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Taylor & Francis Group

Critical Arts

South-North Cultural and Media Studies

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/rcrc20

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To cite this article: Fu Chen (02 Apr 2025): International Relations in *China Daily*'s Climate Change News: An Approach of Social Network Analysis-informed Critical Discourse Studies, Critical Arts, DOI: 10.1080/02560046.2025.2483306

To link to this article: https://doi.org/10.1080/02560046.2025.2483306

CRITICAL ARTS
https://doi.org/10.1080/02560046.2025.2483306

International Relations in *China Daily*'s Climate Change News: An Approach of Social Network Analysis-informed Critical Discourse Studies

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ABSTRACT

When covering the pressing global issue of climate change, media outlets in various countries tend to construct networked international relations that align with their national interests. However, few studies have examined how international relations are portrayed in climate change coverage. Drawing on social network analysis-informed critical discourse studies (SNA-informed CDS), this study investigates the evolution of international relations in *China Daily*'s news reports on climate change (2010–2023). A combined quantitative and qualitative analysis reveals that these reports consistently emphasize the central roles of China, the US, and the EU, while each period constructs a distinctive network. Period 1 (2010–2011) emphasizes a binary division between the developing and developed worlds, portraying China as a key advocate for developing nations. Period 2 (2012–2015) introduces a tripolar representation featuring the US, EU, and a more confident, proactive China in tackling climate change. Period 3 (2016–2023) projects a tense Sino–US relationship, casting the US as a disruptor of the Paris Agreement and China as a defender of the framework, actively seeking EU support to uphold global climate commitments. These discursive shifts reflect China's balancing of leadership ambitions, climate commitments, and national interests in global climate governance.

KEYWORDS

Climate change; climate change news; China; *China Daily*; social network analysis; critical discourse studies; national interests

Introduction

Climate change is a serious challenge that transcends national borders, requiring collective action and mutual accountability from the international community. Within the frameworks of the Kyoto Protocol and the Paris Agreement, countries often leverage their environmental commitments to advance their national interests during international climate change negotiations (Idibekzoda 2024), where collaboration, competition, and compromises between these governmental entities shape the path toward collective climate action. In the coverage of such events related to international relations, a country's media outlets tend to construct narratives aligning with and supporting their source country (Cook 1997; Seib 1997; Wang 2017).

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Limited studies have concentrated on international relations represented in climate news over the past 20 years despite extensive research on climate change news from the perspective of critical discourse studies (CDS) (Wang and Huan 2024), which seek to reveal (unequal) relations between social actors and uncover underlying power dynamics and ideologies within discourse (Fairclough 1995; van Dijk 1988). Previous analytical perspectives include news frames (e.g. Molek-Kozakowska 2018), balanced reporting (e.g. Boykoff 2007), diachronic changes in news reporting (especially in the UK and the US, e.g. Gillings and Dayrell 2023; Stecula and Merkley 2019), the use of various types of metaphors (e.g. Atanasova and Koteyko 2017), and the representation of China's domestic stakeholders (Wang, Cui, and Qu 2024). Notably, in their corpus-assisted analysis of *China Daily*'s climate change news, Fu and Wang (2022) found that the newspaper emphasised the importance of cooperation between China and the US in global climate action, while portraying China as a responsible actor in global climate governance and the US as self-centered and inconsistent in its climate policies. In addition, Wang, Liu, and Xin (2024) analysed the construction of relationships between the two broad terms "developed countries" and "developing countries" represented in the relatively neutral UN climate news and discovered that these reports emphasised that "developed countries should provide funding to developing countries to solve climate change problems", thereby revealing the ideology of humanism endorsed by the UN.

These existing studies have primarily focused on bilateral relationships, but interactions in the complex issue of climate change are not limited to bilateral engagements but often involve additional Parties, non-Party stakeholders, subnational actors, international organisations, etc., creating a network of intertwined relations. As such, this study aims to address this gap by examining the international relations represented in *China Daily*'s climate change news through an integration of social network analysis (SNA) and CDS. For the sake of manageability, this study limits its focus to countries and a selected group of major international organisations, including the EU (European Union), AU (African Union), ASEAN (Association of Southeast Asian Nations), and UNASUR (Union of South American Nations).[1] Specifically, this study seeks to answer the following questions: (1) What are the salient features and patterns of the international relation networks that are discursively constructed in *China Daily*'s climate change reports, and how do they change across time? and (2) what are the underlying ideological or socio-political factors?

Social network analysis-informed critical discourse studies

This study adopts the approach of CDS informed by SNA developed by Chen and Wang (2023), which offers distinct yet interconnected insights into social relationships and power dynamics in discourse. SNA is a quantitative method that applies networks and graph theory to analyse social structures and relationships (Scott 2017). It focuses on the interactions between individuals, groups, organisations, or other entities within a network. These relationships are represented as nodes (social actors) and edges (their

[1]The country names are based on the list of United Nations' member states (https://www.un.org/en/about-us/member-states). Some variants of a certain country's name were aligned (e.g. USA, America, and the U.S.).

connections) in a graph, allowing researchers to study the structure, patterns, and dynamics of interactions from a network perspective, which would otherwise have been invisible to them. In SNA, ties between social actors can be "directed" or "undirected". Directed ties indicate a one-way relationship, such as one person following another on social media without being followed back, while undirected ties represent mutual relationships, such as two people being friends with each other.

SNA involves various techniques, one of which is the crucial task of identifying influential nodes within a network. However, what constitutes an influential node is subject to different interpretations, which are in turn captured by various "centrality measures". Among them, degree centrality measures the number of direct ties a node has, while eigenvector centrality considers not only a node's direct ties but also its neighbours' connections. Beta centrality generalises both degree and eigenvector centrality by considering both direct and indirect connections and taking into account their distances (Borgatti et al. 2024, 167). Betweenness centrality, on the other hand, measures how often a node lies on the shortest paths between nodes in a network, highlighting a node's role as a bridge or connector. In the present study, beta centrality and betweenness centrality are adopted because they reflect two distinct interpretations of a node's influence.

SNA also enables researchers to discover nodes that play equivalent roles and detect cohesive sub-groups or communities within a network. One major conceptualisation of role equivalence is regular equivalence, which identifies nodes that share similar patterns of connections, even if they are not connected to the same others. Regular equivalence is often detected by the REGE algorithm, which can be complemented by hierarchical clustering to visually depict the extent of regular equivalence between nodes. Additionally, cohesive sub-groups or communities within a network refer to distinct groups whose members interact more frequently with one another than with those outside the group. Community detection can be conducted using different algorithms, with one of the most widely used being the Girvan-Newman algorithm (Marqués-Sánchez et al. 2021; Vacca 2020). This algorithm iteratively removes edges (i.e. ties between pairs of nodes) with the highest betweenness centrality, resulting in different partitions (i.e. divisions) of the network (e.g. dividing a network into 3 communities). The quality of these partitions in a network is often assessed using Q values, where higher Q values generally indicate a more effective division of the network into cohesive sub-groups.

The practical implementation of this SNA-informed CDS approach consists of three stages (Chen and Wang 2023). In the context of this study, the first stage is to prepare relational language data, which involves extracting actor pairs that encode international relations (operationalised as countries and selected international organisations for this study). This foundational step provides the relational language data essential for subsequent analysis. The second stage is to conduct quantitative social network analysis. The three common descriptive measures of SNA discussed above are used to analyse the network's structure by identifying influential actors, uncovering actors with similar roles, and revealing cohesive communities. The final stage is to interpret results, focusing on explaining the presence of the salient features and patterns identified through SNA in their contexts. This involves a qualitative linguistic analysis of them within both the immediate textual context and the broader socio-political contexts, aiming to uncover power dynamics and ideologies embedded in the discourse under investigation.

Data and methods

To answer the questions raised in the Introduction, the study employs the SNA-informed CDS procedure discussed above. A corpus of climate change reports from *China Daily* was built. These articles were extracted using the search term "climate change" from a combination of the LexisNexis and the Factiva news databases, as the two sources were found to contain slightly different articles of the same newspaper. The time frame was set between 1 January 2010 and 31 December 2023, as China's media communication of climate change mainly began after the United Nations Climate Change Conference (UNFCCC) held in Copenhagen in December 2009 (See Fu and Wang 2022, 97), and 2023 was the closest full year at the time of data collection. The news articles retrieved from the two databases were then subjected to further screening. Non-news articles were removed, including interview transcripts, communiqués, white papers, government reports, etc. For the remaining articles, duplicate ones were removed using the freeware WCopyfind 4.1.5.[2] Two articles were considered duplicate when there was an 80% (or above) overlap of words between them. After the screening, a total of 8,775 news articles were retained. Drawing on Zhang and Orbie (2019), three distinct phases were identified in China's climate narratives, corresponding with COPs in Copenhagen (2009), Durban (2011), and Paris (2015). The general information of the subcorpora for the three periods (2010–2011, 2012–2015, and 2016–2023) is given in Table 1.

To clearly present the procedure of this study, Table 2 summarises the specifics of the three stages of analysis. In the first stage, dependency parsing was used to create relational pairs among the countries and selected international organisations from the news reports. Dependency parsing analyses a sentence into simple grammatical relationships between its words (Lei and Liu 2018; Liu, Xu, and Liang 2017; Osborne 2019). To illustrate, in the sentence "China overtook the US", "China" acts as the nominal subject (conventionally labeled "nsubj") of the verb "overtook", and "the US" serves as the direct object ("dobj") of the verb "overtook". In this way, we can identify a meaningful relation between the two countries. Moreover, dependency parsing allows us not only to capture cases where two actors are adjacent (such as the example above) but also where they are far apart in the sentence, which is a major advantage of the technique (Evert 2009, 1223).

The present study focuses on two grammatical relations: "nominal subject (nsubj)–direct object (dobj)" and "nominal subject (nsubj)–prepositional object (pobj)", where the subject and object can be countries or selected international organisations. For convenience, the two related grammatical relations are hereafter collectively named "subject–object pairs". The inclusion of both grammatical structures stands to capture more meaningful relations between relevant actors in the news. Utilising the Python package NLTK (Bird, Looper, and Klein 2009), the body part of each news article in the corpus was segmented into individual sentences. Sentences containing two or more countries/selected international organisations were retained. These sentences were then subjected to dependency parsing using the Python package spaCy (Honnibal et al. 2020). Subsequently, pairs of countries/international organisations forming "subject–object" relationships were extracted and manually checked within their contexts.

[2]Available at: https://plagiarism.bloomfieldmedia.com/software/wcopyfind/.

Table 1. The composition of the corpus.

Period	Number of Texts	Number of Tokens*
Period 1 (2010–2011)	691	463,597
Period 2 (2012–2015)	1,899	1,208,794
Period 3 (2016–2023)	6,185	4,085,566
Total	8,775	5,757,957

*Tokens of the body parts of the news articles (i.e. excluding the title, date, and other additional information).

Table 2. An overview of the analytical procedure.

Stage	Task(s)	Technique/Approach	Tool(s)
1—Preparing relational language data	Extracting "nominal subject–(direct/prepositional) object" pairs between countries/selected international organisations	Dependency parsing	Python
2—Conducting social network analysis	a. Finding influential actors in the network b. Identifying actors with similar roles c. Identifying communities in the network	Centrality analysis The REGE algorithm The Girvan-Newman algorithm	UCINET, R
3—Interpreting results	Conducting detailed linguistic analysis in context, informed by the salient features and patterns identified in the SNA	Corpus-assisted critical discourse studies	

In the second stage, a frequency list of these subject–object pairs was compiled for each of the three time periods, and these frequency lists were input into UCINET (Borgatti, Everett, and Freeman 2002) for social network analysis. Specifically, centrality measures including beta and betweenness centrality were calculated. Additionally, the REGE algorithm was used to identify countries and international organisations playing similar roles, and the Girvan-Newman algorithm was employed to detect communities within the network. When applying the REGE algorithm, a dendrogram was drawn for each period using R (R Core Team 2023) to help visualise the results. The method used for constructing the dendrogram was single link hierarchical clustering, also known as the nearest-neighbor method. This approach groups entities by iteratively linking the closest pairs based on their similarity, forming a hierarchical structure. Entities merging at lower levels exhibit greater similarity in their network roles, while those at higher levels are more distinct from each other.

In the third stage, guided by the statistics and visualisations informed by SNA, the discursive features of salient actors and relations were carefully examined within both co-text and socio-political context.

Results

Table 1 shows a sharp rise in the number of relevant articles from Period 1 (691 texts with 463,597 tokens) to Period 3 (6,185 texts with 4,085,566 tokens). This suggests *China Daily*'s significantly increasing attention to climate change over the course of time. In what follows, the findings for each period are presented in detail.

Period 1 (2010–2011)

A total of 341 subject–object pairs (99 distinctive pairs) among 48 countries/international organisations are found in this period. The five most frequent distinctive subject–object pairs (including ties) are given in Table 3.

Table 3. The top 5 subject–object pairs (Period 1).

Subject	Object	Frequency
China	United States	53
United States	China	43
EU	China	36
China	EU	13
Britain	China	11
India	China	11

It is evident that China plays a central role as it appears in all the pairs in Table 3. This is an expected result given that *China Daily* as the leading English-language newspaper of China is likely to build the web of international relations centering around itself. In terms of relations, the bilateral relationship between China and the US is particularly prominent, with "China–United States" and "United States–China" being the top pairs, implying the newspaper's emphasis on their significant mutual interactions. Notable interactions also occur between the EU and China, and the other most frequent pairs in relation to China include countries such as Britain and India.

In addition, there are many other pairs with lower frequencies (not listed in Table 3) that do not include "China", such as "EU–United States" (6), "Russia–India" (3), and "Japan–United States" (2). These pairs highlight a rich variety of relationships in the international climate change narratives in *China Daily*. This indicates that simply listing the frequency of individual subject–object pairs does not fully capture the complexity of their interactions.

To better understand the multiple interactions among these global actors represented in the corpus, the top 10 countries/international organisations in terms of beta centrality and betweenness centrality are listed in Table 4. It is demonstrated that China holds the highest value at 4.81 in terms of beta centrality, which measures the influence of a node within the network by considering both its direct and indirect connections. This highlights its far-reaching influence over other actors in these climate change news reports. The US closely follows China with a beta centrality value of 4.09, and the EU comes third with a value of 2.23, followed by countries such as India, Britain, Japan, and Germany. As regards betweenness centrality, which identifies nodes that serve as bridges within the network, China again holds the top position with a score of 592.32, followed by the US at 173.15. Other key entities include Poland, the EU, Norway, etc.

Table 4. Top 10 countries/international organisations by centrality (Period 1).

Beta Centrality		Betweenness Centrality	
Node	Value	Node	Value
China	4.81	China	592.32
United States	4.09	United States	173.15
EU	2.23	Poland	51.13
India	0.92	EU	40.43
Britain	0.83	Norway	27.27
Japan	0.69	Germany	14.95
Germany	0.57	Indonesia	13.63
Brazil	0.45	India	8.86
Russia	0.34	Russia	2.74
South Africa	0.30	South Africa	2.58

Considering the overlap across both measures, China, the US, and the EU emerge as the three most prominent actors in the network of Period 1, acting simultaneously as the most significant players and bridges. Besides, the three actors play similar roles in the network, as shown by the results obtained from the regular equivalence analysis using the REGE algorithm (Figure 1). On the far left of the dendrogram, China first merges with the US, and at a slightly higher level, the cluster of China and the US joins the EU. The merging of the three entities into one bigger cluster indicates that they are more similar to each other than they are to other entities in the network in terms of their roles or patterns of interaction. This suggests that the newspaper portrays the EU as another central pole of the developed world, alongside the US.

Moreover, the newspaper presents the discursive differentiation between the developing and the developed worlds, as illustrated in Figure 2 based on the community detection results using the Girvan-Newman algorithm. The developed world largely revolves around the US and the EU, while the developing world centers around China. The network in Figure 2 is split into three groups with a modularity score of $Q = 0.330$, which is the largest Q value and indicates the most fitting partition. In this figure, the width of the lines represents the frequency of co-occurrence between nodes—the thicker the line, the more frequent the co-occurrence.

It should be noted that the Girvan-Newman algorithm may not always produce perfectly neat partitions. Despite some exceptions, the overall pattern still demonstrates a clear division between the developed and developing worlds in global climate negotiations as represented in *China Daily*. The larger group on the left, represented by grey squares, includes the US and the EU, along with other developed countries such as Japan, Germany, France, and Britain. The group on the right, represented by blank circles, centers around China and includes a number of developing countries. Three examples are given below to show the interactions between the developed and developing worlds as discursively constructed in the network.

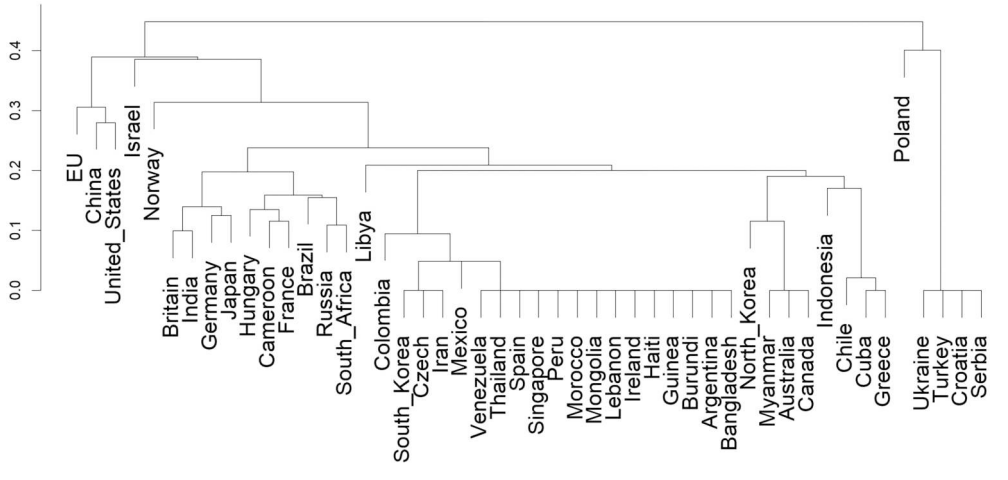

Figure 1. Hierarchical clustering showing regular equivalence of entities (Period 1).

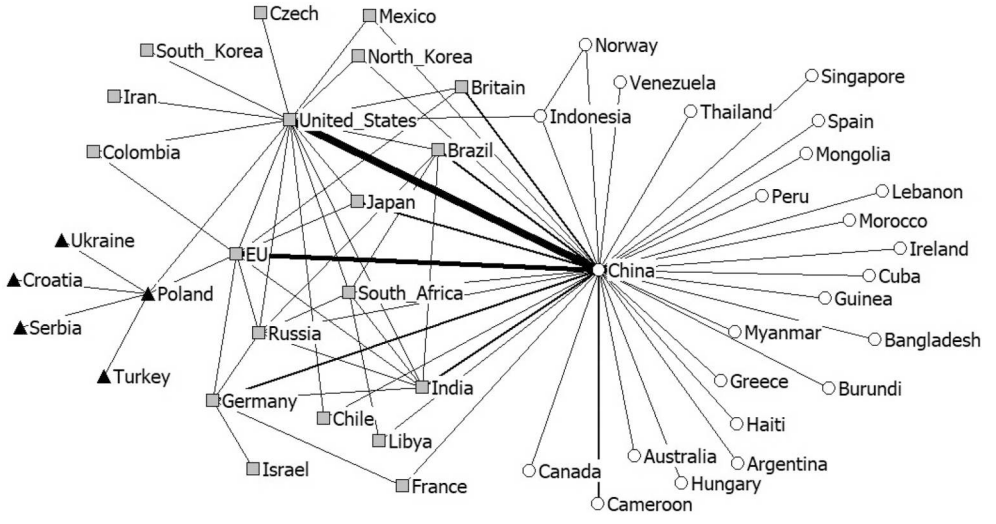

Figure 2. Three-group partition of the network based on the Girvan-Newman algorithm (Period 1).

(1) Thanks to WikiLeaks, we know how ***the United States*** brokered the "Copenhagen Accord" last year after accusing ***China*** (and ***India***) of holding the world to ransom. ("Capital game in climate deal", 2010/12/17)
(2) Meanwhile, ***the United States*** is refusing to move on establishing a Climate Fund, which is crucial in delivering urgently needed money to protect the most vulnerable, until it gets its way on the details of transparency and accountability of emissions cuts in ***China*** and ***other developing economies***. ("Delegates eager to narrow differences", 2010/12/11)
(3) ***EU*** has long sought to engage other major economies, such as ***the US***, ***Japan*** and ***China***, in carrying out similar efforts to reduce carbon emissions. ("Carbon rule may clip wings of China's aviation sector", 2011/05/18)

Both Examples (1) and (2) highlight the United States' confrontational stance toward developing countries in global climate governance. In Example (1), the phrase "Thanks to WikiLeaks" employs a predication strategy of irony (Reisigl and Wodak 2016, 33), implying that the US used covert methods to try to impose unfair conditions on developing countries. Furthermore, the phrase "accusing China (and India) of holding the world to ransom" constitutes a strong evaluative expression, creating a pronounced us-versus-them divide and framing the US as a dominant power exerting pressure on developing countries like China and India. In Example (2), the US' refusal to move on establishing a Climate Fund until it secures favourable terms for itself is highlighted. The term "other developing economies" serves as a nomination discursive strategy (ibid), emphasising the extensive range of countries involved and positioning the US against the whole developing world, underscoring America's resistance to accommodating the needs of the most vulnerable nations.

Example (3) highlights the EU, another major pole of the developed world, and its relations with developing nations. The adjective "long" is used as an intensification

strategy (ibid), emphasising the EU's persistent efforts to engage other major economies in reducing carbon emissions. This portrayal underscores the EU's commitment to aligning major global players towards a shared environmental goal. However, within the context of the source article titled "Carbon rule may clip wings of China's aviation sector", this persistent push by the EU also implies that the developing world, including China, is vulnerable to the stringent carbon reduction policies imposed by developed nations, which may disproportionately impact their economies. As the article later writes, "[i]deally", there should be a global deal "which exempts developing countries from obligations to cut emissions of greenhouse gases."

A distinctive feature of the right-side group in Figure 2 is the prevalence of one-on-one relationships originating from China to other countries. An example is given below.

(4) In addressing climate change, ***China*** has worked with countries such as ***Guinea*** and ***Cuba*** in developing methane technologies, helped the construction of hydropower facilities in countries such as ***Cameroon*** and ***Burundi***, and cooperated with countries such as ***Mongolia***, ***Lebanon*** and ***Morocco*** in developing solar and wind energy, the white paper said. ("Aid from China nourishes developing world", 2011/04/22)

In Example (4), the coordinate structure, which links many countries and concrete climate actions, highlights China's extensive reach and influence in the developing world while also framing it as a benefactor to these countries. Besides, it positions China as a crucial pivot and bridge among developing nations in combating climate change. A close contextual reading of similar subject-object pairs reveals that, in such cases, China is typically portrayed as a key "investor", "trading partner", and "helper" to the developing countries involved.

Overall, during Period 1, *China Daily* highlights a distinction between the developed and developing worlds in global climate change power dynamics. The narratives frequently depict developing countries as vulnerable to the excessively high climate demands imposed by the developed world, highlighting the threat these demands pose to their national interests. At the same time, the reports tend to underscore China's role as a key voice in global climate negotiations, positioning it as a significant player advocating for the interests of the developing world.

Period 2 (2012–2015)

In this period, a total of 987 subject–object pairs (205 distinctive pairs) among 104 countries/international organisations are found. The top 5 distinctive subject–object pairs (including ties) are given in Table 5.

Table 5 shows that in Period 2, while pairs between China and the US remain the most frequent, those between China and France become the second most frequent pairings, replacing pairs between China and the EU from Period 1 (cf. Table 3). A closer inspection shows that this change is largely due to the 2015 United Nations Climate Change Conference held in Paris, France, which dominated the discourse at the time. This suggests that the change may represent a temporary peak. Building on this, the individual pairings are then organised into a network for further analysis. Table 6 highlights the top 10 nodes in the network listed separately by beta and betweenness centrality. With regard to beta

Table 5. The top 5 subject–object pairs (Period 2).

Subject	Object	Frequency
China	United States	145
United States	China	128
China	France	42
France	China	36
China	EU	27
EU	China	27

Table 6. Top 10 nodes of countries/international organisations by centrality (Period 2).

Beta Centrality		Betweenness Centrality	
Node	Value	Node	Value
China	7.13	China	3399.22
United States	6.53	United States	318.93
France	1.85	EU	185.43
EU	1.44	Brazil	93.33
India	1.20	Japan	63.26
Britain	1.03	Italy	61.38
Japan	0.69	Britain	60.90
Fiji	0.60	Zimbabwe	31.65
Brazil	0.44	Russia	15.98
Australia	0.39	India	4.68

centrality, China tops the list at 7.13, followed by the US at 6.53, reflecting their dominant central positions in climate change discussions in Period 2, as in Period 1. For betweenness centrality, in addition to China (3399.22) and the United States (318.93), the EU's bridging role is also highlighted (185.43).

On the other hand, as indicated by the regular equivalence analysis (Figure 3), while China and the US appear to play similar roles (positioned next to each other

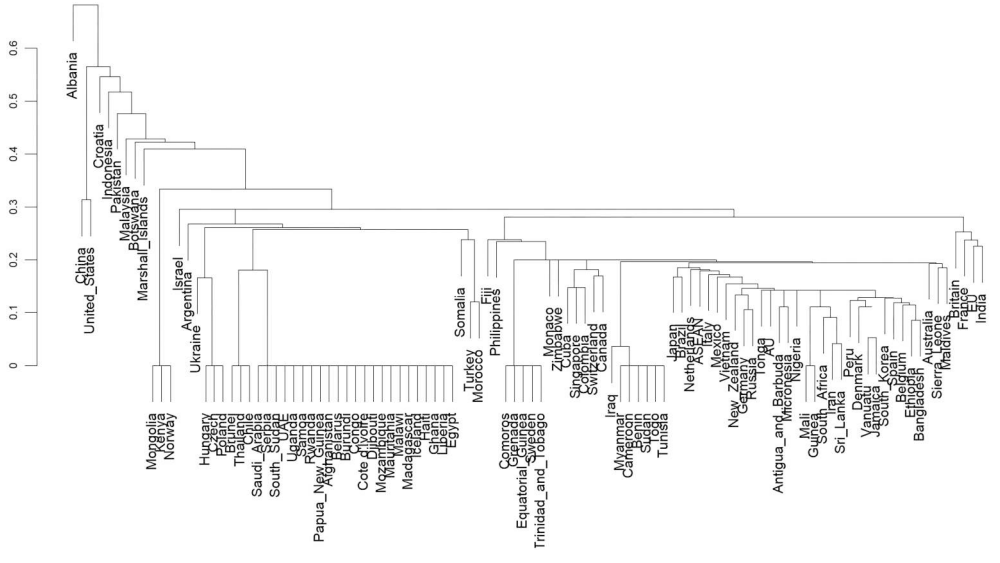

Figure 3. Hierarchical clustering showing regular equivalence of entities (Period 2).

near the leftmost side of the dendrogram), the EU is located on the rightmost side, adjacent to India, France, and Britain. This suggests that, unlike in Period 1, the EU in Period 2 exhibits distinct patterns of interaction within the network compared to China and the US.

This distinction is also echoed by the community detection result. Figure 4 illustrates a five-group partition of the network, based on the largest Q value of 0.370. A noticeable difference between the network graphs of Period 1 (Figure 2) and Period 2 (Figure 4) is that while the US and the EU are in the same cluster in the former, in the latter graph they are placed in separate clusters (the cluster surrounding the US are marked by grey squares, and that surrounding the EU by dark grey up triangles. Both are on the right).

Specifically, we can see that a significant proportion of the nodes in the cluster surrounding the EU are European countries (e.g. Britain, France, the Netherlands), suggesting strong internal ties within the European bloc. On the surface, these ties may contribute to the distinct interaction patterns that set the EU apart from China and the US. However, a closer examination shows that the narrative does not primarily emphasise the coalition of European countries in climate matters. Instead, the frequent cooccurrence of a European country and the EU often serves to frame the discussion around China, underscoring China's significant role in climate change efforts in relation to the EU. Two examples are given below.

(5) ***The Netherlands*** is the founding member of ***the EU*** and plays a unique role in ***the EU*** affairs. ("Chinese vice premier meets Netherlands' PM on climate co-op, ties", 2014/09/24)

(6) ***China*** is ready to boost its cooperation with ***the Netherlands*** on climate change, making it a fresh highlight of ***China–EU*** partnership, said the presidential convoy. (ibid)

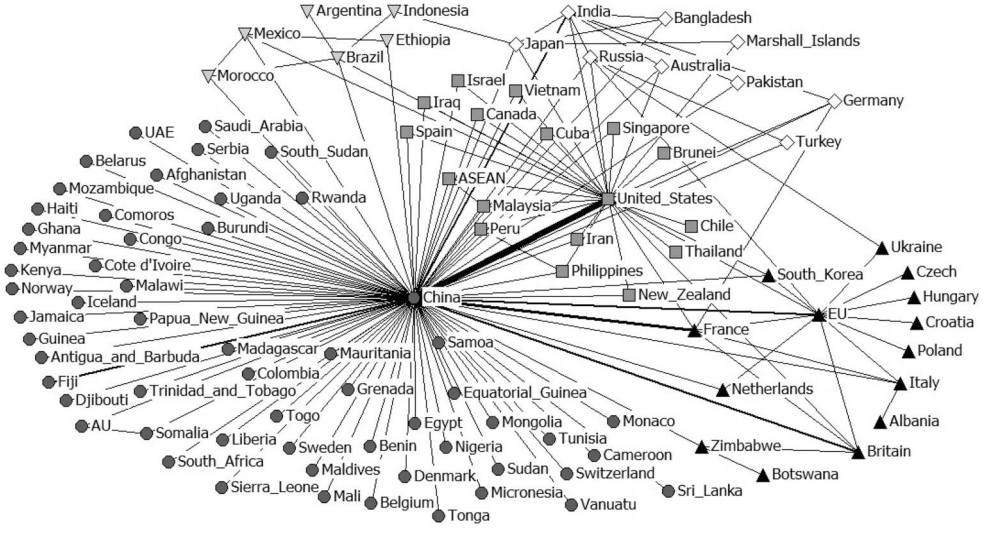

Figure 4. Five-group partition of the network based on the Girvan-Newman algorithm (Period 2).

At first glance, Example (5) merely states the close relationship between the Netherlands and the EU. Rather, this statement sets the stage for Example (6), which appears two paragraphs later in the same article, where the narrative shifts to foreground China's involvement. The adjective "ready" in Example (6) signifies China's proactive stance in climate change cooperation. Moreover, describing this cooperation as a "fresh highlight" suggests that China's climate change cooperation with the Netherlands brings new significance to the broader China–EU partnership, reinforcing its role as an essential partner in the EU's efforts to tackle climate challenges.

In fact, Examples (5) and (6) reflect a general shift in *China Daily*'s narrative regarding China's central role in climate governance in Period 2. An examination of the predicate verbs when China serves as subject and another country as direct object (dobj) in Period 2 shows that the most frequent verbs (with their frequencies shown in parentheses) include *support* (14), *overtake* (9), *surpass* (9), *replace* (5), *urge* (5), and *welcome* (4), indicating a more confident China and its proactive involvement in global climate governance. This contrasts with Period 1 where the narrative often projects China's status as a developing country not to shoulder undue burdens. Two examples are presented below.

(7) ***China*** firmly supports ***France*** in hosting the UN climate change conference beginning late this month, and hopes that the summit in Paris could achieve overall and balanced results, Xi said while meeting with Hollande. ("China and France sign 17 cooperative agreements", 2015/11/02)
(8) ***China*** has since overtaken ***the United States*** and is now the largest market for wind power. ("Renewable energy riding high", 2012/02/25)

In Example (7), the verb "support" underscores China's active commitment to the success of the summit in Paris. Furthermore, the use of the intensifier "firmly" highlights the strength of China's strong support for France in hosting the UN climate change conference, and positions China as a reliable and supportive partner in global climate negotiations. In Example (8), the verb "overtook" signifies a notable shift in global leadership in renewable energy, with China surpassing the US to become the largest market for wind power. This choice of verb highlights China's rapid progress and leadership in the renewable energy sector, further emphasising its growing influence and proactive stance in global climate governance.

Many similar examples can also be found in "subject–prepositional object" pairs involving China. For instance:

(9) But Qi said ***China*** was showing "global leadership" on climate change and that ***Australia*** would have to forge a new export relationship with ***China*** as the economic giant's coal imports, which have slumped this year, begin to slow. ("China is working to reach its emissions peak before 2030 deadline, analyst says", 2015/10/06)
(10) ***China*** has signed a host of significant joint announcements on climate change during 2015, including with ***the United States***, ***the EU***, ***France***, ***Brazil*** and ***India***. ("Veteran official leading China's delegation", 2015/11/30)

Example (9) begins by explicitly portraying China as a key player in climate change governance with the phrase "global leadership". The part of the sentence after "and" suggests

that China's shifting energy policies—marked by a decline in coal imports—are significant enough to influence Australia's export strategy. By placing "Australia" in the subject position, the sentence shifts focus to how Australia must respond to China's changing coal policies. This subtly frames Australia as the one that must take action, reinforcing China's authority in shaping global energy dynamics. This underscores China's growing role in global energy markets, aligning with its broader environmental commitments. Example (10) illustrates China's broad reach in climate diplomacy by listing several countries and international organisations with which it has made joint announcements. The intensifying phrase "a host of" further emphasises the range and significance of these collaborations. This enumeration, along with China being positioned as subject, underscores its extensive international engagement and reinforces the narrative of China as a proactive figure in global climate initiatives.

Together, a major theme running through *China Daily*'s climate reports in Period 2 is China's increasingly confident and assertive role in global climate governance, actively shaping and driving global environmental policies.

Period 3 (2016–2023)

In Period 3, a total of 2,864 subject–object pairs (383 distinctive pairs) involving 151 countries/international organisations are identified. The increased number of actors, along with the higher frequency of their interactions, highlights the intensified engagement of diverse global players in the newspaper's climate change reporting during Period 3. The top 5 distinctive subject–object pairs are given in Table 7.

A key difference among the three periods regarding frequencies of subject–object pairs is that in the first two periods, the pair of "China–United States" tops the frequency lists, followed by "United States–China". Instead, in Period 3, "United States–China" ranks first (462 times), while "China–United States" ranks second (360). This seems to imply a more active role assigned to the US in *China Daily*'s climate reports during Period 3. When the pairs are woven into a network, the top 10 nodes, as measured by beta and betweenness centrality, are shown in Table 8. Moreover, the specific characteristics of the data from Period 3 allow for a finer distinction between out-beta and in-beta centrality. Out-beta centrality indicates how often an actor is the initiator of interactions, while in-beta centrality shows how often an actor is the recipient of interactions.[3]

Considering the overlap across the three measures—out-beta, in-beta, and betweenness centrality—the results indicate that the US, China, and the EU remain the most prominent entities in *China Daily*'s reporting in Period 3. In addition, the higher out-beta centrality of the US compared to China points to the former's more proactive role in reaching out and initiating interactions within the network, aligning with the top frequency ranking of the "United States–China" pair discussed above. A qualitative inspection of the intervening verbs between the US (subject) and China (direct object) in Period 3 shows that the most frequent verbs (and their frequencies in parentheses) are

[3]In the beta centrality analysis, different methods were used due to data characteristics across the three periods. For Periods 1 and 2, directed data yielded zero eigenvalues, so beta centrality was calculated using undirected, valued adjacency matrices, providing a single value for each node. In Period 3, non-zero eigenvalues from directed data allowed for separate out-beta and in-beta centrality values.

Table 7. The top 5 subject–object pairs (Period 3).

Subject	Object	Frequency
United States	China	462
China	United States	360
EU	China	161
China	EU	146
China	France	83

Table 8. Top 10 nodes of countries/international organisations by centrality (Period 3).

Out-beta Centrality		In-beta Centrality		Betweenness Centrality	
Node	Value	Node	Value	Node	Value
United States	8.29	China	8.92	China	10866.88
China	8.08	United States	7.21	United States	589.70
EU	3.44	EU	3.30	Germany	320.91
France	1.23	France	1.61	EU	139.65
Britain	1.16	Germany	1.14	Russia	125.23
Germany	1.10	Japan	0.90	Switzerland	124.12
Japan	0.46	Russia	0.80	Australia	105.71
Canada	0.44	Britain	0.77	Britain	94.33
Australia	0.28	ASEAN	0.62	Iran	89.15
Bangladesh	0.28	India	0.48	Ethiopia	87.87

contain (15), *see* (10), *accuse* (6), *meet … half way* (6), *demonise* (4), *regard* (4), *confront* (3), *need* (3), and *target* (3), and some less frequent ones include *challenge* (2), *criticise* (2), *exclude* (2), *isolate* (2), *pressure* (2), *prevent* (2), *suppress* (2), among others. In terms of the transitivity system (Halliday 1994), these verbs work to encode material (e.g. *contain*), mental (e.g. *regard*), or verbal (e.g. *accuse*) processes. On closer examination, most of these verbs serve to project a predominantly antagonistic attitude of the US toward China. One example is given below.

(11) But with that in mind, Kerry should not come with the unrealistic impression that ***the United States*** can pressure ***China*** to take any impractically bigger strides in emissions reduction. ("Climate collaboration should not be venue for geopolitical rivalry", 2021/09/01)

The use of the verb "pressure" in Example (11) sets up a power dynamic, suggesting an attempt by the United States to compel China to conform to its expectations. Meanwhile, the deontic modality ("should not") expresses a strong advisory stance, and the adjective "unrealistic" constitutes an evaluative attribution of negative traits (Reisigl and Wodak 2016, 33) that undermines the legitimacy of the United States' stance. Together, these elements frame China as a sovereign power resistant to coercion in climate negotiations.

It's also interesting to compare the intervening verbs between the US (subject) and China (direct object) in Period 3 discussed above with those in Period 2. In Period 2, the top three intervening verbs between the two countries are *welcome* (8), *contain* (4), and *support* (3), with the verb *contain* appearing either in hypothetical or negative contexts. Taken together, the narrative in Period 2 seems to project a largely friendly attitude

of the US toward China. Through perusing the relevant sentences, it is revealed that the contrast in tone between the two periods largely coincides with the diverging policies and stances between the Obama and subsequent Administrations. Three examples are given below.

(12) And ***US*** President Barack Obama has repeatedly stated that ***the US*** welcomes a strong, prosperous and successful ***China*** that plays a greater role in world affairs. ("Xi's visit will propel the new model with US", 2015/09/19)
(13) And given that ***the US*** now describes ***China*** as its "largest strategic competitor", bilateral climate cooperation appears even more difficult. ("US has ruined chances of climate cooperation", 2022/09/17)
(14) ***The US*** has denied ***China***'s developing country status and is trying to compel ***China*** to increase its emissions reduction efforts. ("Green essentials", 2022/11/23)

In Example (12), the adverb "repeatedly" functions as an intensifier, and, together with the verb "welcome", emphasises a sustained friendly stance toward China under the Obama Administration. In stark contrast, Example (13) starts with a presupposition introduced by "given", which assumes that the reader already accepts the adversarial framing of the Sino–US relationship under subsequent Administrations (China as the "largest strategic competitor"). This presupposition sets the stage for the subsequent assertion that the bilateral climate cooperation will face significant obstacles. Similarly, in Example (14), the coordination links two actions, conveyed through the strong verbs "denied" and "compel", which underscore the assertiveness of the US stance. Additionally, by positioning the US as subject, the narrative frames the US as taking deliberate and forceful steps to influence China's actions, thereby justifying China's stance against shouldering undue responsibilities in international climate governance given its "developing country status" which is "denied" by the US.

Besides the Sino–US relationship, from the partition of the network (Figure 5, based on the largest Q value of 0.317), we can observe a relatively large cluster around the EU on the top right (dark up triangles), which is separate from a smaller cluster around the US on the bottom right (light grey circles). Additionally, the regular equivalence analysis shows that China and the US are directly merged at a lower height, suggesting their similar roles as pivotal actors. On the other hand, the EU is merged first with a large cluster of other actors, indicating that it has different patterns of interaction from those of China and the US within the network (the corresponding dendrogram is not shown here due to its large size). Again, the EU seems to behave differently and plays a role distinct from the US in the network. An inspection of relevant sentences provide evidence for the above distinctions on the qualitative side. For instance:

(15) ***The European Union*** has indicated it will work closely with ***China*** to prevent ***the US*** from backsliding on its commitment to the Paris climate agreement. ("China and EU align to prevent US climate pact withdrawal", 2016/11/14)
(16) And since ***China*** and ***the US*** are more likely than not to cooperate on various issues, especially climate change, in the future, ***the EU*** will only harm itself if it abandons its win-win cooperation with ***China*** at the coaxing of ***the US***. ("EU shouldn't let hearsay damage ties with China", 2021/04/24)

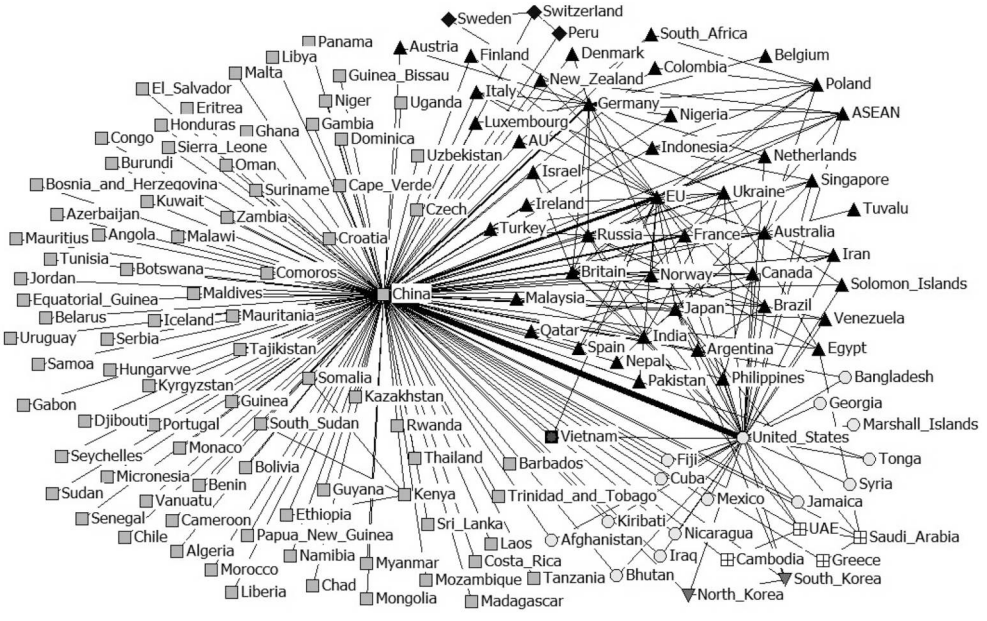

Figure 5. Seven-group partition of the network based on the Girvan-Newman algorithm (Period 3).

In Example (15), the adverb "closely" as in the phrase "work closely" underscores the EU's willingness to collaborate with China, highlighting a strategic alignment between the two actors against perceived US unreliability, and positioning them as unified defenders of the Paris Agreement. By comparison, Example (16) presents a hypothetical scenario with a warning tone, suggesting that the EU would harm itself by abandoning its cooperation with China in favour of blindly following the US. The term "coaxing" implies that the US is employing subtle, self-serving tactics to sway the EU, while the phrase "win-win cooperation" frames the China–EU partnership as mutually beneficial.

Overall, the narrative during this period appears to portray a tense US–China relationship in global climate governance, with the US depicted as a disruptor of the established climate governance framework set by the Paris Agreement, while China is portrayed as a defender of this framework. In contrast, the EU is shown as an actor that China actively seeks to persuade to join its efforts in upholding global climate commitments.

Discussion

By integrating SNA into CDS, this study highlights the salient patterns of international relations constructed in *China Daily*'s climate change reports from 2010 to 2023, as well as their evolution over time. It is shown that China consistently emerges as the most significant actor, which aligns with the vantage point of the newspaper. Notably, China is typically portrayed as a leading voice and a key bridge for the developing world. Meanwhile, the US and the EU are also represented as playing particularly pivotal roles. Together, this suggests the newspaper's tripolar perspective on global climate governance. Some other actors, such as France, Britain, and Germany, also feature prominently

at different times across the three periods, often due to specific key events in a particular period such as state visits by Chinese leaders or significant international climate conferences.

Informed by these quantitative insights, the study delves into their contexts and finds that the narratives in *China Daily*'s climate reports have evolved over time. In Period 1, a clear distinction is drawn between the developing and developed worlds. In this narrative, China is portrayed as an advocate for the common interests of developing countries, while the US and EU are depicted as representatives of the developed world, often imposing undue climate responsibilities on developing nations. In Period 2, the narrative shifts to represent China as an increasingly confident and assertive leader in global climate governance. In Period 3, a confrontational US–China relationship is constructed, with the US depicted as bent on having its own way and undermining collective climate efforts such as the Paris Agreement. Meanwhile, China is positioned as a stabilising force, advocating for adherence to international climate agreements. In addition, in both Periods 2 and 3, the EU is depicted as an actor that China aims to win over.

The pattern observed in Period 3 echoes Huan's (2024) analysis of climate change reports by another Chinese newspaper *People's Daily* (English Version, 2015–2022). Employing the Discursive News Values Approach (DNVA), he found that the newspaper emphasised tensions between China and the US while highlighting cooperation between China and the EU. In addition, the evolution of the narratives across the three periods identified in the present study is largly consistent with the trajectory of Chinese climate discourse changes found in Zhang and Orbie (2019) based on content analysis. This convergence of results, despite using different research methods, corroborates the robustness of the new analytical framework employed in the present study.

As the official English-language mouthpiece of the country, *China Daily*'s changing contruction of international relations in its climate reporting is largely shaped by the government's offical stances. For example, around Period 1, China was laying more emphasis on the principle of "common but differentiated responsibilities", which asserts that developed nations, particularly Western countries, should bear the primary responsibility for emissions reductions and historical emissions (cf. Examples (1–4)). This stance was largely driven by the need to balance global environmental responsibilities with China's national development priorities, such as its high per capita GDP growth goals at the time (Gong 2011; Zhao 2021). This position was also evidently reflected in the establishment of the BASIC bloc by Brazil, China, India, and South Africa in 2009 ahead of the Copenhagen Summit, where these countries negotiated jointly with developed nations to safeguard the interests of the developing world.

China's subsequent changes in foreign and domestic policies are also embodied in these climate change news, espcially those in Periods 2 and 3. During these periods, several key initiatives were launched under the leadership of President Xi Jinping, including the Belt and Road Initiative (BRI) in 2013 and the establishment of the Asian Infrastructure Investment Bank (AIIB) in 2015. These years also witnessed the articulation of the grand vision of the Great Rejuvenation of the Chinese Nation ("China Dream") and a "Community of a Shared Future for Mankind", alongside a stronger emphasis on ecological civilizaiton by the central leadership. These initiatives and proposals collectively demonstrate China's ambition to reshape the existing Western-centric global order. Against this background, China's active participation in international climate negotiations,

particularly in the formulation of the Paris Agreement, was arguably part of this broader ambition (cf. Examples (6–10)).

However, China's leadership in global climate governance tends to be more defensive, characterised by a cautious commitment to international climate goals while balancing these with its national interests such as economic development and energy security (Eckersley 2020). In China's 2021 White Paper "Responding to Climate Change: China's Policies and Actions", multilateralism and the principle of "common but differentiated responsibilities" are once again emphasised as essential for tackling climate change.[4] As shown in Example (14), *China Daily* highlighted the Chinese government's re-emphasising its developing country status in Period 3. When then-US President Donald Trump announced in 2017 that the US would withdraw from the Paris Agreement, it created significant uncertainty in global climate leadership and threatened to reduce international funding for climate initiatives, particularly in developing countries (Thakur 2021). This prospect left a leadership void that China, as an emerging economy, was hesitant to fill, as it was not in China's best national interest to assume such a role. On the other hand, following the US's decision to withdraw, the EU, another major emitter and a traditional advocate for emission reduction, found itself increasingly interdependent with China on climate issues. As a result, both demonstrated a willingness to collaborate closely to uphold the Paris Agreement and address global climate challenges (Eckersley 2020; Gurol and Starkmann 2021; cf. Examples (6, 15–16)).

Conclusion

This study reveals not only China's stance in global climate governance but also how it positions itself amid complex interactions with other global actors. Taking the emerging SNA-informed CDS approach, it examines how relations among countries and international organisations are constructed in climate change reports by *China Daily* across three periods from 2010 to 2023. The findings indicate that the reports consistently emphasise the central roles of China, the US, and the EU. Moreover, each period constructs a distinctive international network, reflecting China's efforts to balance its leadership aspirations, climate commitments, and national interests in global climate governance.

This study is not without limitations. Due to space constraints, only a selection of salient actors and relationships were analysed. Additionally, the potential of other structures for revealing international relations in discourse, beyond the use of subject–object pairs, remains an area for future exploration. Future reseach can also extend the scope of international relations to Non-Governmental Organizations (NGOs) and other entities for a more comprehensive understanding of the interwoven web of global climate governance.

Disclosure statement

No potential conflict of interest was reported by the author(s).

[4]Available at http://english.scio.gov.cn/node_8026776.html.

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