
RESEARCH ARTICLE

Influence of Political Leaders in Five Countries on Climate Diplomacy via Twitter

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ABSTRACT

Climate diplomacy is one of the hot topics in recent years that the world has paid extensive attention to. It goes beyond the traditional regional environmental issues; the worldwide impact of climate change makes international cooperation in this area more and more close. In order to explore the influence of political leaders on climate diplomacy and the reasons for their influence, this paper selects five countries with large differences in national conditions. And these countries will have a significant impact on international climate diplomacy in 2023. They are the United States, France, Brazil, Japan, and Senegal. This study quantitatively examines the data content analysis of climate-related tweets posted by political leaders from five countries on Twitter in 2023 and their social network influence through social network analysis and other quantitative studies to explore the influence of political leaders from five countries on international climate diplomacy. Finally, the conclusion is that the online power and influence of political leaders in each country do not exist independently but are closely linked to the real power of each country.

KEYWORDS

Climate politics, social network analytics (SNA), political leaders, Twitter.

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1. Introduction

1.1. Research Background

With the continuous development of the Internet and the iterative updating of mobile Internet devices, social media platforms such as Facebook, Twitter, Reddit, Sina Weibo, and so on play a crucial role in today's international communication. These social platforms have the following characteristics: firstly, extensive. Large social media platforms often gather billions of users, and their global reach makes them the best platform for information dissemination. Second, immediacy. The release mechanism of social media platforms allows everyone to immediately send out the news of the moment at any location. Therefore, it has the advantages of high speed and convenience and is very adaptable to the ever-changing international environment. Third, multi-directionality. Traditional media such as television and newspapers are usually one-way communication, while social media platforms have broken the single barrier and realised two-way and even multi-directional mass-self communication (Castelles, 2011). This interactive mechanism of participation, commenting, and sharing among users improves the level of communication of the content, and the disseminator of the information can better understand the attitude and feedback of the recipients of the information. Therefore, social media platforms have not only become the Public Sphere for ordinary people to express their political views, fight for political rights, and influence political decision-making but also an important medium for political communication by political leaders of various countries. Through the Twitter Diplomacy Report (Twiplomacy) released by Burson-Marsteller, as shown in *Table 1*, the proportion of governments and leaders opening Twitter accounts has been increasing and showing a stable trend in recent years.

Table 1 Percentage of Twitter accounts launched by Governments

particular year	2014	2015	2016	2018	2020	2022
proportions	83%	86%	90%	97%	98%	98%

Source: Burson-Marsteller (2014-2022).

And as a result of the increase in extreme weather events around the world and a general increase in public awareness of environmental protection, climate politics is moving closer and closer to the centre of the political arena. Since the United Nations Framework Convention on Climate Change (UNFCCC) was adopted by the United Nations General Assembly in 1992, climate change conferences have been held annually since 1995. However, 'climate change is one of the most prominent and politicised scientific issues' (Baker, 2014), and due to the transnational and self-conscious nature of climate governance, serious collective action dilemmas have arisen in practice, and it has also often become a tool for political games between large and small countries. On the one hand, the climate issue is a political topic that can be easily communicated to the public, and on the other hand, the climate issue is complex because it covers many aspects of knowledge, so when it comes to the public's view, social media platforms play an extremely important role, largely influencing the general public's cognitive and emotional tendencies towards a certain climate event. It can be said that social media platforms are becoming an important platform for governments and leaders to raise awareness of climate issues.

1.2 Literature Review

In order to investigate the network of node influence and comprehend network structure, power network theory is frequently used internationally in conjunction with social network analysis. Verona et al. (2018), for instance, used the Castanet theory of power as a framework and the traditional algorithms of social network analysis to create a power network of Brazilian politicians, political parties, and political movement funders, with the focus being on the country's presidential campaigns from 2002 to 2016. The study focuses on the capacity of network players to connect disparate networks, exchange resources, and modify network policies. Faul (2015) finds that the network structure and relationships of global policy actors are influenced by power relations external to the network, implying that the emerging, network-based policy cooperation and governance did not have the effect of flattening power. This is based on the application of power network theory to the question of whether the Internet deepens the existing power hierarchy through social network analysis. The extent to which stakeholders in domestic sporting events in Canada are closely connected to their relational networks in the governance network, as well as the centrality of influential stakeholders in the network and their ability to control its flow, were examined by Naraine et al. (2016) using power network theory.

In China, power network theory is a rather small-scale indigenous field of study. The majority of domestic research only goes as far as theoretical introduction and categorization; only Zhou Xiang and Li Jing (2016) combined Castor's power network theory with other theories to assess the influence of international communication. Starting with two comparable concepts—*influence* and *power* in English—the study investigated how combining the power network theory's *connecting-in* power, *connecting-out* power, *network power*, and *grouping power* may boost China's influence in international communication. Zhou and Li's paper uses the *out* and *in* values of each network actor as a measure of the node's influence, citing Itai's (Itai, 2010) research results on hyperlinked citation networks in international news to explain the players' *connect-in* and *connect-out* power. Furthermore, the study conducts a comparative analysis of news trade data in Central Asia and concludes that nations occupying a dominating position in the network structure have greater influence in international communication. In the study of international communication influence, Zhou and Li contend that coercion cannot be separated from the concept of influence because communication networks, structures, and power are inherently coercive. Rather, focus should be placed on this subtler and more complex form of coercion.

Climate politics is a multifaceted and complex field that has garnered significant attention over the years. The study of climate change communication has become increasingly important as stakeholders utilize the Internet and social media to disseminate information and mobilize support (Schaefer, 2012). The role of emerging powers, such as China, India, Brazil, and South Africa, in global climate politics has been a topic of discussion, with concerns raised about their rapid economic development, growing power-political ambitions, and rising greenhouse gas emissions (Hurrell et al., 2012). In Copenhagen, the concept of climate justice was articulated through discussions on antagonism, the commons, and solidarity (Chatterton et al., 2013). Scientific knowledge has become a primary framework for political discourse on climate change, leading to a need to democratize climate knowledge and envision climate praxis through political ecology and feminist science studies (Rice et al., 2015). However, in the existing research results, there is no research related to climate diplomacy concerns and areas of concern through power network analysis of social media, which is one of the significance of our research on this topic.

1.3 Problem Statement and Objectives

Nowadays, the climate problem is becoming increasingly serious, and climate governance has become an important channel for countries to establish hostile or cooperative relations. Moreover, political advocacy on social media platforms has not yet emerged,

and countries are still adapting the discourse and means of advocacy. In today's research on social media platforms such as Twitter, most studies are based on communication theories, and there are fewer studies linking it to the issue of climate politics. We hope to draw some lessons for how to communicate on social media platforms about other issues in global governance through the climate issue. We selected five representative countries, the United States, Japan, Brazil, France, and Senegal, in which some countries have a unique path of climate diplomacy, others have influence on climate issues involving the whole world, and differences in climate governance between developed and developing countries can be seen between continents. By analysing the influence of climate-related tweets from the Twitter accounts of national leaders, the intention is to explore: 1. what is the current level of public attention to climate-related communication on social media platforms; and 2. what are the inter-country differences in communication methods and discourses, depending on national circumstances and policy approaches?

2. Overview of Research Methodology

Social network analysis is a quantitative research method developed by sociologists on the basis of graph theory and mathematical modelling. It is mainly used to analyse the properties and structure of social networks. The social network analysis method echoes the power network theory, which holds that network relationships are the key to understanding human society. Social network analysis provides new methods and perspectives for analysing social actors' relationship networks and network influence. In this paper, we try to use social network analysis to visualise and measure the influence of political leaders on climate issues in five countries: the United States, France, Brazil, Japan, and Senegal.

Social network analysis focuses on the 'core-edge' structure to quantify the closeness of each network node. In addition, based on this, the nodes in the network are classified into core and edge networks. The importance of a node is judged by the importance of the node's followers and the closeness of their connections to the node; the more connections established in the network, the faster it spreads and the more central it is. In ORA's algorithmic model, the degree of authority centrality of a node depends on whether it's connected in nodes that have many connected out nodes. A node that is authoritative in its influence in the network can receive information from a large range of nodes, and each node can disseminate the information to a large audience. Therefore, the more authoritative the node is in the network, the greater its propagation power in the network and the more social actors it influences.

3. Research Theory

The non-traditional security issue of climate change has posed a wide-ranging threat to world security, fuelling global tensions and the risk of conflict. This study analyses the climate diplomacy influence of political leaders in five countries based on a geopolitical perspective. The two main theories used in this paper are described below.

3.1 Climate Diplomacy under Geopolitics

Geopolitics initially highlights the geographical factor in international affairs, and American scholar Spykman defines geopolitics as 'the integrated planning of a country's security policy based on geographical factors' (Le, 2019). Two other American scholars, Pencer and Peltier, viewed geopolitics as 'the art or science of using geography to seek guidelines for political purposes' (Zhong & Tang, 2016). However, with the changing environment of the times, today's geopolitics is no longer limited to the scope of geographical factors. It includes various fields such as economy, politics, military, culture, and technology, which are mainly closely related to the global power game. The geopolitical shift of climate diplomacy refers to the fact that climate has become a front for all countries to participate in the global game. Moreover, climate diplomacy has become a tool and weight for all countries to safeguard their own competitive interests. The way to do so has also gone beyond traditional diplomacy based on dialogue and negotiation and emphasized the comprehensive use of political communication, diplomatic action, economic and trade policies, industrial policies, and so on. Since climate change became an important issue in international politics in the early 1990s, the attention and investment in climate issues have continued to increase around the world. Countries' approaches to climate issues have taken many different directions under the influence of geopolitics. In addition, the redistribution of resources resulting from the response to climate change could also destabilise the world situation by causing turmoil in many countries as a result of the development transition.

In this international context, we further explore the social media influence of different political leaders.

3.2 Political Leadership Influence under Climate Diplomacy

Political leaders generally refer to the heads of state and government. Social media and political communication have become the most important means for political leaders to expand their influence. In the case of Twitter, which is the subject of this paper, then U.S. President Barack Obama used Twitter to gain a large amount of public support during his presidential campaign in 2008 and thus gained the advantage of being re-elected. The success of this political propaganda has made the study of social networks and political communication a hot topic for scholars around the world. The study of Twitter and political leaders entered a second wave of research after President Donald Trump came to power, a new American leader known globally for 'tweeting the country.'

The importance of social media as a tool for political communication has been universally recognised. Among the 193 UN member states, there are 123 Twitter accounts of national political leaders, accounting for 63.7% of the total (Pavón-Guinea, 2018), which has become an important tool for presidential campaigns and daily political communication around the world. Barbaro (2015) also suggests in his study that Twitter has become a tool for politicians to distract political attention, conduct political propaganda, and attack political opponents.

Social media has been used by more and more political leaders to disseminate their personal advocacies and national policies due to its openness, timeliness, and interactivity. Climate governance, a topic that cannot be ignored in politics, has been expressed in the tweets of several leaders.

4. Analysis of tweets

4.1 Data Analysis of Tweets

This paper collects a total of 188 tweets on climate topics posted on the Twitter platform in 2023 by political leaders from five countries: U.S. President Joe Biden, French Prime Minister Emmanuel Macron, Brazilian President Lula, Japanese Prime Minister Fumio Kishida, and Senegalese President Sall. Among them, US President Joe Biden posted 99 tweets, French Prime Minister Emmanuel Macron posted 47 tweets, Brazilian President Lula posted 37 tweets, Japanese Prime Minister Fumio Kishida posted 3 tweets, and Senegalese President Sall posted 2 tweets. *Table 2* shows the data of tweets posted by the political leaders of the five countries in 2023.

Table 2 Climate tweets data sheet

Political Leaders' Twitter Accounts	Number of climate tweets involved	Total number of tweets	percentage
President Biden	99	2131	4.65%
Emmanuel Macron	47	954	4.93%
Lula	37	3391	1.09%
Fumio Kishida	3	329	3.34%
Macky Sall	2	231	0.87%

From this data, it can be roughly concluded that the five countries attach importance to the climate.

By counting the number of views, retweets, and comments, the proliferation and influence of tweets from political leaders in the five countries are quantified. Among them, US President Joe Biden's tweets mentioning climate have the greatest influence, while Senegalese President Sall's tweets have relatively less influence. The specific data are shown in *Table 3*.

Table 3 Tweet spread data table

Political Leaders' Twitter Accounts	Number of climate tweets involved	Average forwarding volume	Average Views	Average Collection	Average number of comments
President Biden	99	2.1k	1568.1k	9.4k	4.0k
Emmanuel Macron	47	662	414.1k	2.8k	601.6
Lula	37	871	153k	3.4k	713
Fumio Kishida	3	1.2k	635k	3.0k	5.5k
Macky Sall	2	406	63k	538	102

4.2 Content Analysis of Tweets

In international communication, the views and positions of political leaders are communicated through the media in their own languages. Different national conditions and different climate-related policies in each country determine the differences in the content of the leaders' expressions in the media. With the exception of Fumio Kishida and Sall, who tweeted less, the other three leaders published a considerable number of tweets on climate-related topics. In Brazilian President Lula's tweets, the keyword climate was mentioned 37 times, cop282 times, climate education once, combustion energy twice, and forest protection four times. In U.S. President Joe Biden's tweets, the keywords climate were mentioned 95 times, clean energy three times, carbon emissions four times, and the Paris Agreement three times. French President Macron's tweets, on the other hand, talked about various aspects of the climate in more depth, involving more keywords, such as mentioning the keyword climate 10 times, biodiversity 9 times, the Paris Pact for Humanity and the Planet 5 times, global warming once, the Paris Summit twice, decarbonisation 3 times, the climate transition once, the meeting of the Coalition of Marine Nations once, and so on.

In US President Joe Biden's climate and environment related tweets, there are many references to his New Deal to develop a comprehensive, 'whole-of-government' system of climate policies and measures, with tweets on reducing US carbon emissions by 50% to 52% from 2005 levels by 2030, achieving carbon-free electricity generation through a renewable energy transition by 2035, and achieving carbon-free electricity generation by 2050. The tweets cover three major climate governance goals: reducing U.S. carbon emissions by 50% to 52% from 2005 levels by 2030, achieving carbon-free power generation through a transition to renewable energy by 2035, and achieving net-zero emissions in the U.S. by 2050, as well as returning to the Paris Agreement, hosting a 'Leaders' Summit on Climate,' and advancing climate issues on multilateral platforms such as the G7. In some of the climate conference related tweets, Biden clearly expressed the need to put the climate crisis at the centre of U.S. foreign policy and national security. His tweets were more objective, mostly retweets of other official U.S. tweets, and mainly explained the content and circumstances of climate events.

French President Macron's tweets involve the Durban Climate Change Conference (COP17), the European Union (EU), the Umbrella Group (Umbrella Group), BRICS, the Group of 77 (G77), and other diversified climate co-governance subjects. In his tweets, Macron actively advocated for major energy transitions and greenhouse gas emissions reductions, emphasising the environmental threat posed by the energy crisis and the development of industrialised cities and the urgency of taking action. As President Macron is the youngest President of France and makes good use of social networks for advocacy, most of his tweets are strongly emotional, such as President Macron's tweet on 11 November 2023: "Nous lançons aujourd'hui l'Appel de Paris pour les glaciers et les pôles. De la détermination, de la coopération et des moyens vers un objectif: protéger notre planète." His tweets are not only objective information about existing activities and situations but also a strong call to action that seeks to gain the attention of the public and involve them in the process.

Brazil was an early participant in global climate governance compared to other developing countries. He has always considered climate governance as a determining factor in the country's development. In contrast to the aforementioned tweets from the US and France, which were mostly about multilateral climate diplomacy, Brazilian President Lula's tweets were more focused on domestic climate policy. A total of 23 of the 37 climate diplomacy tweets dealt with domestic climate governance, mainly in 3 areas: agriculture, energy, and climate adaptation. In Lula's tweets, although there are concerns about the cost of emission reduction, he is more positive about climate change as a new economic growth point, focusing on promoting the effective integration of climate change and economic growth and proposing a low-carbon development plan.

Japanese Prime Minister Fumio Kishida and Senegalese President Sall have fewer tweets on their Twitter accounts involving climate governance. The three tweets by Fumio Kishida are all related to an important climate governance event in 2023: the discharge of nuclear wastewater and their content emphasises the non-hazardous nature of nuclear wastewater, with the main purpose of winning more support from the public for the Japanese government's action of discharging nuclear wastewater into the oceans, which does not further reflect Japan's policies and initiatives on climate governance. However, the percentage of climate-related tweets and the content of a single climate-related tweet show that climate governance is a peripheral part of the Japanese government's policy system. President Sall of Senegal only issued two tweets, mainly about strengthening the management of environmental pollution and related laws and regulations, and committed to maintaining ecological security, reflecting that Senegal attaches more importance to the development of a green economy.

Climate change has become a hot topic in recent years, is closely related to environmental science, and has a bearing on a country's domestic energy plans, tax arrangements, and other policies. The climate-related statements made by the leaders of the five countries on the Twitter platform reflect the breadth and depth of their countries' climate action and their responsibility in the face of global environmental issues.

5. Network Analysis

In this paper, we use a Python programme to capture basic information such as username, number of followers, and follower data of 123 global political leaders' Twitter accounts. In addition, we take the 123 global political leaders' Twitter accounts as independent network actors and construct a network matrix for forming climate influence by taking the mutual concern relationship between each account and the mentioning of the leaders in the climate-related tweets as the edge. Finally, we analysed the data using the social network analysis software UCINET and ORA.

5.1 Network Characteristics

The degree of aggregation of social networks is generally reflected by network density. Network density is an important indicator of how closely network nodes are connected and how active network communication is. It ranges from 0 to 1, and the closer the value is to 1, the closer the relationship between network nodes. The data shows that the global political leaders' climate diplomacy network density is 0.043, with relatively loose connections. Specifically, 123 national leaders form 98 two-way connections and 543 one-way connections in the network. That is, the number of times leaders formed mutual followers or mentioned each other in

climate-related tweets was 97, and the number of times leaders unilaterally followed or mentioned each other in climate-related tweets was 542. Of these, there were 7 two-way links and 52 one-way links involving French Prime Minister Macron; 3 two-way links and 47 one-way links involving United States President Biden; 2 two-way links and 28 one-way links involving Brazilian President Lula; only 20 one-way links involving Japanese Prime Minister Fumio Kishida; and 5 two-way links and only 23 one-way links involving Senegalese President Sall.

5.2 Centrality and Authority

The centrality of authority is a measure of the quality and quantity of other nodes to which a node is connected. The higher the centrality of authority, the higher the node's position in the network and the more other nodes it can influence. Despite the fact that Biden does not follow any political leaders from other countries, 27 international leaders actively follow or mention Biden and U.S. climate policy in climate-related tweets. The centrality of Biden's authority on climate action is heightened by the fact that most of the leaders who follow Biden hold significant positions in their networks. French Prime Minister Emmanuel Macron is a close second; as an avid social media enthusiast, Macron posts an average of three tweets per day, with the highest number of tweets posted in a single day being nine. Senegalese President Sall, on the other hand, has a relatively weak influence, although the number of leaders actively following or mentioning Sall in climate-related tweets exceeds the number of those involving Fumio Kishida; these followers are mainly clustered in Africa and have less authoritative influence in the network, as shown in *Table 4*.

Table 4 authority centrality of political leaders

arrange in order	Political Leaders' Twitter Accounts	nations	Development Level	authority centrality
1	PresidentBiden	United States of America	developed country	0.357
2	Emmanuel Macron	French	developed country	0.341
3	Fumio Kishida	Japanese	developed country	0.194
4	Lula	Brazilian	Developing country	0.179
5	MackySall	Senegal	The least developed countries	0.043

5.3 Factors Influencing Network Impact

5.3.1 Economic Strength

From the ranking of the centrality of authority, leaders from developed countries seem to have more influence in climate diplomacy social networks, and in order to verify this conjecture, this study combines the analysis of Gross Domestic Product (GDP) with the centrality of the authority of its country's political leaders' climate diplomacy social networks. As shown in *Table 5*, a country's GDP value is positively correlated with the centrality of authority of its political leaders ($r = .510$). This result is consistent with the previous data presentation, which shows that a country's level of economic development has a greater impact on the climate diplomacy influence of its leaders. The United States, as the country with the strongest economy today, also has a very high position in the discourse of its political leaders on climate diplomacy, so it is located in the first place in the climate diplomacy influence of political leaders in the five countries. Senegal's President Sall, who is the last most influential country, is affected by his country's economic level, and his international political status is much lower than that of the political leaders of the previous four countries, so his influence on climate diplomacy is also relatively small.

Table 5 Correlation coefficients between GDP and the degree of centre of authority

	the degree of centre of authority
Gross domestic product	.510**

5.3.2 Priority given to climate

In processing the data, this study found that there is a significant relationship between the climate diplomacy influence of the political leaders of the five countries in their tweets and their level of concern about events involving climate. Therefore, the correlation analysis between the number of climate tweets of the political leaders of the five countries (representing their concern for climate issues) and the centrality of their authority in climate diplomacy was derived in the previous section. As shown in *Table 5*, the number of climate tweets and political leaders' centre of authority in climate diplomacy shows a strong positive correlation ($r = .572$). So, national political leaders' attention to climate issues and engagement with activities are closely related to their political leaders' influence on climate diplomacy. France's traditional emphasis on climate issues makes President Macron also attach great importance to the implementation of domestic climate governance policies and participation in international multilateral climate activities, although there is a large gap between France and the U.S. in terms of total GDP and the international political status is also a large difference, but the French political leader's social activism boosts his influence on climate diplomacy, and the gap between Macron and Biden's centrality of authority on climate diplomacy is small.

Table 6 Correlation coefficients between the number of climate tweets and the degree of centre of authority

	the degree of centre of authority
Number of climate tweets	.572**

By analysing the content of climate-related tweets by political leaders of the five countries in the previous section, it is clear that there is a big difference in the degree of participation of the five countries in multilateral climate governance activities. For example, the United States and France are active in international climate governance activities, participating in the Group of 77 (G77), the European Union (EU), and other diversified climate co-governance bodies, and are active in climate governance arenas such as the Leaders' Climate Summit and the meetings of the Coalition of Oceans Countries. Japan and Senegal, on the other hand, are more concerned with the implementation of their own climate policies. The level of participation in multilateral climate governance activities demonstrates a country's responsibility and commitment to the global climate issue, and practical actions enhance the status of the country's political leaders in climate diplomacy.

6. Conclusion

By analysing the data and content of climate tweets, combined with the online influence of the leaders of the five countries, this study concludes that the climate-related remarks made by the leaders of the five countries on the Twitter platform reflect the breadth and depth of the scope of the country's climate action. And this directly affects the influence of climate diplomacy on different political leaders. In analysing the content and influence of the Twitter accounts of the leaders of the five countries mentioned above, we can draw the following conclusion: the online power and influence of the political leaders of each country do not exist independently but is closely related to the real power of each country. On the basis of the influence and centrality of leaders' accounts, which are directly linked to national power, the importance that countries attach to climate issues is also reflected in the influence of climate diplomacy. In addition, the occurrence of important climate events will also make the influence of the country's political leaders in a certain period of time expand rapidly.

Twitter is a window for the public display of national relations, and the Twitter accounts of national political leaders play an important role in publicising national policies, shaping the personal image of leaders, and promoting the process of civil diplomacy. However, due to the relatively large number of global political leaders' accounts, this paper only analyses the content of the climate-related tweets of the five leaders. The content of the climate-related tweets of other political leaders involving the five leaders is only counted in number, and the content is not analysed in depth. Although the lack of this aspect does not form a large bias in the analysis of the influence, there is bound to be a certain effect on the accuracy of the value of the centrality of authority.

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