfel, 1974; Tajfel & Turner, 1979; Turner et al., 1987; Hogg & Abrams, 1988). A core insight of this tradition is that individuals derive self-esteem and meaning from group memberships and are therefore motivated to maintain a positive social identity through intergroup comparison. Under conditions of perceived threat —when a group’s status, moral standing, or competence is challenged —this motivation can produce systematic ingroup favoritism and outgroup derogation. These mechanisms are not merely attitudinal:

they are enacted through language, structuring how actors frame responsibility, attribute blame, and evaluate the performance of others. In online environments, these dynamics may be intensified: the relative anonymity and reduced social accountability of digital platforms lower the cost of expressing antagonistic or exclusionary views, facilitating sharper ingroup–outgroup distinctions (Suler, 2004; Matamoros-Fernández, 2017). Linguistic research demonstrates that group bias is frequently realized through subtle rhetorical patterns —pronoun usage, attribution of blame, moral evaluation —rather than through explicit hostility (van Dijk, 1998).

SIT-informed research has increasingly emphasized that identity expression online is situational and context-dependent rather than a uniformly stable ideological disposition. Group orientations are activated and suppressed in response to specific topics, discursive cues, and interactional contexts (Oakes, Haslam & Turner, 1994; Bail et al., 2018). Climate change, as a morally charged and politically contested domain, has been identified as a particularly potent trigger for identity-based dynamics (Hornsey et al., 2016). This situational character of identity activation implies that different discursive contexts within the same debate community may engage group-oriented rhetoric to substantially different degrees —a theoretical implication that existing empirical research has not systematically pursued.

Applying this framework to Reddit climate discourse requires specifying who the relevant social groups are. In this study, group boundaries are constructed along two intersecting axes. The primary axis is national-discursive: English-speaking Western Reddit users constitute the implicit ingroup, while China functions as the most prominent outgroup reference point in the comparative discourse under examination. This configuration reflects the structural position of China in global climate politics as a simultaneously large emitter, technological competitor, and geopolitical rival, which renders it a natural target for national boundary-drawing and responsibility attribution. The secondary axis is ideological: group boundaries also form between users who advocate for immediate climate action and those who express skepticism toward prevailing climate policy frameworks.

These two dimensions are not mutually exclusive; they frequently co-activate, with ideological positioning often expressed through national comparison.

This two-axis group definition clarifies what SIT predicts for Reddit climate discourse, but it also exposes the key limitation of existing SIT-informed research in this area. That research has predominantly treated identity-based bias as a stable background property of users or communities—something that users bring to the discourse and express more or less uniformly across it. What existing frameworks cannot explain is how identity mechanisms are differentially activated across discursive registers within the same debate community. When users frame China’s renewable energy expansion through infrastructure metrics rather than moral responsibility, the identity dynamics engaged may differ substantially from those activated by explicit blame attribution—yet existing SIT-informed research offers no account of how such variation in discursive register maps onto variation in identity mechanism activation. The explanatory gap is not empirical coverage but analytical: existing frameworks lack the conceptual tools to treat discursive form as a variable that modulates how identity mechanisms are engaged, rather than as a neutral medium through which stable identity dispositions are expressed.

4.2.3 CHINA AS RHETORICAL RESOURCE IN CLIMATE DISCOURSE

China occupies a central and contested position in global climate politics, frequently framed simultaneously as the world’s largest emitter, an emerging technological leader, and a strategic geopolitical rival (Beeson, 2010; De Vries et al., 2021). These tensions are reflected in Western media narratives, where climate discussions about China are routinely entangled with broader concerns about transparency, strategic opportunism, and institutional legitimacy (d’Hooghe, 2015; Callahan, 2016). Studies of online discourse suggest that national images are particularly susceptible to simplification and stereotyping in digital environments, where questions of responsibility, fairness, and competence are readily mapped onto national categories (Pearce et al., 2014; Jang & Hart, 2015). China’s

structural position in global climate governance makes it an especially available target for such mappings within English-language online discourse.

Existing research on China's online image has focused primarily on media representation or aggregate public opinion at the population level (d'Hooghe, 2015). What this body of research establishes—that China is studied, discussed, and evaluated as a topic across a variety of communicative contexts—is analytically distinct from what it has not yet examined: how references to China function as discursive acts within ongoing climate discussions. To invoke China in a climate debate is not merely to introduce a topic; from a SIT perspective, it is to instantiate an intergroup boundary, positioning the speaker within an evaluative frame in which one group is held accountable and another does the accounting. Whether China is invoked as a technological benchmark, a moral counterexample, or a strategic threat, the rhetorical act of invocation organizes the discourse around competitive intergroup comparison and activates identity dynamics associated with that positioning.

This distinction—between national outgroup referents as topics of climate discourse and national outgroup referents as discursive resources, rhetorical instruments through which intergroup boundaries are enacted, responsibility is attributed, and comparative national standing is asserted—marks a gap in the existing literature's interpretive capacity. China remains the most analytically central and empirically prominent instance of such invocation in Anglophone climate discourse, and the argument developed here draws primarily on its use; the gap, however, is not confined to China as an object of study. Existing frameworks are equipped to describe what is said about national outgroup referents in climate discourse; they are not equipped to explain how different modes of invoking such referents serve different identity-management functions within argumentative exchanges, or why the rhetorical register through which a national outgroup is invoked should be expected to vary systematically in its relationship to evaluative bias. This analytical limitation—a failure to theorize outgroup invocation as a rhetorically variable instrument rather than as a sub-

stantive topic with fixed discursive properties —is not a matter of empirical undercoverage of any particular country in climate communication research. It reflects the absence of an analytical framework capable of treating the invocation of national outgroup referents as a class of rhetorical acts whose identity-management function is not fixed by the referent itself but depends on the discursive register in which that invocation is deployed.

4.2.4 RESEARCH GAPS AND RESEARCH QUESTIONS

The preceding sections identify three interrelated explanatory limitations in the existing literature that the present study is designed to address. Each limitation reflects not a gap in empirical coverage —an area where data are absent —but a failure of interpretive framework: a domain in which existing analytical tools are structurally unable to account for a class of phenomena that theory predicts should be present.

The first limitation concerns the structural organization of climate discourse in relation to identity salience. As Section 4.2.1 establishes, existing scholarship has documented polarization, identity signaling, and moralized language as features of online climate discourse, but has treated these as relatively uniform background properties rather than as varying systematically within the same debate community across different argumentative registers. The explanatory limitation is that existing frameworks cannot account for how the internal discursive landscape of a debate community is organized along dimensions of identity relevance —which argumentative registers engage identity mechanisms more or less intensively, and how that variation structures the discourse as a whole. This is not a gap that additional empirical coverage of climate communication can fill; it requires a reconceptualization of climate discourse as a structured system of identity-mediated variation rather than a uniformly polarized communicative field. Addressing this limitation analytically means first establishing what that internal structure actually looks like: which discursive patterns are present, how they relate to one another, and how they are organized in relation to identity salience as a the-

oretical dimension. The study must therefore ask: What discursive patterns characterize climate change discussion comments on Reddit climate subreddits, and how are these patterns organized in relation to identity salience as a theoretical dimension? (RQ1)

The second limitation concerns the relationship between instrumental discourse and evaluative bias. As Section 4.2.2 establishes, SIT-informed research has treated identity-based bias as a stable background property of users or communities and has not examined how identity mechanisms are differentially activated across discursive registers within the same community. The explanatory limitation is that existing frameworks cannot account for whether ostensibly neutral, technocratic, or metric-driven framings engage identity mechanisms differently from explicitly moralized ones — and specifically whether instrumental discourse may serve identity-protective functions that existing frameworks would attribute only to explicitly partisan or moral rhetoric. Prior research has generally characterized technocratic framings as normatively rational or bias-reducing, but this assumption has not been subjected to systematic empirical scrutiny at the comment level using linguistic operationalizations of evaluative bias. The more precise analytical deficit, however, is that existing research has not systematically compared whether competence-based and moralized forms of comparative discourse differ in their association with evaluative bias — a comparison that is necessary to make the identity-management function of instrumental discourse analytically tractable rather than merely theoretically speculated. Without that comparison, any claim that instrumental discourse serves identity-protective functions remains unanchored to observed variation in how comments oriented toward different discursive registers actually differ in their evaluative orientation toward ingroup and outgroup referents. Moving from structural description to empirical estimation is therefore the necessary analytical step — one that requires asking how the compositional variation identified in the discourse relates to measurable differences in evaluative orientation, and whether the distinction between competence-based and moralized comparison registers in the bias estimates in ways that existing frameworks would not predict. This analytical necessity motivates the study's

second research question: How does variation in the relative prevalence of discursive patterns correspond to variation in group-oriented evaluative bias at the comment level, and do different forms of comparative discourse vary systematically in their association with such bias? (RQ₂)

The third limitation concerns interpretation, but its character is more specific than the mere absence of an integrated account. As Section 4.2.3 establishes, existing research has examined national outgroup referents as topics in climate discourse but has not theorized their invocation as a rhetorically variable instrument whose identity-management function depends on the discursive register in which it is deployed. The explanatory limitation that follows from this is precise: existing SIT-informed frameworks do not provide the analytical tools necessary to move from observed variation in evaluative bias across discursive patterns to theoretically grounded claims about the conditions under which identity-defensive mechanisms are activated. It is not that interpretation is absent from the literature; it is that the available interpretive apparatus treats identity-defensive responses as a relatively uniform class of phenomena, and therefore cannot explain why the relationship between competence-based and moralized comparative discourse and evaluative bias—if that relationship proves to be differentiated—should constitute evidence about activation conditions rather than merely about rhetorical surface variation. Both the structural description delivered by the first question and the bias estimates delivered by the second remain analytically incomplete without such an account: they establish that variation exists and that it corresponds to measurable differences in evaluative orientation, but existing frameworks cannot explain what that pattern of variation reveals about when and why identity-defensive mechanisms are engaged across different discursive registers in climate debate communities. The study must therefore close this interpretive gap by asking how variation in evaluative bias across different discursive patterns can be interpreted within a SIT framework of situational identity management, and what this variation reveals about the conditions under which identity-defensive mechanisms are activated in climate discourse. (RQ₃)

These three explanatory limitations motivate three research questions that build on one another

in a logical progression. The first addresses the structural description of the discourse; the second tests how variation across that structure is associated with measurable differences in group-oriented bias; the third situates both findings within an interpretive-theoretical account of identity management under conditions of climate governance conflict. Together, they are addressed through an analytical strategy combining topic modeling with compositional regression using additive log-ratio transformation—a combination that uniquely enables the estimation of substitution effects, capturing how variation in the relative composition of discursive patterns across comments corresponds to systematic changes in evaluative bias in ways that single-frame or sentiment-polarity approaches cannot.

4.3 THEORETICAL FRAMEWORK

The theoretical framework developed in this section assembles six analytically distinct mechanisms needed to address the explanatory limitations identified in the literature review. These mechanisms are not proposed as novel theoretical inventions; each is grounded in an established body of research. What is original is their integration into a coherent analytical structure—a repertoire of identity-defensive orientations—suited to the specific empirical and theoretical questions of this study. Together, the six mechanisms provide the conceptual vocabulary for reconceptualizing climate discourse as a structured system of identity-mediated variation rather than a uniformly polarized communicative field.

4.3.1 THE SIT FOUNDATION AND ITS ANALYTICAL LIMITS

As established in Section 4.2.2, SIT provides the foundational account of how group affiliations shape perception, evaluation, and communication in online climate discourse. The core SIT logic—that individuals and collectives are motivated to maintain positive distinctiveness through inter-

group comparison, and that perceived threats to group status, moral standing, or competence can activate systematic ingroup favoritism and outgroup derogation —is not restated here in detail. The two-axis group definition (national-discursive and ideological), the situational character of identity activation, and the specific mechanisms of online bias are established in Section 4.2.2 and are assumed throughout what follows.

What the standard SIT toolkit cannot address, however, is precisely the explanatory limitation identified in Section 4.2.2: it does not specify how identity mechanisms are differentially activated across discursive registers within the same debate community. SIT predicts that identity threat will generate defensive responses, but it does not distinguish between the identity-management functions served by different rhetorical forms —between metric-driven instrumental discourse and explicit moral attribution, for instance, or between securitizing moves and ironic disengagement. To address this limitation, the present framework supplements SIT with theoretical resources drawn from organizational identity research, securitization theory, and the sociology of cynicism. The scope of each cross-contextual application is acknowledged where it is introduced.

4.3.2 MORAL DISENGAGEMENT, TECHNOCRATIC RATIONALIZATION, AND STRATEGIC BUFFERING

The second explanatory limitation identified in Section 4.2.4 —that existing frameworks cannot account for whether instrumental or metric-driven discourse may serve identity-protective functions —motivates the three mechanisms introduced in this subsection. A prior condition for understanding how identity mechanisms are activated is recognizing the conditions under which they are suppressed. Moral disengagement, as elaborated by Bandura (1999), describes the process through which discourse attenuates normative judgment by displacing evaluative attribution onto technical, systemic, or procedural frames —rendering group-based moral comparison temporarily irrelevant. In climate discourse, this mechanism operates when biophysical or systems-level framing absorbs the

discursive space that would otherwise be occupied by responsibility attribution and intergroup evaluation. This provides the theoretical basis for Layer A, in which identity salience is attenuated rather than activated. The latter two are derived from organizational identity research and are presented here as analytically distinct instruments within the broader repertoire.

Technocratic rationalization is defined as the deployment of metric-driven, efficiency-oriented, or procedural discourse in ways that may perform identity-protective functions while maintaining the appearance of rational, non-partisan evaluation. Its theoretical derivation draws on Elsbach and Kramer's (1996) account of how organizations under reputational threat respond by reframing their performance in terms of dimensions on which they retain comparative advantage —shifting the evaluative terrain from contested moral ground toward competence-based claims that are harder to contest from outside the technical domain. Applied to online political discourse, and acknowledging the disciplinary distance involved in this extension, the mechanism may manifest in climate debate through the structuring of argumentative exchanges around infrastructure feasibility, cost-efficiency, data quality, implementation timelines, or the technical merits of emissions accounting methodologies. Such framings can displace direct moral attribution while simultaneously asserting the epistemic authority and evaluative positioning of the speaker. This mechanism is analytically relevant to RQ1 as a candidate account of one discursive form through which identity work may be accomplished without explicit hostility, and to RQ2 as a basis for predicting that the prevalence of technocratic discourse across comments may not uniformly correspond to reduced evaluative bias.

Strategic buffering is defined as the redirection of evaluative criteria toward dimensions on which the ingroup retains comparative advantage, thereby managing identity threat without direct confrontation. Its theoretical derivation also draws on Elsbach and Kramer (1996), specifically their account of how threatened actors selectively reframe the basis of evaluative comparison in ways that preserve a favorable self-assessment. Adapting this logic to the domain of online climate discourse, strategic buffering may operate when participants shift the basis of comparison —for example, from

absolute emissions figures to per-capita rates, from current performance to historical responsibility, or from aggregate national statistics to technological trajectory—in ways that are formally plausible but functionally oriented toward protecting the ingroup’s evaluative standing. Distinguished from technocratic rationalization by its emphasis on comparative repositioning rather than on epistemic authority claims, strategic buffering is a candidate mechanism for RQ₂ insofar as it may account for systematic asymmetries in how evidence is selected, weighted, and contextualized across discursive positions within the same community.

4.3.3 MORALIZATION, SECURITIZATION, AND EPISTEMIC CYNICISM

The gradient structure proposed in Section 4.3.2 positions technocratic rationalization and strategic buffering at its lower end, where identity investment is managed through suppression or concealment within ostensibly neutral registers. This suppression logic, however, presupposes that the discursive stakes of intergroup comparison remain sufficiently contained for instrumental reframing to absorb identity threat. Where that condition does not hold—where identity threat is sustained, where the evaluative stakes of national or ideological comparison are high, or where the accumulated pressure of intergroup conflict exceeds what procedural or technocratic registers can manage—the discourse may shift toward modes of identity management that do not conceal identity investment but escalate it. The three mechanisms introduced in this subsection describe that escalation: moralization, securitization, and epistemic cynicism occupy the high-identity-salience end of the gradient and represent analytically distinct forms of identity escalation that existing frameworks have not systematically theorized in the context of online climate debate.

Moralization is defined as the framing of evaluative positions in terms of absolute moral right and wrong, reducing evaluative ambiguity and activating binary ingroup–outgroup distinctions. Its theoretical derivation draws on SIT’s account of outgroup derogation (Tajfel & Turner, 1979; Turner et al., 1987), in which the ingroup’s moral superiority is asserted not merely as a comparative judg-

ment but as a self-evident standard against which outgroup actors are assessed. In climate discourse, moralization may manifest as the attribution of bad faith, denial, or moral complicity to outgroup actors —particularly when China is invoked not as a benchmark or competitor but as a morally disqualified interlocutor. This mechanism is analytically relevant to RQ₁ as a structural feature of how the most identity-salient discursive positions are drawn within the corpus, and to RQ₃ as a candidate account of why certain patterns of evaluative bias may be interpretable as identity-protective rather than epistemically motivated responses to the evidence.

Securitization is defined as the discursive construction of climate issues as existential threats to national survival, moral integrity, or civilizational legitimacy, thereby legitimizing exceptional evaluative reasoning and narrowing the space for compromise. Its theoretical derivation draws on Buzan, Wæver, and de Wilde (1998), whose account of securitization as a speech act that elevates an issue above ordinary political deliberation is adapted here —with acknowledged distance from its original state-level security studies context —to identity escalation dynamics in platform-mediated online discourse. Applied to Reddit climate debate, securitization may function to elevate the evaluative stakes of intergroup comparison: when climate inaction is constructed as an existential threat, outgroup actors associated with that inaction may be positioned as agents of civilizational harm, and the rhetorical invocation of China as an irresponsible or bad-faith actor may acquire a gravity that exceeds ordinary policy disagreement. This mechanism is analytically relevant to RQ₁ as a structuring feature of the most intensified discursive moments in the corpus, and to RQ₃ as a framework for interpreting why identity-protective responses in climate discourse may escalate beyond the conventions of policy debate into the register of civilizational threat and moral emergency.

Where securitization drives the escalation of identity stakes beyond the threshold of ordinary deliberative norms, epistemic cynicism marks its terminus —the point at which the evaluative framework itself collapses and rational exchange is replaced by performative cynicism. The two mechanisms are therefore analytically related: securitization creates the conditions under which epistemic

cynicism becomes the only available discursive response, though in practice the two may co-occur rather than follow a strict temporal sequence. Epistemic cynicism is defined as the reflexive withdrawal from shared evaluative standards under entrenched identity conflict, characterized by the presumption that all knowledge claims are politically compromised and that fact-based deliberation has become untenable. Its theoretical derivation draws on Sloterdijk's (1987) analysis of modern cynicism as a form of 'enlightened false consciousness' —a condition in which actors are aware of the gap between ideological claim and reality but continue to perform the forms of rational discourse without investment in their truth-content —applied here, with acknowledged disciplinary distance from its original sociological context, to the specific conditions of platform-mediated climate debate. In this discursive mode, knowledge claims may be advanced less as contributions to shared inquiry than as identity signals, and the rhetorical forms of evidence and argument may be deployed ironically, deflectively, or as performances of epistemic superiority rather than as genuine persuasive moves. This mechanism is analytically relevant to RQ₁ insofar as it predicts a distinctive discursive signature in the corpus —ironic, meta-discursive, or strategically self-distancing —and to RQ₃ as a theoretically specified condition under which persuasion and evidence-exchange break down and deliberative interpretation no longer applies.

4.3.4 SCOPE AND POSITIONING

The hierarchical structure that organizes the six mechanisms is not merely an expository device but a theoretical claim about the organization of discourse itself—one that generates specific empirical predictions for each of the three research questions rather than serving as a taxonomic convenience. The mechanisms that suppress identity investment and those that escalate it occupy systematically distinct positions along this gradient, and the discursive communities engaging in climate debate may draw on them in ways that reflect this underlying structure; whether the discourse exhibits that systematic variation, whether identity-salience gradient position carries detectable consequences

for evaluative bias, and whether the pattern of bias variation reveals the conditions under which identity-defensive mechanisms are activated —these are precisely what RQ₁, RQ₂, and RQ₃ are respectively designed to assess.

Three cross-contextual theoretical borrowings underpin this framework, each applied on the basis of structural analogy rather than empirical transplant. Elsbach and Kramer's (1996) account of identity defense was developed in organizational settings and is applied here to online political discourse; the extension involves meaningful differences in scale, anonymity, and the absence of institutional membership, and the claims advanced on its basis are scoped accordingly. Buzan, Wæver, and de Wilde's (1998) securitization framework was developed for state-level security politics and is applied here to identity escalation in online discourse; the framework operates at the level of discursive logic, where the structural dynamics of escalation beyond ordinary deliberative norms retain their analytical force independent of institutional context. Sloterdijk's (1987) account of cynicism was developed within the sociology of modernity and is applied here to the specific conditions of platform-mediated climate debate; the application treats epistemic cynicism as a discursive mode rather than as a characterological or philosophical claim about contemporary subjectivity.

Finally, the national-discursive and ideological axes described in Section 4.2.2 are not independent analytical layers operating in isolation. They frequently co-activate. A discourse participant who deploys technocratic rationalization in the context of China-framing may simultaneously be performing ideological identity work. The framework is designed not merely to accommodate such intersections but to foreground them as substantively meaningful features of the discourse: the co-activation of multiple identity axes and multiple mechanisms within the same discursive moment is treated here as a structural property of climate debate on Reddit rather than as an analytical complication to be resolved.

4.4 METHODOLOGY

4.4.1 DATA

We collected data using Python from Reddit. To identify relevant discussions, Reddit posts were retrieved using the keyword combinations "climate change" + "China" and "global warming" + "China". We focused on four highly active climate-related subreddits: r/climatechange, r/climate, r/environment, and r/ClimateNews. These subreddits were chosen because they represent heterogeneous yet overlapping climate discourse communities, enabling the examination of identity dynamics across different communicative contexts. All data were collected in English, which implies that the sample captures predominantly English-speaking Western users and is likely skewed towards audiences in the United States and other Anglophone countries; this should be borne in mind when assessing the generalizability of findings to non-Western or non-English-speaking climate discourse.

A total of 10,401 comments were extracted from 65 posts published throughout 2025. Posts were selected on the basis of two engagement indicators: upvote count and total comment volume. For each subreddit, all posts published within the study period were retrieved and ranked by a composite engagement score computed as the sum of their standardized upvote count and standardized comment volume. The top posts were selected from this ranked list until a total of 65 posts was reached across the four subreddits. In cases where two posts returned identical composite scores, the post with the higher raw comment volume was prioritized as the tie-breaking criterion. Each comment extracted from these posts was treated as an individual document for subsequent text analysis.

4.4.2 ANALYTICAL STRATEGY: FROM TOPIC MODELING TO DISCURSIVE IDENTITY LAYERS

Our methodological approach combines unsupervised topic modeling, theory-guided qualitative interpretation, and quantitative bias measurement, with the goal of capturing context-dependent identity activation and strategic positioning, rather than assigning static ideological labels to users.

TOPIC MODELING AND PREPROCESSING

To uncover latent thematic structures in the corpus, we employed Latent Dirichlet Allocation (LDA), an unsupervised Bayesian generative topic modeling technique (Blei, 2012; Maier et al., 2018). In this framework, topics are represented as probability distributions over words, and each document is modeled as a mixture of multiple topics under a bag-of-words assumption.

We implemented LDA using Gibbs Sampling via the `topicmodels` and `ldatuning` packages in R. Text preprocessing followed a standardized cleaning pipeline. First, all tokens were converted to lowercase. We then removed punctuation, numerical digits, and stop words using the `Snowball` and `SMART` English stopwords lists implemented in the `stopwords` R package. Additional platform-related tokens (e.g., “http”, “https”, and “amp”) were removed to eliminate residual URL fragments and formatting artifacts. Tokens shorter than three characters, tokens containing digits, and tokens including non-alphanumeric characters were excluded. To reduce noise and eliminate both overly common and extremely rare terms, we filtered out words appearing in more than 99% or fewer than 0.1% of documents. Lemmatization and stemming were intentionally not applied in order to preserve linguistic nuance and semantic stability in topic interpretation.

To determine the optimal number of topics, we estimated a series of candidate models using the `ldatuning` package in R. Topic numbers were explored across a wide range of values, including models with 10–100 topics (in increments of 10), 120–180 topics (in increments of 20), and 200–300

topics, with a more fine-grained search between 80 and 100 topics (in increments of 1). Model fit was evaluated using four widely used diagnostic metrics—Griffiths2004, CaoJuan2009, Arun2010, and Deveaud2014 (Walter & Ophir, 2019). Based on the balance across these indicators, we selected a 20-topic model for the final analysis.

QUALITATIVE ANALYSIS

Rather than mechanically aggregating topics through purely statistical clustering, we adopted a manual topic typification approach grounded in SIT. Each of the 20 topics was examined individually through a structured qualitative content analysis protocol conducted by the primary author. For each topic, we systematically analysed the top-loading words by probability, FREX terms (frequent and exclusive words), and the top 30 most representative documents, defined as those with the highest topic proportion scores (Walter & Ophir, 2019).

To contextualise and interpret the computational findings, we conducted close readings of these representative comments to illustrate how identity orientations are situationally activated rather than consistently expressed as stable individual positions. This multi-layered inspection enabled the inductive derivation of five discursive layers (Layers A–E). These layers were not imposed a priori but emerged from repeated qualitative comparison across topic interpretations, through which recurring patterns of identity orientation were progressively abstracted into analytically distinct configurations. Although the layers were derived inductively from the data, their interpretation is grounded in the six theoretical mechanisms elaborated in Section 4.3—moral neutralization, technocratic rationalization, moralization, strategic buffering, securitization, and epistemic cynicism—which provide the analytical vocabulary for explaining the identity-management function of each layer. The layers are thus neither purely empirical clusters nor theoretically pre-specified categories, but the product of an abductive process in which theoretical mechanisms and empirical patterns were brought into dialogue.

The full characterisation of each layer is provided in Section 4.5.1. Topics were interpreted not as ideological camps but as discursive contexts that activate different identity strategies.

DICTIONARY AND BIAS MEASUREMENT

To operationalize group orientation and bias within the discourse, we employed a computational dictionary-based approach using the *quanteda* package in R. This analysis was conducted on the full corpus of documents rather than the preprocessed texts used for topic modeling, in order to preserve the original linguistic context of the discourse. The approach enables the systematic quantification of linguistic markers associated with social categorization and group positioning.

We developed a custom linguistic dictionary organised into two analytically distinct layers capturing five categories of group-related rhetoric. The first layer comprises group orientation categories, which capture the discursive positioning of speakers relative to social groups: Ingroup Orientation (10 terms) and Outgroup Orientation (11 terms). The second layer comprises affective valence categories, which measure evaluative tone independently of group membership: Superordinate Identity (6 terms), Negative/Blame Rhetoric (10 terms), and Positive/Cooperative Rhetoric (7 terms). This two-layer structure ensures that group categorization and rhetorical evaluation are treated as conceptually separable dimensions of discourse, consistent with SIT's distinction between social categorization and evaluative differentiation.

Outgroup Orientation (11 terms) captures language directed at or associated with actors positioned as external to the speaker's group, including institutional actors (e.g., government, politician, lobbyist) and foreign state actors. This asymmetry between the discursive definition of the ingroup and the more concrete referential character of outgroup terms reflects a well-documented pattern in intergroup discourse, whereby outgroups are more frequently reified as bounded entities—including nation-states—while ingroup membership tends to be expressed through relational and affiliative language (cf. Tajfel & Turner, 1979). China-related terms (e.g., China, Chinese, Beijing)

were not pre-specified in the initial dictionary design but were incorporated following qualitative screening of the corpus, during which geopolitical attribution to China emerged as a recurrent and analytically salient framing pattern.

Additionally, Superordinate Identity (6 terms) was included as an exploratory category to capture language invoking a shared human or global identity that transcends ingroup/outgroup distinctions; its theoretical implications are discussed in relation to the findings in Section 4.5. This category was not entered as a predictor in the regression model; it was retained as a descriptive measure to facilitate qualitative interpretation of topics in which superordinate framing appeared as a structurally relevant feature.

Negative/Blame Rhetoric (10 terms) captures evaluatively negative and attributive language; Positive/Cooperative Rhetoric (7 terms) captures evaluatively constructive and collaborative language. This two-layer structure ensures that group categorization and rhetorical evaluation are treated as conceptually separable dimensions of discourse, consistent with SIT's distinction between social categorization and evaluative differentiation. Several dictionary entries employ wildcard operators (e.g., citizen*, migrant*, responsibil*) to capture common linguistic inflections such as plural forms and derivations. The complete dictionary is reported in Table A.2 (Appendix A).

Dictionary terms were derived through a combination of theoretical grounding in SIT and iterative corpus reading. Initial candidate terms for the group orientation categories were identified deductively from SIT constructs of in-group/out-group categorization, while terms for the rhetorical categories were developed and refined inductively through repeated reading of a random sample of corpus documents, ensuring ecological validity with respect to the specific lexical patterns present in Reddit climate discourse.

After preprocessing the corpus, we constructed a Document–Feature Matrix (DFM) and applied dictionary lookups to compute the frequency of each category at the document level. To account for variation in document length, category counts were normalized by the total number of tokens in

each document, yielding relative frequency ratios. Because the ingroup and outgroup dictionaries contain a comparable number of entries (10 and 11 terms, respectively), additional normalization by dictionary size was not necessary.

The primary dependent variable, the Bias Score, was operationalized as the difference between outgroup- and ingroup-oriented rhetoric. Prior to computing this score, the component ratios are defined as follows: $\text{IngroupRatio} = \text{count of ingroup dictionary terms in a document} / \text{total tokens in that document}$; $\text{OutgroupRatio} = \text{count of outgroup dictionary terms in a document} / \text{total tokens in that document}$. The Bias Score is then computed as:

$$\text{BiasScore} = \text{OutgroupRatio} - \text{IngroupRatio} \quad (4.1)$$

The theoretical minimum of the BiasScore is -1 (a document composed entirely of ingroup terms), and the theoretical maximum is $+1$ (a document composed entirely of outgroup terms); in practice, values cluster near zero given the relative sparsity of dictionary matches in natural language. Positive values indicate outgroup-oriented framing, whereas negative values reflect ingroup-oriented framing. As a concrete interpretive example, a score of $+0.05$ indicates that outgroup references exceed ingroup references by five percentage points of total token share, reflecting a moderate outward-attributive orientation in that document. Bias Scores were subsequently used as the dependent variable in a compositional regression model.

The independent variables of the regression model are the five discursive layers (A–E), entered as additive log-ratio (ALR)-transformed proportions following the compositional data transformation, alongside any control variables specified therein.

STATISTICAL MODEL SPECIFICATION

Because the five discursive layers (A–E) are expressed as proportions that sum to one, they constitute compositional data and cannot be treated as independent predictors due to perfect multicollinearity. To account for this constraint, we applied an additive log-ratio (ALR) transformation (Aitchison, 1982) and estimated an ordinary least squares (OLS) regression model. Layer E (Meta-Identity Breakdown) was selected as the reference category for the ALR transformation. Layer E represents the least structurally coherent identity frame in the typology, characterized by fragmented, ironic, or disengaged discourse that resists alignment with any stable in-group or out-group position; as the least structured baseline, it provides a theoretically meaningful reference against which shifts toward more clearly defined identity configurations (Layers A–D) can be interpreted. Layer E’s selection as reference category reflects its theoretical position as the least structurally coherent frame in the typology rather than its corpus prevalence; its high volumetric share is itself consistent with the diffuse and heterogeneous character of meta-discursive collapse.

4.5 RESULTS

4.5.1 THE HIERARCHICAL LANDSCAPE OF CLIMATE DISCOURSE

Our analysis of the 20 LDA-identified topics reveals that climate discourse on Reddit is not a monolithic debate but a stratified discursive landscape. As comments shift in their primary discursive focus from biophysical systems toward human agency and geopolitical power, a hierarchy is observable across topics—from lexical patterns dominated by technical and scientific terminology toward patterns featuring evaluative, blame-attributing, and geopolitically charged language. This progression is visible in the top-probability and FREX terms associated with each topic and in the character of representative comments. Critically, the five-layer hierarchy presented here is theory-driven, not

statistically derived: the ordering from Layer A to Layer E reflects a theoretically specified gradient of identity salience grounded in SIT (Tajfel & Turner, 1979), imposed through qualitative classification of topic content rather than emerging from the topic model itself.

The 20 topics form a spectrum of identity salience. At the lower end (Layer A), topics are characterized by scientific and technical terminology and lexical patterns consistent with low interpersonal conflict. At the upper end (Layer E), topics feature cynicism-associated terms, geopolitical references, and distrust-signalling language. This distributional contrast is consistent with prior theoretical accounts of identity salience gradients in political discourse (Tajfel & Turner, 1979; Reicher, 2004), though the present data can establish the lexical pattern but cannot confirm the underlying psychological gradient.

LAYER A: SITUATIONAL ATTENUATION OF IDENTITY SALIENCE

Layer A is theoretically grounded in the mechanism of moral disengagement (Section 4.3.2), in which technically framed discourse attenuates normative judgment by displacing evaluative attribution onto biophysical or systemic frames. At the lower end of this hierarchy, Layer A encompasses topics whose top-probability terms are dominated by technical and scientific vocabulary, with a corresponding absence of evaluative or blame-attribution language in representative comments (T₁₃, T₁₉).

Topic 13 is characterized by the frequent co-occurrence of terms such as energy, china, green, clean, renewable, production, economic, growth, transition, and consumption—a lexical pattern consistent with framing state behaviour in terms of material output and feasibility rather than political or normative evaluation. Representative comments in this layer tend to feature descriptions of capacity and transition trajectory rather than attributions of blame or moral failure. Although T₁₃'s top terms include geopolitical referents such as China, the framing context of representative comments indicates that national actors are introduced as exemplars of feasibility rather than as targets

Table 4.1: Social Identity Theory in Climate Discourse

Layer	Discursive Function	Topic ID	Topic Label	SIT Classification	Corpus Proportion
Layer A: Situational Attenuation of Identity Salience	Epistemic Realism: Establishing physical boundaries where group identity becomes irrelevant.	T13	Renewable Ambitions and the Economic-Environmental Nexus	Technoeconomic Realism (Competence over Morality)	9.9%
		T19	Scientific Complexity and the “Aerosol Termination” Paradox	Epistemic Negotiation of Unintended Consequences	
Layer B: Instrumental Comparison	Competence Evaluation: Comparing the state capacity and practical efficiency of different systems.	T5	Energy Infrastructure, Transition Efficiency, and Strategic Autonomy	Pragmatic Rationalization (Competence over Morality)	25.02%
		T7	The Calculus of Culpability and Moral Dilution	Relativistic De-responsibilization (Metric-based Cynicism)	
		T9	Technoeconomic Pragmatism and the Logic of Market Dominance	Technoeconomic Realism (Competence over Morality)	
		T11	Epistemic Vigilance and the Discursive Validity Battle	Intellectual Distinction (Cognitive Gatekeeping)	
		T6	Systemic Pragmatism and Existential Realism	Superordinate Identity Activation	
Layer C: Moralized Comparison	Out-group Derogation: Simple binary framing of “virtuous self” vs. “polluting other.”	T1	Institutional Responsibility and Intra-group Critique	Responsibility Attribution (Institutional & Intra-group)	19.95%
		T3	Superordinate Identity and Cognitive Diffusion in Climate Discourse	Perception & Awareness (Identity Recategorization)	
		T4	Intergroup Accountability and the Global Responsibility Debate	Blame/Responsibility Attribution (Intergroup Accountability)	
		T8	Post-Colonial Justice and the Global North-South Divide	Moral Recategorization (Global North vs. Global South)	
Layer D: Strategic Social Creativity	Dimension Shifting: Moving the goalposts via metric switching (T15) or strategic self-criticism (T2).	T2	Epistemic Legitimacy, Knowledge Authority, and Comparative Governance Efficacy	Perception & Epistemic Evaluation (Competence vs. Integrity)	20.08%
		T15	Strategic Moral Accounting (Metric-Shifting Identity Defense)	Strategic Moral Accounting (Metric-Shifting Identity Defense)	
		T16	Temporal Uncertainty and the Ephemerality of Climate Judgment	Temporal Deferral and Unstable Norm Evaluation	
		T17	Systemic Legitimacy Defense (Epistemic Distrust and Moralized Attribution)	Systemic Legitimacy Defense (Epistemic Distrust & Moralized Attribution)	
Layer E: Meta-Identity Breakdown	Epistemic Closure: Discursive boundaries locked by geopolitical fear and cynical closure.	T10	Domestic Dysphoria and the Micro-Politics of Futility	Intra-group Alienation & Cross-Group Ecological Fatalism	24.97%
		T12	Strategic Decline Narratives and Missed Leadership	Intergroup Competition (Status Threat & In-group Scapegoating)	
		T14	Hegemonic Antagonism and the “World’s Largest” Comparative Trap	Existential Threat Framing (Zero-Sum Antagonism)	
		T18 ³⁴	Meta-Discursive Cynicism and the “Propaganda War” Narrative	Meta-Cynical Polarized Defensiveness (Out-group Derogation)	
		T20	Algorithmic Guardianship and the Cross-Topic Moral Anchor	Structural Neutrality vs. Moral Equivalence (Defensive Relativism)	

Note: Layer assignments reflect theory-guided qualitative classification based on top-probability terms, FREX terms, and representative comments. They do not represent statistically derived clusters.

of moral attribution; identity salience is thus attenuated by the technoeconomic register even where national comparison is present.

Topic 19 is characterized by terms including global, pollution, warming, air, increase, water, average, due, effect, and reduction —vocabulary associated with physical and geophysical processes. Representative comments in this layer predominantly feature scientific and technical terminology rather than evaluative or identity-marking language. This lexical pattern is consistent with the theoretical concept of moral neutralization, in which technically framed discussions attenuate normative judgment (Opotow & Weiss, 2000). Overall, Layer A topics are distinguished observationally by the prevalence of technical and scientific terminology and, in theoretical terms, by what SIT would classify as low identity salience (Tajfel & Turner, 1979) —though the data establish only the lexical pattern, not the psychological state.

LAYER B: INSTRUMENTAL COMPARISON

Layer B is theoretically grounded in the mechanisms of technocratic rationalization and strategic buffering (Section 4.3.2), through which identity work is accomplished within ostensibly neutral instrumental registers. Layer B consists of topics whose top terms reflect technocratic evaluation, industrial logic, and epistemic governance (T5, T6, T7, T9, T11). Topic 5 is characterized by terms such as coal, power, plants, gas, building, nuclear, capacity, renewables, electricity, and generation —a lexical pattern consistent with infrastructure-focused and engineering-parameter framing. Topic 9 is characterized by terms including solar, manufacturing, panels, wind, batteries, cheap, cost, massive, market, and electric, indicating an orientation toward economic and market-logic framing. The prevalence of infrastructure and cost-efficiency terminology in these topics is consistent with what Latour (2004), Barry (2002), and Hajer (1995) describe as the dampening of moral tension through instrumental framing.

Topic 11 is characterized by terms such as one, actually, article, something, data, read, look, say-

ing, always, another, and maybe —terms associated with meta-discursive reference, source-citation, and epistemic evaluation. Representative comments in this layer tend to feature challenges to the evidential basis or interpretive framing of prior claims. This lexical pattern is consistent with what SIT describes as in-group boundary maintenance through epistemic performance (Tajfel & Turner, 1979). The prevalence of epistemic and evaluative language in this layer is consistent with Kahan et al.'s (2012) argument that scientific literacy may intensify identity-protective cognition; the present data can observe the lexical pattern but cannot confirm the underlying cognitive mechanism.

Topic 7 is characterized by terms including much, problem, better, make, part, pretty, worse, produce, possible, and basically —vocabulary consistent with comparative evaluation of scale and relative responsibility. This lexical pattern is consistent with comparative evaluation of responsibility across scales —a discursive pattern that has been discussed in the literature on moral disengagement and responsibility diffusion (Bandura, 1999; Norgaard, 2011).

Topic 6 is characterized by terms including can, see, need, way, go, point, enough, america, mean, free, and current, a pattern consistent with systemic-pragmatic evaluation of collective capacity. Across Layer B, the co-occurrence of technical, economic, comparative-scalar, and systemic-pragmatic terminology in these topics is, in theoretical terms, consistent with instrumental neutralization as a discursive register.

LAYER C: MORALIZED COMPARISON

Layer C is theoretically grounded in the mechanism of moralization (Section 4.3.3), in which evaluative positions are framed in terms of moral right and wrong, activating binary ingroup–outgroup distinctions. Layer C encompasses topics whose top terms are marked by explicit attribution language, collective human subjects, and geographically or institutionally specified out-groups (T₁, T₃, T₄, T₈). Topic 1 is characterized by terms such as fossil, oil, fuel, fuels, industry, companies, renewables, and need —a lexical pattern featuring named industrial actors and resource categories that is

consistent with institutional responsibility attribution and what Marques et al. (1988) describes as the Black Sheep Effect, wherein in-group critique functions to protect perceived in-group moral integrity. Topic 3 is characterized by terms including people, think, really, many, things, don, lot, know, let, real, talking, cause, and stupid —terms invoking undifferentiated collective human subjects and epistemic challenge. This lexical pattern is consistent with superordinate identity framing in SIT (Tajfel & Turner, 1979), in which responsibility is distributed across humanity rather than attributed to a specific out-group. Topic 4 is characterized by the frequent co-occurrence of terms such as even, still, china, less, yes, lot, fact, reduce, blame, local, and without —notably, the explicit presence of the term blame alongside geopolitical referents is consistent with intergroup accountability framing and historical contestation of responsibility (Opotow & Weiss, 2000).

Topic 8 is characterized by terms such as china, countries, western, india, west, usa, nations, developed, rich, developing, canada, and south —a dense co-occurrence of geopolitically specified national and regional referents consistent with post-colonial framing and North–South responsibility discourse (Roberts & Parks, 2007). Collectively, the lexical patterns across Layer C topics are, in theoretical terms, consistent with what SIT describes as moralized intergroup comparison (Tajfel & Turner, 1979).

LAYER D: STRATEGIC SOCIAL CREATIVITY

Layer D is theoretically grounded in the mechanism of strategic buffering as social creativity (Section 4.3.2), in which evaluative criteria are redirected toward dimensions preserving ingroup comparative advantage. Layer D encompasses topics whose top terms reflect epistemic governance, metric specification, and temporal reference (T₂, T₁₅, T₁₆, T₁₇). Topic 2 is characterized by terms including climate, change, said, believe, care, plan, zero, say, issue, science, media, environment, and net —a pattern featuring epistemic verbs (believe, said, say, care) alongside policy-temporal referents (plan, net zero). Representative comments in this layer tend to feature evaluative assessments

of institutional commitment and credibility. This lexical pattern is consistent with SIT's account of competence-versus-integrity evaluation as a form of intergroup comparison (Tajfel & Turner, 1979).

Topic 15 is characterized by terms such as emissions, per, carbon, capita, eu, population, total, lower, half, emission, peak, million, increasing, and billion—a dense co-occurrence of emissions-metric vocabulary spanning per-capita, total, and cumulative framings. The simultaneous presence of multiple incommensurable metrics in this topic's top terms is consistent with what SIT describes as metric-shifting identity defence, in which numerical framing is deployed to reposition moral responsibility (Tajfel & Turner, 1979). Whether this reflects deliberate metric selection cannot be determined from lexical data alone.

Topic 16 is characterized by terms including deleted, years, year, last, since, ago, next, past, compared, post, two, decade, and removed—notably, the high-probability presence of deleted and removed alongside temporal referents is an observable corpus feature consistent with social risk associated with time-bound evaluative claims. This lexical pattern is consistent with what SIT would frame as temporal identity uncertainty, in which group-evaluative claims are tied to shifting temporal benchmarks (Tajfel & Turner, 1979).

Topic 17 is characterized by terms such as chinese, government, true, states, policy, makes, system, uk, means, control, american, tell, and public—co-occurring governmental, national, and epistemic-authority referents. This pattern is consistent with systemic legitimacy evaluation combining epistemic skepticism with institutional assessment, as described in work on political trust and regime comparison (Norris, 1999). Across Layer D, the prevalence of epistemic, metric-quantification, and temporal vocabulary across these topics is, in theoretical terms, consistent with what SIT describes as social creativity strategies—reframing the comparative dimension rather than directly contesting moral standing (Tajfel & Turner, 1979).

LAYER E: META-IDENTITY BREAKDOWN

Layer E is theoretically grounded in the mechanisms of securitization and epistemic cynicism (Section 4.3.3), representing the terminus of identity escalation at which rational exchange gives way to epistemic closure. Layer E is defined by topics whose top terms are dominated by geopolitical referents, cynicism-signalling vocabulary, and status-comparative framing (T₁₀, T₁₂, T₁₄, T₁₈, T₂₀). Topic 12 is characterized by terms such as *us*, *now*, *right*, *trump*, *europa*, *economy*, *china*, *trade*, *since*, *americans*, *future*, *left*, *went*, and *days* —a co-occurrence of domestic political actors, geopolitical rivals, and temporal-decline markers consistent with status-threat and in-group scapegoating framing. Topic 14 is characterized by terms including *china*, *world*, *country*, *largest*, *every*, *rest*, *biggest*, *planet*, *made*, *large*, *greenhouse*, *military*, and *far* —superlative and scale-comparative vocabulary (*largest*, *biggest*, *rest*) alongside geopolitical referents, a pattern consistent with zero-sum antagonism framing (Wendt, 1999). Topic 18 is characterized by terms such as *just*, *good*, *going*, *bad*, *stop*, *say*, *yeah*, *shit*, *know*, *lol*, *literally*, *never*, *mean*, and *propaganda* —notably, the explicit presence of *propaganda* alongside informal and negation-heavy vocabulary (*never*, *bad*, *shit*, *lol*) represents an observable co-occurrence of cynicism-related and epistemic-closure vocabulary. Topic 10 is characterized by terms including *get*, *time*, *want*, *take*, *long*, *back*, *work*, *everyone*, *going*, *first*, *trying*, *money*, *big*, and *everything* —general-referent vocabulary consistent with diffuse futility framing rather than targeted out-group attribution. Topic 20 is characterized by terms such as *like*, *well*, *just*, *earth*, *nothing*, *seems*, *human*, *america*, *already*, *australia*, *rare*, and *action* —a pattern featuring hedged epistemic markers (*seems*, *like*, *nothing*) alongside geopolitical referents, consistent with moral equivalence or defensive relativism framing.

The co-occurrence of geopolitical, status-comparative, cynicism-signalling, and epistemic-closure vocabulary across Layer E topics is, in theoretical terms, consistent with what SIT describes as meta-identity breakdown —a condition in which identity-protective concerns override both epistemic

evaluation and normative moral framing (Tajfel & Turner, 1979; Reicher, 2004). The present data establish the lexical patterns described above; causal or process-level interpretations would require evidence beyond topic model outputs.

4.5.2 BIAS ACROSS DISCURSIVE LAYERS

Table 4.2 presents the results of the additive log-ratio ordinary least squares (OLS) regression, modeling bias score as a function of the relative prevalence of five discursive layers: Identity Suspension, Instrumental Comparison, Moralized Comparison, Strategic Social Creativity, and Meta-Identity Breakdown. The overall model is statistically significant ($F = 14.31$, $p < 0.001$), indicating that the compositional structure of discursive strategies is systematically associated with bias. Although the explained variance is modest (adjusted $R^2 = 0.006$), this magnitude is expected given the abstract and multi-determined nature of discursive bias and the large sample size.

Table 4.2: Log-ratio Compositional Regression Results

Discursive Layer	Log-ratio (relative to E)	Estimate	Std. Error	95% CI	p-value
Identity Suspension	$\log(A/E)$	0.0007	0.0014	$[-0.0021, 0.0036]$	0.612
Instrumental Comparison	$\log(B/E)$	0.0084	0.0018	$[0.0049, 0.0119]$	< 0.001
Moralized Comparison	$\log(C/E)$	0.0055	0.0021	$[0.0013, 0.0096]$	0.010
Strategic Social Creativity	$\log(D/E)$	-0.0007	0.0018	$[-0.0043, 0.0029]$	0.715
Intercept	—	0.0031	0.0013	$[0.0006, 0.0057]$	0.016

Notes: Entries are OLS coefficients from an additive log-ratio compositional regression. All predictors are expressed relative to Layer E (Meta-Identity Breakdown). Confidence intervals are at the 95% level.

As shown in Table 4.2 and Figure 4.1, Instrumental Comparison exhibits a strong and positive association with bias score when compared to the reference category, Meta-Identity Breakdown ($\beta = 0.0084$, 95% CI $[0.0049, 0.0119]$, $p < 0.001$). This finding indicates that discourses emphasizing functional rivalry, technological capacity, and policy implementation efficiency are associated with higher levels of bias when they replace meta-level systemic or fatalistic framing. Substantively, this suggests that competence-based comparisons between political or technological systems are associ-

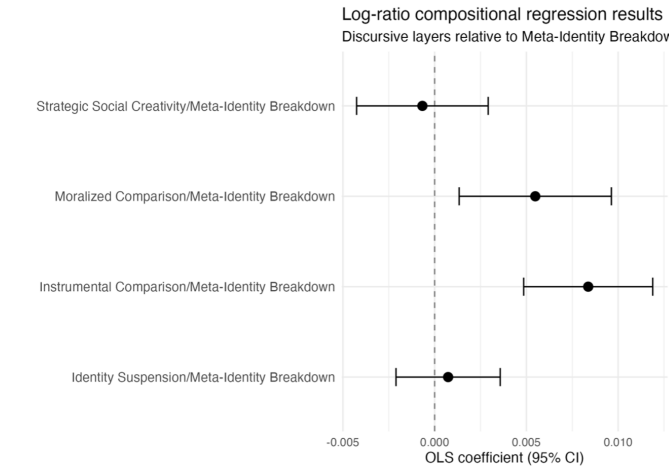


Figure 4.1: Log-ratio compositional regression results

ated with higher evaluative bias, a pattern consistent with the interpretation that assessable performance metrics provide a more tractable basis for intergroup differentiation than diffuse systemic uncertainty.

Moralized Comparison also shows a statistically significant positive association with bias score relative to Meta-Identity Breakdown ($\beta = 0.0055$, 95% CI [0.0013, 0.0096], $p = 0.010$), although the magnitude of this effect is smaller than that observed for Instrumental Comparison. This layer is characterized by moral dualism and the externalization of guilt through binary oppositions between a virtuous in-group and a morally deficient out-group. The result indicates that explicit moralization and out-group derogation contribute to increased bias, but less strongly than competence-based rivalry, suggesting that moral framing alone is not the most potent driver of discursive bias.

In contrast, Identity Suspension does not exhibit a statistically significant association with bias score when compared to Meta-Identity Breakdown ($\beta = 0.0007$, $p = 0.612$). Discourses that neutralize identity salience by appealing to scientific realism, systemic complexity, or physical constraints

do not systematically increase or decrease bias relative to meta-level identity collapse. This finding suggests that epistemic realism functions as a bias-neutralizing strategy, neither intensifying nor mitigating bias in a consistent direction.

Similarly, Strategic Social Creativity shows no statistically significant association with bias score relative to Meta-Identity Breakdown ($\beta = -0.0007$, $p = 0.715$). Discursive strategies that reframe evaluative criteria, shift metrics, or engage in strategic self-criticism do not appear to systematically alter bias levels. This result implies that dimension shifting and metric manipulation may serve a defensive or stabilizing function rather than an escalatory one, maintaining group status without necessarily amplifying bias.

Meta-Identity Breakdown serves as the reference category in the log-ratio specification. Conceptually, it represents a state of discursive closure characterized by systemic fear, geopolitical fatalism, and epistemic boundary locking. All reported coefficients should therefore be interpreted as substitution effects, reflecting shifts away from meta-identity breakdown toward more agentic or evaluative discursive modes.

Taken together, the results indicate that bias is selectively associated with specific discursive substitutions rather than with framing intensity per se. In particular, shifts from meta-identity breakdown toward instrumental and moralized forms of comparison are associated with increased bias, whereas shifts toward identity suspension or strategic social creativity are not. These findings suggest that bias emerges most strongly when discourse moves from systemic abstraction into arenas of comparative evaluation—especially those centered on competence and moral accountability.

4.6 DISCUSSION

4.6.1 PRIMARY SYNTHESIS

The results depict climate discourse on Reddit as a hierarchically structured discursive system in which the salience of social identity increases predictably as discussion shifts from biophysical processes to questions of human agency, governance, and geopolitical power. Across the five empirically derived layers, discourse transitions from epistemically grounded sensemaking to identity-protective, status-oriented reasoning. Importantly, bias is not uniformly distributed across this hierarchy. Instead, it emerges selectively when discourse moves into arenas of comparative evaluation—particularly those centered on competence and moral accountability—rather than when identity is either suspended through scientific realism or collapses into fatalistic meta-narratives.

The regression results reinforce this interpretation by demonstrating that bias is most strongly associated with substitutions away from Meta-Identity Breakdown toward Instrumental and Moralized Comparison. These findings indicate that bias is most strongly associated not with polarization intensity per se, but with discursive shifts toward assessable, contestable metrics—such as technological capacity, policy efficiency, or moral responsibility—within otherwise abstract or fatalistic frames. In contrast, discursive modes characterized by epistemic realism or strategic reframing neither exacerbate nor systematically attenuate bias, suggesting a stabilizing rather than escalatory function.

4.6.2 THEORETICAL ALIGNMENT

These findings align closely with Social Identity Theory, particularly the claim that intergroup bias is most likely to arise when social comparison occurs along salient, evaluable dimensions that bear on group status (Tajfel & Turner, 1979; Tajfel, 1982). The strong association between Instrumental

Comparison and bias is consistent with prior work showing that competence-based comparisons—rather than overt moral condemnation—are especially potent triggers of intergroup differentiation, as they allow status hierarchies to be contested under a veneer of rational evaluation (Fiske et al., 2002; Kahan et al., 2012).

The results also corroborate evidence from cultural cognition research demonstrating that increased technical or scientific reasoning does not necessarily reduce bias and may, under certain conditions, intensify identity-protective cognition (Kahan et al., 2012; Kahan, 2017). In the present analysis, technocratic and metric-driven framings function not as neutral arbiters, but as tools for strategic evaluation and in-group positioning. Conversely, the bias-neutral effect of Identity Suspension supports earlier work suggesting that attention to material constraints and systemic complexity can temporarily decouple cognition from identity threat (Norgaard, 2011).

Notably, the null effects observed for Strategic Social Creativity complicate assumptions derived from classic social creativity theory, which posits that dimension shifting should reduce intergroup conflict by redefining evaluative criteria (Tajfel & Turner, 1979). Here, metric shifting and strategic self-critique appear to preserve group coherence without escalating bias, indicating a defensive equilibrium rather than genuine depolarization. Finally, Meta-Identity Breakdown resembles what prior scholarship has described as affective disengagement or fatalistic withdrawal, wherein deliberation is curtailed not through consensus but through the erosion of agency and evaluative relevance (Bandura, 1999).

Although Superordinate Identity was not modelled as a regression predictor, its distribution across topics informs the qualitative interpretation of Layer C. The exploratory category of Superordinate Identity, included as a theoretically adjacent but empirically derived category, captures a residual recategorization dynamic in which speakers invoke a shared human or global identity to transcend ingroup–outgroup distinctions. This pattern is consistent with SIT’s account of superordinate categorization as a potential depolarizing mechanism (Gaertner & Dovidio, 2000; Tajfel &

Turner, 1979), though its limited prevalence in the corpus suggests it remains a marginal rather than structurally significant feature of Reddit climate discourse.

4.6.3 CHINA AS A CROSS-LAYER RHETORICAL RESOURCE

The term *china* appears as a top-probability word across multiple discursive layers, suggesting a distributional breadth not observed for other national referents in the corpus. In Layer A, *china* co-occurs with *energy*, *green*, *renewable*, *production*, and *economic* in T₁₃, a lexical pattern consistent with technoeconomic framing of state capacity. In Layer C, *china* appears alongside *blame*, *fact*, and *reduce* in T₄, and alongside *western*, *developed*, *rich*, and *nations* in T₈ —co-occurrence patterns consistent with intergroup accountability and post-colonial responsibility framing respectively. In Layer E, *china* co-occurs with *trump*, *trade*, *economy*, and *americans* in T₁₂, and with *largest*, *biggest*, *military*, and *planet* in T₁₄ —a lexical pattern consistent with status-comparative and zero-sum antagonism framing. Taken together, these observations indicate that China-referencing terms are distributed across the full gradient of the discursive hierarchy rather than concentrated within a single layer.

The regression results reported in Table 4.2 indicate that Layer B is associated with the strongest positive bias coefficient relative to Layer E (estimate = 0.0084, 95% CI [0.0049, 0.0119], $p < .001$), while Layer A is associated with a non-significant coefficient (estimate = 0.0007, $p = .612$). T₁₃, the topic in which *china* co-occurs most consistently with technoeconomic vocabulary, is classified in Layer A, where the regression results indicate no significant evaluative bias. Layer B topics —T₅ and T₉ —involve comparable competence-based and infrastructure-oriented framing but are associated with a significantly stronger positive bias coefficient; this pattern is consistent with the regression results, though the data do not establish a directional relationship between co-occurrence structure and bias magnitude. Whether the lexical distinction between T₁₃ and the Layer B topics accounts for any portion of the observed difference in bias coefficients cannot be determined

from the present analysis. This observation is nonetheless consistent with the possibility that the layer-level gradient described in Section 4.5.1 corresponds, at least descriptively, with variation in evaluative bias coefficients.

Three distributional patterns in China invocation are observable across the topic model. First, in T₁₃, china co-occurs with terms including renewable, clean, green, economic, and growth—a pattern observed within Layer A and associated with technoeconomic and capacity-oriented vocabulary. Second, in T₄ and T₈, china appears alongside blame, reduce, western, developed, rich, and nations—co-occurrence patterns observed within Layer C and linked to responsibility attribution and regional categorization. Third, in T₁₂ and T₁₄, china is observed in proximity to largest, biggest, military, trade, and trump—terms associated with superlative scale comparison and geopolitical decline framing, and located within Layer E. These three distributional patterns correspond to distinct positions along the gradient structure described in Section 4.5.1, and their layered variation is consistent with the theoretical gradient imposed on the topic model through qualitative classification. These distributional patterns are based on lexical co-occurrence data and cannot be taken as evidence of systematic rhetorical variation at the level of communicative practice.

The modest explained variance of the regression model (adjusted $R^2 = 0.006$) warrants explicit acknowledgment as a substantive limitation. Among the most proximate sources, the Bias Score operationalization relies on a dictionary with limited coverage of climate-specific evaluative language, particularly in the Negative/Blame Rhetoric category, which may systematically underestimate the full range of outgroup-oriented framing in the corpus; future research employing finer-grained operationalizations of evaluative bias would be better positioned to assess the strength of this relationship.

4.6.4 METHODOLOGICAL IMPLICATIONS FOR COMPUTATIONAL CLIMATE COMMUNICATION

Methodologically, the findings demonstrate the value of combining unsupervised topic modeling with theoretically grounded discursive classification. Rather than treating topics as substantively independent or normatively equivalent, the hierarchical layering reveals how topic context itself conditions identity salience and bias expression. This approach extends prior computational studies of climate communication that focus primarily on sentiment or polarization metrics by embedding discourse within a structured social–psychological framework.

The modest explained variance of the regression model is consistent with expectations for large-scale, text-based analyses of abstract constructs such as bias. Importantly, the statistically robust substitution effects underscore that compositional modeling captures meaningful discursive dynamics that would be obscured by absolute frequency counts or single-dimension polarization measures. These results suggest that future NLP-based climate communication research would benefit from modeling discourse as a system of substitutable strategies rather than as isolated frames.

4.6.5 GROUNDED CONCLUSIONS AND IMPLICATIONS

Taken together, the results indicate that bias in climate discourse is most likely to intensify when discussions transition from systemic abstraction to comparative evaluation, particularly along dimensions of competence and moral responsibility. For climate communication and policy engagement, this implies that technocratic or performance-based framings—often assumed to be depoliticizing—may inadvertently activate identity competition and evaluative bias. In contrast, framings that foreground physical constraints, scientific uncertainty, or systemic complexity appear to neutralize identity dynamics without provoking additional bias.

These findings do not suggest that evaluative discourse should be avoided, but they underscore

the importance of recognizing when and how comparative frames reintroduce identity threat. Effective climate communication may therefore depend less on increasing informational precision or moral clarity, and more on managing the discursive transitions that move audiences from shared sensemaking into arenas of social comparison.

4.7 CONCLUSION

This study presents a process-oriented, hierarchical analysis of climate change discourse on Reddit, integrating SIT with quantitative measures of bias and compositional data analysis. By mapping discourse into five layers—ranging from Identity Suspension (Layer A) to Meta-Identity Breakdown (Layer E)—the analysis demonstrates how online climate discussions systematically manage identity salience, escalate moralization, and, under conditions of heightened identity threat, culminate in the breakdown of deliberation.

Three principal contributions emerge from the findings. First, the study extends SIT into dynamic online environments by showing how participants engage in identity buffering, competence comparison, moral negotiation, and strategic metric manipulation as they navigate cognitive and moral pressures within climate discourse. Second, the results identify layer-specific mechanisms associated with bias. Instrumental Comparison and Moralized Comparison (Layers B and C) are associated with higher levels of evaluative bias, whereas Identity Suspension and Strategic Social Creativity (Layers A and D) are associated with discursive stabilization rather than escalation. The application of compositional data analysis further clarifies that substitutions away from meta-discursive framing (Layer E) toward more agentic and evaluative modes of discourse—particularly those centered on competence—are systematically associated with increased bias. Third, the analysis characterizes the terminus of deliberation. In Meta-Identity Breakdown (Layer E), rational exchange gives way to epistemic cynicism and geopolitical anxiety, illustrating the conditions under which

deliberative engagement is no longer sustained.

Collectively, the study advances theory, methodology, and practice. Theoretically, it positions SIT as a dynamic and process-oriented framework capable of capturing identity negotiation across shifting discursive contexts in digital debates. Methodologically, it demonstrates the utility of integrating hierarchical discourse modeling with compositional regression to examine how substitutions between discursive layers are associated with variation in bias. Practically, the findings suggest that climate communication interventions may benefit from focusing on high-bias layers (B and C), while selectively drawing on stabilizing strategies characteristic of lower-bias layers (A and D) to support more deliberative and less polarized forms of engagement.

In sum, the analysis shows that online climate discourse is not a static contestation of opinions, but a structured, identity-driven ecosystem. Attending to its layered dynamics provides a grounded framework for understanding how bias emerges, how deliberation is maintained or disrupted, and how constructive engagement might be supported in digitally mediated public spheres.

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5

Conclusion: A Multi-Dimensional Framework of Climate Discourse

This monograph adopts a multi-dimensional approach to examine climate change discourse across distinct communicative arenas, reflecting broader developments in climate communication research that emphasise the role of framing, media mediation, and public engagement (Nisbet, 2009; Boykoff, 2011). The overarching framework is organised along three dimensions—political, struc-

tural, and psychological—which collectively facilitate a comprehensive understanding of how climate discourse is produced, disseminated, and interpreted in contemporary media environments. The political dimension focuses on the generation of discourse within traditional media, particularly state-aligned newspapers. The structural dimension addresses the patterns of circulation and influence within digital networks, highlighting the role of algorithms, actor positioning, and relational connectivity. The psychological dimension considers the interpretive processes and social identity mechanisms that shape audience reception and discursive bias in online environments. By maintaining these three analytically discrete lenses, the study allows for the systematic investigation of climate discourse across its lifecycle—from source generation, through mediated pathways, to individual reception and response—without presuming causal links among these domains, consistent with qualitative research designs that prioritise multi-level analytical perspectives rather than linear causal modelling (Maxwell, 2013).

The following sections summarise the principal findings of each dimension, in turn, outlining the context, methodological approach, and key contributions of the respective analyses. The political dimension, as operationalised in the first component of this study, addresses the production of climate change discourse within the context of Chinese newspapers between 2000 and 2020. It is concerned with the mechanisms by which discourse is generated, structured, and aligned with official environmental policies. This dimension provides a foundation for understanding the formal communicative strategies employed by traditional media to shape public understanding and to consolidate the state's discursive authority.

5.1 DIMENSION 1: POLITICAL (SOURCE)

5.1.1 CONTEXT

The political dimension centres on the discursive construction of climate change in Chinese newspapers over two decades, encompassing the period from 2000 to 2020. This era is marked by the increasing institutionalisation of environmental policy within China, alongside a growing global focus on climate governance. Within this context, newspapers functioned as both vehicles for information dissemination and instruments for aligning public perception with official policy objectives. The study foregrounds the role of party-sponsored newspapers, particularly *People's Daily* and *Guangming Daily*, while also considering non-party-sponsored outlets, including *Beijing News*, *Southern Weekend*, and *Caixin Weekly*, to situate media coverage within a broader landscape of journalistic practice. The analysis situates climate change as a discursive object shaped by a variety of strategies, including expertise, quantification, dramatization, moralization, mystification, self-euphemization, condemnation of the other, and denial. Across the twenty-year period, the evolution of coverage reflects both temporal policy milestones—such as the Eleventh and Thirteenth Five-Year Plans—and international events, including the 2007 UN Climate Change Conference in Bali and the Paris Agreement (COP 21) in 2015. The political dimension thus captures the structured processes through which climate change was made meaningful within Chinese media and how these processes corresponded with state objectives in consolidating discursive hegemony.

5.1.2 METHODS

The methodological approach integrates Critical Discourse Analysis (CDA) with a dual focus on textual and contextual analysis, drawing on established approaches to media discourse and ideological representation in communication research (Fairclough, 1995; van Dijk, 1998; Wodak & Meyer,

2001). Textual analysis considered the deployment of discursive strategies, lexical choices, thematic emphases, and formal features, such as genre and article length. Contextual analysis was pursued along two axes: a comparative-synchronic approach, which allowed simultaneous description across multiple newspapers, and a historical-diachronic approach, which traced the evolution of discourse over time. A comprehensive corpus of 19,676 climate change news articles was constructed from People's Daily ($n = 11,874$) and Guangming Daily ($n = 7,802$), identified through the WiseSearch database using keywords such as "climate change," "global warming," "climate risk," and "low carbon." A sampled CDA analysis was conducted on 35 articles from each party-sponsored newspaper across three periods: 2000–2006, 2007–2014, and 2015–2020, selected for topic relevance, popularity, layout, length, and information source. Complementary reference analysis incorporated 30 articles from non-party-sponsored newspapers, enabling evaluation of coverage beyond state-aligned sources.

5.1.3 FINDINGS

The study identifies distinct temporal patterns in the discursive construction of climate change. Between 2000 and 2006, climate change emerged gradually in media coverage but was not yet framed as a salient public concern. Party-sponsored newspapers employed quantification to contextualise climate risks and cited domestic experts to mitigate public anxiety. Mystification and valorization of ecological projects further moderated perceived threats, as exemplified by coverage highlighting substantial investments in environmental infrastructure, such as the protection of the Tarim River Basin. Non-party-sponsored newspapers largely echoed these discursive strategies, incorporating euphemization and popular science content. The period from 2007 to 2014 witnessed a substantial increase in coverage, driven by domestic policy initiatives and international climate negotiations. Party-sponsored media employed euphemization and moralization to position China positively on the global stage and to counteract international criticism, particularly following COP

15 in 2009. Non-party-sponsored outlets diversified the discursive landscape by integrating human-interest narratives and economic perspectives, while largely maintaining alignment with the national policy agenda. Between 2015 and 2020, media discourse increasingly emphasised China's international leadership, moral responsibility, and policy achievements, particularly in the wake of the Paris Agreement and the deterioration of China–U.S. relations post-2017. Moralization, self-euphemization, and expertise were strategically combined to reinforce state authority and present China's climate governance as exemplary, while market-oriented media such as Caixin News highlighted economic aspects and dramatized urgency without direct state critique. Across all periods, the corpus demonstrates that party-sponsored newspapers consistently aligned with official environmental policy, reflecting the broader institutional role of media in shaping and reinforcing state narratives within the Chinese political communication system (Brady, 2009).

5.1.4 CONTRIBUTION

This dimension contributes empirically to the understanding of climate discourse production within a state-mediated media environment. The study delineates the specific discursive strategies through which newspapers aligned with official policy and facilitated the consolidation of governmental hegemony. It highlights the interplay between textual construction, political context, and the institutional imperatives of media practice. Furthermore, it provides critical insight into the mechanisms by which climate change is framed, valorized, or mitigated through discursive devices such as expertise, moralization, and self-euphemization. By documenting the evolution of these strategies over two decades and across multiple outlets, this dimension elucidates the processes by which political actors and media institutions co-produce climate narratives, shaping both domestic understanding and the international image of China's climate governance. In doing so, it establishes the foundational lens of the monograph, demonstrating how climate discourse is generated as a politically situated phenomenon and setting the stage for subsequent examination of its circula-

tion and reception within structural and psychological dimensions.

Building upon this analysis of discourse production within traditional media, the second dimension shifts attention to the structural pathways through which climate-related information circulates within digital environments.

5.2 DIMENSION 2: STRUCTURAL (PATHWAY)

5.2.1 CONTEXT

The structural dimension examines the circulation of climate-related discourse within digital networks, specifically focusing on the 2021 Henan floods as observed on the Chinese social media platform Weibo. This dimension addresses the patterns of information flow, the relational configuration of actors, and the structural mechanisms that influence the visibility and mobilisation of discourse within digital networks, drawing on established research in network science and information diffusion (Barabási, 2016; Bakshy et al., 2012). Within this framework, the study treats the social media environment as a complex, algorithmically mediated ecosystem in which human actors, automated accounts, environmental events, and platform-specific features collectively co-produce discursive influence and engagement. The Henan floods serve as a cosmopolitical actant, generating environmental disruption that triggers a surge of digital interactions and reshapes the relational positioning of network participants. The analytical focus is on how structural centrality, engagement, and recruitment capacity are distributed across heterogeneous nodes, and how these patterns are modulated by both algorithmic amplification and event-driven dynamics. The structural dimension thus situates discourse within the networked pathways through which information propagates, enabling examination of the emergent patterns that structure digital public debate without presupposing linear influence from traditional media sources.

5.2.2 METHODS

A multi-method network analysis informed by Actor-Network Theory (ANT) was employed to map the structural configuration and mobilisation potential within the Weibo discourse surrounding the Henan floods. The study constructed a network comprising nodes representing individual accounts and edges corresponding to relational interactions. Centrality measures, including k-core analysis and PageRank, were applied to assess structural embedding and hierarchical positioning within the network, following established methodological frameworks in social network analysis (Freeman, 1977; Newman, 2018). Community detection was implemented using the Modularity algorithm, and the E-I Index was calculated to evaluate the ratio of internal to external connectivity within communities. Engagement was operationalised through median interaction metrics, while recruitment capacity served as an indicator of a node's potential to mobilise followers. Temporal analysis compared network configurations across pre-event, during-event, and post-event phases, facilitating assessment of the dynamics of expansion, consolidation, and structural closure. Spearman correlation analysis quantified macro-level associations between PageRank and engagement ($\rho = 0.917$), and ANT-informed interpretation allowed integration of human, automated, and environmental actants with platform algorithmic processes. The methodological design thus foregrounded the structural and relational dimensions of discourse circulation while capturing the co-constitutive role of digital infrastructures in shaping visibility and interaction.

5.2.3 FINDINGS

The Weibo discourse network exhibited a stratified and segmented topology with pronounced modularity. Pre-event network analysis revealed a weakly articulated structure comprising 2,231 nodes and 2,213 edges, with minimal community differentiation (Modularity = 0.037). During the flood event, the network expanded markedly to 13,265 nodes and 13,360 edges, accompanied by an in-

crease in Modularity to 0.673, reflecting the emergence of institutionally and relationally cohesive clusters. Post-event contraction yielded a network of 5,324 nodes and 5,372 edges, characterised by highly cohesive but externally insulated communities (Modularity = 0.942). Across all phases, the E-I Index remained strongly negative (-0.960), indicating that the majority of interactions were internally contained within communities, with 98% of ties confined to intra-community exchanges. Bridging nodes, although sparse, facilitated limited cross-community translation and maintained structural linkages between otherwise isolated clusters.

At the level of individual actors, structural centrality and engagement exhibited both alignment and divergence. Node 1294811905 demonstrated maximal PageRank (0.129145166) and moderate median engagement (8), while Node 1202968283 achieved substantial engagement (1,858) and exceptionally high recruitment capacity (4.764), despite occupying a comparatively peripheral structural position (PageRank = 0.06256542). Conversely, Node 3296569781 achieved extreme engagement (8,763) with minimal structural embedding (PageRank = 0.00002682651). These findings indicate that macro-level correlations between PageRank and engagement are largely consistent, yet micro-level divergences reveal that structurally central nodes may not generate commensurate interaction, whereas content-rich or visually salient nodes achieve high engagement despite low centrality. Hybrid mobilisers sustained mid-level recruitment through consistent interactions both within and across clusters, while algorithmic processes—including feed ranking and content promotion—amplified certain nodes, reflecting the growing role of algorithmic curation in shaping visibility and information flows on digital platforms (Gillespie, 2014).

The analysis further indicates that the environmental event of the Henan floods acted as an exogenous shock, triggering network mobilisation and driving temporal reconfiguration. Institutional nodes maintained dense internal reciprocity, consolidating narratives within communities, whereas grassroots actors leveraged algorithmic amplification and content resonance to achieve disproportionate engagement. Cross-community bridging relied on a limited set of structurally fragile nodes,

underscoring the importance of relational positioning in mediating network-wide circulation. Network segmentation and modularity increased progressively over time, reflecting the consolidation of algorithmically and relationally stabilised clusters in the post-event phase. Overall, the digital discourse exhibited a dynamic interplay among human actors, algorithmic affordances, and environmental contingencies, generating a complex topology of influence, engagement, and recruitment within the Weibo network.

5.2.4 CONTRIBUTION

This dimension contributes to the understanding of climate discourse by elucidating the structural and relational dynamics that shape digital circulation and public visibility. By integrating network analysis with ANT-informed interpretation, the study demonstrates that influence, engagement, and recruitment within online climate discourse are co-produced by heterogeneous actants, algorithmic mediation, and event-driven dynamics. It reveals that structural centrality does not necessarily correspond to high engagement or mobilisation potential and that algorithmic amplification can create asymmetries in visibility and interaction. The temporal trajectory from pre-event diffusion to post-event consolidation highlights the processes by which networked discourse stabilises, modularises, and insulates itself within cohesive communities. Moreover, the analysis identifies the differentiated roles of institutional, grassroots, and bridging actors, illustrating how structural positioning and relational resonance collectively mediate the circulation and reception of climate-related information. By systematically mapping these patterns, the structural dimension provides a rigorous empirical account of the pathways through which climate discourse traverses digital networks, establishing the meso-level architecture of information flow that complements the political and psychological dimensions of the study.

While the structural dimension clarifies how climate discourse travels through digital networks, the final dimension turns to the interpretive responses of individuals who encounter and engage

with such discourse online.

5.3 DIMENSION 3: PSYCHOLOGICAL (RESPONSE)

5.3.1 CONTEXT

The psychological dimension addresses the interpretive and cognitive responses of individuals to climate change discourse within online environments, focusing on the dynamics of social identity and evaluative bias. The study examines discourse on Reddit, a global digital platform, where participants engage in discussions across multiple climate-focused subreddits, including r/climatechange, r/climate, r/environment, and r/ClimateNews. This dimension investigates how social identity influences the reception, interpretation, and escalation of climate-related discourse, drawing on the social identity tradition in social psychology which emphasises the role of group membership in shaping intergroup evaluation and bias (Tajfel & Turner, 1979; Reicher, Spears, & Haslam, 2010).

By examining discourse at the individual level, this dimension complements the political and structural analyses, elucidating the psychological processes that mediate responses to climate information once it has been disseminated across traditional and digital pathways. The study situates climate discourse as a stratified cognitive ecosystem, wherein layered identity dynamics interact with normative, evaluative, and epistemic components, thereby shaping the formation of bias and the trajectory of online debate.

5.3.2 METHODS

A layered analytical framework and compositional modeling approach were employed to capture the multi-level structure of climate discourse and its relationship with identity-driven bias. The dataset comprised 10,401 comments extracted from 65 posts across the four subreddits, with pre-processing procedures that converted tokens to lowercase, removed stop words, punctuation, and

numerical digits, and filtered terms appearing in >99% or <0.1% of documents. Latent Dirichlet Allocation (LDA) with Gibbs Sampling was implemented in R (topicmodels and ldatuning), resulting in a 20-topic solution, following the probabilistic topic modelling framework originally proposed by Blei, Ng, and Jordan (2003). Topics were manually typified through close reading of top-loading words and representative documents, enabling identification of identity-related mechanisms such as Strategic Buffering, Environmental Securitization, and Meta-discursive Cynicism. Quantitative assessment of group bias utilised dictionary-based analyses in R (quanteda package), calculating BiasScore as OutgroupRatio minus IngroupRatio and normalising by document length. Hierarchical compositional regression analyses employed additive log-ratio (ALR) transformations, consistent with statistical approaches for analysing compositional data structures (Aitchison, 1982). This methodological approach allowed systematic examination of layer-specific shifts in identity salience, discursive evaluation, and the emergence of bias across hierarchical strata of discussion.

5.3.3 FINDINGS

The analysis reveals a stratified hierarchical structure of climate discourse, comprising five distinct layers (A–E) characterised by differential identity salience and evaluative orientation. Layer A, termed Identity Suspension or Cognitive Realism, focuses on material and physical constraints of renewable energy and complex scientific processes, with discussions anchored in scientific literacy and temporally suspended moral evaluation. Layer B, Instrumental Comparison or Pragmatic Rationalization, involves technocratic evaluation, industrial logic, and procedural standards, stabilising identity through metric-based assessments while displacing normative moral evaluation. Layer C, Moralized Comparison or Moral Dualism, exhibits high identity salience, where participants engage in critique of domestic elites, invoke superordinate identities, and negotiate intergroup accountability, activating evaluative bias through moralised framing. Layer D, Strategic Social Creativity or Epistemic Evaluation, reflects meta-cognitive discourse in which participants employ reversed com-

parisons, strategic moral accounting, and temporal uncertainty to balance legitimacy and competence assessments. Finally, Layer E, Meta-Identity Breakdown or Deliberation Collapse, represents the endpoint of discourse, where rational debate is curtailed, deliberation collapses, and attention shifts to status and geopolitical concerns, sustaining out-group bias.

Compositional regression analyses indicate that shifts from Layer E toward Layers B and C are associated with systematic increases in evaluative bias. Instrumental Comparison (Layer B) exhibits a positive relationship with bias ($\beta = 0.0084$, 95% CI [0.0049, 0.0119], $p < 0.001$), while Moralized Comparison (Layer C) also shows a significant positive effect ($\beta = 0.0055$, 95% CI [0.0013, 0.0096], $p = 0.010$). In contrast, Identity Suspension (Layer A) and Strategic Social Creativity (Layer D) display non-significant associations with bias ($\beta = 0.0007$, $p = 0.612$ and $\beta = -0.0007$, $p = 0.715$, respectively), indicating stabilising effects on discourse.

These findings demonstrate that evaluative bias is selectively activated during shifts from systemic abstraction toward agentic and comparative evaluative layers, consistent with social psychological research demonstrating how collective identity frameworks shape patterns of in-group and out-group evaluation (Brewer and Gardner, 1996). The hierarchical layering of discourse therefore conditions both the emergence and modulation of bias, providing a nuanced understanding of the psychological mechanisms underpinning individual responses to climate discourse.

5.3.4 CONTRIBUTION

The psychological dimension extends Social Identity Theory into online climate discourse, demonstrating the dynamic processes through which participants engage in identity buffering, competence comparison, moral negotiation, and strategic metric manipulation. By characterising layer-specific mechanisms, the study identifies high-bias contexts (Layers B and C) in which evaluative and moralised comparisons intensify in-group/out-group differentiation, as well as stabilising contexts (Layers A and D) where discourse remains anchored in scientific literacy and systemic abstrac-

tion. The analysis of Meta-Identity Breakdown (Layer E) elucidates the limits of deliberative exchange, highlighting the transition from rational evaluation to affective disengagement and geopolitical framing. Methodologically, the integration of hierarchical topic modeling with compositional regression enables precise mapping of discursive substitutions and their influence on bias, providing a framework for targeted climate communication strategies. By articulating how individual identity processes shape the reception and interpretation of climate discourse, this dimension complements the political and structural analyses, completing the multi-dimensional lens on climate communication.

Taken together, the findings from these three analytical perspectives provide the basis for the integrated framework presented in the concluding section below.

5.4 CONCLUSION OF THE INTEGRATED FRAMEWORK

Across the three studies, one descriptive observation warrants brief note: in each communicative environment examined, some form of stratification appears to organise discourse—whether in the hierarchical alignment of newspapers with state authority, the tiered positioning of actors within digital networks, or the layered identity dynamics shaping online deliberation. This parallel is noted cautiously, as each instance arises from environment-specific mechanisms that were analysed independently and are not assumed to be causally connected. Whether this reflects a broader feature of climate communication or is an artefact of the analytical frameworks employed remains an open question for future research. Collectively, the three dimensions—political, structural, and psychological—constitute a comprehensive framework for analysing climate change discourse from source to pathway to response. The political dimension captures the generation of discourse within traditional media and its alignment with state policy objectives. The structural dimension elucidates the circulation and visibility of discourse across algorithmically mediated digital networks, highlighting

patterns of engagement, recruitment, and community consolidation. The psychological dimension addresses individual interpretive processes, identity salience, and the conditions under which evaluative bias emerges or is stabilised in online discussions. Importantly, this study does not aim to establish linear causal relationships among these dimensions; rather, it utilises three complementary observational lenses to provide a multi-level perspective on climate discourse. By maintaining the analytical independence of each dimension, the monograph preserves methodological and empirical rigour while enabling scholars to examine climate communication as a complex, multi-faceted phenomenon, tracing its evolution from discursive production to structural propagation and, finally, to cognitive and social interpretation.

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A

Appendix

A.1 TOPIC MODEL, TOP WORDS, AND ASSOCIATED FRAMES

Table A.1: Topic model, including labels, top 10 words and associated frame. Notice that all words were transformed into lowercase letters before modeling.

Topic	Topic Label	Top 10 Words	Associated Group
T1	Fossil Oil and Fuel Dependency	fossil, oil, fuel, just, make, fuels, also, use, using, industry	Moralized Comparison
T2	Climate Change and Governance Debate	climate, change, said, believe, care, plan, zero, say, issue, gt	Strategic Social Creativity
T3	Public Perception and Everyday Reasoning	people, think, really, many, things, don, lot, know, let, real	Moralized Comparison
T4	China and Responsibility Attribution	even, still, china, less, yes, though, lot, used, fact, reduce	Moralized Comparison
T5	Energy Infrastructure and Transition	coal, power, plants, new, gas, building, nuclear, capacity, renewables, electricity	Instrumental Comparison
T6	Pragmatic Realism and Feasibility	can, see, need, way, go, point, keep, around, enough	Instrumental Comparison
T7	Comparative Evaluation and Problem Framing	much, problem, better, making, great, sure, make, part, pretty, worse	Instrumental Comparison
T8	Global Inequality and International Responsibility	china, countries, western, india, west, usa, nations, developed, rich, developing	Moralized Comparison
T9	Renewable Technology and Market Dominance	solar, manufacturing, panels, wind, batteries, huge, cheap, cost, massive, cars	Instrumental Comparison
T10	Cynicism and Futility Narratives	get, time, want, take, long, back, work, everyone, going, first	Meta-Identity Breakdown
T11	Epistemic Validation and Information Skepticism	one, actually, article, something, way, read, data, look, saying, always	Instrumental Comparison
T12	Geopolitics and Strategic Decline	us, now, right, trump, europe, economy, china, trade, since, americans	Meta-Identity Breakdown
T13	Renewable Energy and Green Development	energy, china, also, green, clean, renewable, production, economic, growth, sources	Identity Suspension
T14	Comparative National Emissions	china, world, country, largest, every, rest, biggest, planet, made, large	Meta-Identity Breakdown
T15	Carbon Accounting and Per Capita Logic	emissions, per, carbon, capita, eu, population, total, lower, half, emission	Strategic Social Creativity
T16	Temporal Uncertainty and Deleted Futures	deleted, years, year, last, since, ago, gt, next, past, compared	Strategic Social Creativity
T17	Governance Systems and Political Legitimacy	chinese, government, true, states, policy, makes, system, uk, means, control	Strategic Social Creativity
T18	Meta-Cynicism and Emotional Exhaustion	just, good, going, bad, stop, say, yeah, shit, know, lol	Meta-Identity Breakdown
T19	Environmental Pollution and Climate Science	global, pollution, warming, air, increase, water, average, due, effect, reduction	Identity Suspension
T20	Humanity and Moral Relativism	like, well, just, earth, nothing, seems, human, america, already, australia	Meta-Identity Breakdown

A.2 20 TOPIC LABELS, EXPLANATIONS, AND SIT CLASSIFICATION

TOPIC 1

Label: Institutional Responsibility and Intra-group Critique

Explanation: Reddit users assign responsibility for climate inaction to internal elites (e.g., fossil fuel corporations, politicians), rather than ordinary citizens. This reflects “intra-group blaming,” allowing the broader in-group to maintain moral integrity by distancing from deviant sub-groups.

SIT Classification: Responsibility Attribution (Institutional & Intra-group)

Typical Stance: In-group policing and self-criticism; moral self-purification without external hostility.

TOPIC 2

Label: Epistemic Legitimacy, Knowledge Authority, and Comparative Governance Efficacy

Explanation: Users compare out-group (e.g., China) and in-group (Western countries) performance. Competence-based respect for the out-group’s strategic consistency allows criticism of the in-group’s hypocrisy. Distinguished from Layer B in that evaluation is mediated through epistemic credibility and governance legitimacy rather than infrastructure metrics or cost-efficiency—a form of dimension-shifting that characterizes strategic social creativity.

SIT Classification: Perception & Epistemic Evaluation (Competence vs. Integrity)

Typical Stance: Out-group admiration serves as a vehicle for in-group self-critique.

TOPIC 3

Label: Superordinate Identity and Cognitive Diffusion in Climate Discourse

Explanation: Focuses on collective human cognitive limitations rather than specific nations. Shared responsibility is diffused across “people in general,” reducing intergroup confrontation but potentially creating “learned helplessness.”

SIT Classification: Perception & Awareness (Identity Recategorization)

Typical Stance: Common in-group identity; superordinate human identity reduces psychological cost of assigning blame.

TOPIC 4

Label: Intergroup Accountability and the Global Responsibility Debate

Explanation: Users assess global responsibility for emissions across producers and consumers. Comparative assessments highlight fairness and interdependencies.

SIT Classification: Responsibility Attribution (Intergroup Accountability)

Typical Stance: Blame attributed to both domestic and foreign actors, emphasizing equity and policy evaluation.

TOPIC 5

Label: Energy Infrastructure, Transition Efficiency, and Strategic Autonomy

Explanation: Users focus on technical evaluation of energy strategies (e.g., coal plants, grid capacity), shifting discourse from moral judgment to functional assessment.

SIT Classification: Pragmatic Rationalization (Competence over Morality)

Typical Stance: Out-group competence is acknowledged to neutralize moral conflict.

TOPIC 6

Label: Systemic Pragmatism and Existential Realism

Explanation: Evaluates global climate salvageability; identity distinctions are suspended under shared existential threat. Focus on feasibility and systematic reasoning rather than morality.

SIT Classification: Superordinate Identity Activation under Existential Threat

Typical Stance: Forward-looking technical rationality; neutralizes ideological or intergroup confrontation.

TOPIC 7

Label: The Calculus of Culpability and Moral Dilution

Explanation: Relativistic moral comparisons across multiple environmental metrics (“what-about-ism”), minimizing perceived in-group responsibility.

SIT Classification: Relativistic De-responsibilization (Metric-based Cynicism)

Typical Stance: Moral dilution; complexity used to argue in-group contributions are minimal.

TOPIC 8

Label: Post-Colonial Justice and the Global North-South Divide

Explanation: Historical responsibility for emissions shapes discourse; Global South aligned against Western hypocrisy.

SIT Classification: Moral Recategorization (Global North vs. Global South)

Typical Stance: Out-group solidarity; critique of in-group moral authority.

TOPIC 9

Label: Technoeconomic Pragmatism and the Logic of Market Dominance

Explanation: Industrial and economic efficiency drive evaluation; environmental progress measured by production, scale, and cost.

SIT Classification: Technoeconomic Realism (Competence over Morality)

Typical Stance: Out-group competence recognized; in-group defensive bias is secondary.

TOPIC 10

Label: Domestic Dysphoria and the Micro-Politics of Futility

Explanation: Local political exhaustion shapes global systemic interpretation; includes trans-human perspective assessing collective human failure.

SIT Classification: Intra-group Alienation & Cross-Group Ecological Fatalism

Typical Stance: Systemic cynicism at domestic level; species-level fatalism at global level.

TOPIC 11

Label: Epistemic Vigilance and the Discursive Validity Battle

Explanation: Meta-discursive debate on knowledge production, verification, and weaponization. Users claim epistemic superiority to assert in-group authority.

SIT Classification: Intellectual Distinction (Cognitive Gatekeeping)

Typical Stance: Subreddit “sanity check”; meta-level policing of knowledge and truth claims.

TOPIC 12

Label: Strategic Decline Narratives and Missed Leadership

Explanation: Focus on Western hegemony loss and internal political friction; in-group scape-goating preserves national self-esteem.

SIT Classification: Intergroup Competition (Collective Relative Deprivation & Status Threat)

Typical Stance: Blame internal subgroups; geopolitical regret framing.

TOPIC 13

Label: Renewable Ambitions and the Economic-Environmental Nexus

Explanation: Nations assessed for competence in renewable energy deployment; duality of fossil and renewable sectors highlights strategic motivations over morality.

SIT Classification: Technoeconomic Realism (Competence over Morality)

Typical Stance: Global competence evaluation; relative technological and economic status assessed.

TOPIC 14

Label: Hegemonic Antagonism and the “World’s Largest” Comparative Trap

Explanation: Extreme zero-sum framing of China as existential threat; superlative and absolutist discourse dominates.

SIT Classification: Existential Threat Framing (Zero-Sum Antagonism with Hostile Attribution)

Typical Stance: Maximum out-group differentiation; identity-driven exaggeration and cognitive bias.

TOPIC 15

Label: Strategic Moral Accounting (Metric-Shifting Identity Defense)

Explanation: Users deploy selective metrics to defend in-group position and critique out-groups; morality mediated via numbers rather than ideology.

SIT Classification: Strategic Moral Accounting (Metric-Shifting Identity Defense)

Typical Stance: Numbers-as-weapon dynamic; selective interpretation preserves in-group moral status.

TOPIC 16

Label: Temporal Uncertainty and the Ephemerality of Climate Judgment

Explanation: Climate assessments are temporally unstable; progress and failure continuously renegotiated.

SIT Classification: Temporal Deferral and Unstable Norm Evaluation

Typical Stance: Temporal identity uncertainty; shifting evaluation of responsibility.

TOPIC 17

Label: Systemic Legitimacy Defense (Epistemic Distrust and Moralized Attribution)

Explanation: Evaluations of regime legitimacy, policy effectiveness, and moral authority. Skepticism toward external data reinforces in-group understanding.

SIT Classification: Systemic Legitimacy Defense

Typical Stance: Defense of institutional legitimacy; moralized and epistemic judgments intertwined.

TOPIC 18

Label: Meta-Discursive Cynicism and the “Propaganda War” Narrative

Explanation: Substantive policy discussion collapses into disputes over narrative legitimacy; emotive and aggressive language signals identity signaling.

SIT Classification: Meta-Cynical Polarized Defensiveness

Typical Stance: Identity boundary defense; out-group delegitimization under epistemic distrust.

TOPIC 19

Label: Scientific Complexity and the “Aerosol Termination” Paradox

Explanation: Mechanism-oriented reasoning dominates; minimal intergroup antagonism. Focus on technical literacy and climate model interpretation.

SIT Classification: Epistemic Neutralization (Mechanism-Based Reasoning Beyond Identity Defense)

Typical Stance: Technical sensemaking; identity concerns subordinated.

TOPIC 20

Label: Algorithmic Guardianship and the Cross-Topic Moral Anchor

Explanation: Hybrid topic combining automated moderation and moral “whataboutism.” Climate debate intersects with human rights claims; platform structure shapes discourse.

SIT Classification: Structural Neutrality vs. Moral Equivalence (Defensive Relativism)

Typical Stance: “Janitor and judge” role; automated moderation constrains discussion while moral disputes define in-group/out-group positioning.