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Carbon neutrality vs. neutralité carbone: A comparative study on French and English users' perceptions and social capital on Twitter

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Carbon neutrality is one of the most critical global concerns at present. As one of the largest social media, Twitter is used widely by individuals, organisations, and government agencies to share their comments and perceptions on carbon neutrality. This study collected 26425 English and 20331 French tweets to compare the differences between French and English tweets. Social network analysis found that users in the French social networks interacted more frequently than the English ones. The geodesic analysis evidenced that the connection of any two users required about five intermediate users on average in French networks, while English ones required seven intermediate users. The modularity metrics of the English network were higher, indicating that users in English networks did not communicate with different clusters and people in carbon neutrality issues. In addition, the French network of carbon neutrality activists comprised politicians, government agencies, journalists, NGOs, and companies, while those in the English network mainly included companies, media, and politicians. Sentiment analysis and independent samples t-test have confirmed that despite the types of activists and the interactions between clusters being different, negative Tweets were more than positive ones in English and French networks, especially in French networks. It may be caused by people's dissatisfaction with the government's current carbon neutrality policy. By analysing the social pattern on Twitter, the research results allow people to know more about the means to enhance carbon-neutral knowledge sharing, which has the policy and social significance for addressing climate change.

KEYWORDS

carbon neutrality, Twitter, social network analysis, sentiment analysis, social capital

Introduction

Global warming impacts society, the economy, the environment, and other aspects (Rabaey and Ragauskas, 2014; Hoang and Kanemoto, 2021). Since the industrial revolution, greenhouse gas emissions caused by human activities have been the leading cause of global warming. It is one of the critical factors that restrict sustainable development. Energy issue has been at the core of United Nations Sustainable Development Goals. To lay a solid foundation for prosperity, scholars pointed out that countries should balance three critical aspects of the energy trilemma: environmental sustainability, energy security, access and affordability (Khan et al., 2022). In 2015, the "Paris Agreement" reached a consensus that the global temperature increase should not exceed 2°C by the 21st century (Shao X. et al., 2021). The special report from the Intergovernmental Panel on Climate Change released in 2018 highlighted that limiting global warming to 1.5°C can significantly reduce the impact of climate change. Thus, countries worldwide must reduce their emissions to achieve carbon neutrality. The US government promised that greenhouse gas emissions in 2030 will be reduced by 50%–52% compared with 2005 and reach carbon neutrality by no later than 2050 (Whitehouse, 2021). The EU claims that by 2050, more than 80% of the electricity will come from renewable energy, on top of about 15% of nuclear power, which will be the pillar of Europe's carbon-free power system. As one of the important member states of the European Union, the French National Assembly incorporated net-zero emission into law on 27 June 2019. The High Council on Climate of France suggested that the government triple the emission reduction rate to achieve the carbon neutrality goal in 2050 (Gouvernement, 2017).

To achieve carbon neutrality and sustainably support human activities, reducing carbon emissions from fossil fuels and promoting carbon sequestrations in terrestrial and marine ecosystems are essential. For example, India has been using biomass energy to overcome the current energy crisis (Irfan et al., 2022). However, the existing technologies, policies, and people's living habits challenge reaching the goal of net-zero carbon emissions (Cheng, 2020). Although many countries have implemented laws requiring enterprises, organisations, and industries to use carbon-neutral technology gradually and publish their carbon emission data (Attia et al., 2021), carbon neutrality remains a non-mandatory activity at the individual level. Reaching this target mainly depends on personal environmental awareness and perception of climate change (Wan et al., 2021). Yangka et al. (2019) pointed out that carbon neutrality relies not only on the nation's policy but people's willingness, which is the premise for reaching the goal of carbon neutrality.

With the development of information communication technology, social media enables people to share their views and change how they communicate (Song et al., 2022). It eliminates time and space constraints and facilitates knowledge dissemination and sharing (Yao et al., 2022). Previous studies have confirmed the potential of using social media such as Twitter to share expert knowledge and increase user interest in specific topics (Etemadi et al., 2021; Yao et al., 2021). However, few studies highlighted the public attitudes and information flow on carbon neutrality in social networks despite this topic being on many governments' agendas. Besides, understanding the public's views and opinions on carbon neutrality may ease governments' policy implementation, provide suggestions that lead to a low carbon society, relieve climate change and achieve sustainability goals. This research selects the French-speaking population and the English ones for several reasons: while English is the most popular language used by all nations, the Paris Agreement imposes a significant impact on carbon emission globally, and the government in France has just implemented carbon emission legislation (Légifrance, 2021; Ministère De La Transition Écologique Et De La Cohésuin Des Territoire. and Ministère De La Transistion Énergique, 2022), and there are high-profile protests on environmental issues in France (Garric, 2022, Ouest France., 2022; Le Deley, 2022; Monin, 2022). These three reasons indicate a high interest in carbon emission and environmental issues in the French-speaking community. Using carbon neutrality and neutralité carbone as keywords, this study collected English and French tweets to study the following research questions:

1) What are the users' perceptions of carbon neutrality on Twitter?
2) Who influences more on Twitter?
3) Do English and French social networks differ on carbon neutrality issues?

Acknowledging the importance of individual willingness on the issue, the literature review introduces the idea of social capital in social media, establishing a theoretical, and methodological framework for this study. Following the introduction, the literature review section first identifies the concept of carbon neutrality and three key factors that influence carbon neutrality. Section 3 illustrates the research methods: social network analysis, sentiment analysis and theory of computational communication to study English and French Twitter users' views and opinions on carbon neutrality. The conclusion offers insights to individuals who wish to share related carbon neutrality knowledge and raise awareness of people's environmental responsibility. It throws light on policy and social contribution of this research that address climate change.

Literature review

Carbon neutrality and influential factors

Many places worldwide advocate the carbon neutrality goal to alleviate the problems of climate change. Carbon neutrality refers to the environmental protection behaviour of reducing

carbon dioxide emissions. It offsets the carbon dioxide produced by people through afforestation or by using green products and energy (Dhanda and Hartman, 2011; Bento et al., 2015). Carbon emissions are related to multiple factors such as population size (Ribeiro et al., 2019), industrial and energy structure (Wu et al., 2022), urbanisation (Xu et al., 2018), foreign trade (Zhang, 2012), sustainable use of material resources (Xie et al., 2022) etc., Among these factors, there are three foci in academia. Regarding technology and management, Prabu and Geeta (2015) proposed an underground coal gasification technology, which could use carbon dioxide as a gasification medium, combined with carbon capture and storage technology to increase net thermal efficiency and reduce carbon emissions significantly. Some scholars also concurred that realisation of village carbon neutrality should start with design and village infrastructure modification, adjusting the regional energy mode of operation, and adopting an appropriate biomass energy compensation mechanism to achieve carbon neutrality (Goodfield et al., 2014).

From the perspective of policies and regulations, the government needs to implement related policies and offer enterprises guidelines to reduce carbon emissions by improving the incentive and restraint mechanism to achieve carbon neutrality. For example, instead of giving subsidies, which will lead companies to maintain the status quo of non-market activities (Shao X.-F. et al., 2021), Zhang H. et al. (2021) suggested using carbon, energy, and other taxes to increase energy consumption or emission cost. These are the primary tools to regulate the cost of energy production. Jia and Lin (2020) discussed the different impacts of a carbon tax and trading mechanism on the environment, energy, and economy. They found that carbon tax is more potent in emission reduction than carbon trading (Zhang S.-C. et al., 2021; Carroll and Stevens, 2021). However, Povitkina et al. (2021) pointed out that the carbon tax is unfair due to a lack of trust in the government and high oil prices.

At present, there are many difficulties in achieving carbon neutrality. Ojha et al. (2020) showed that although carbon tax effectively reduces carbon emissions, it lowers GDP. Khastar et al. (2020) analysed the impact of a carbon tax on social welfare and emission reduction rate through a general equilibrium model. The result showed that although Finland's carbon tax policy successfully reduced carbon dioxide emissions, it harmed Finnish's social welfare. In addition, different people's willingness to pay for carbon offset projects was also an obstacle that hindered carbon neutrality. Rehman et al. (2021) found that carbon emissions from transportation affected Pakistan's economic development *via* econometric analysis. Mclennan et al. (2014) revealed that air passengers from the United Kingdom and Europe were more willing to pay for carbon offset projects than in Asia. Masood et al. (2015) stated that income, education level, and awareness of climate change heavily influenced the willingness to pay for carbon offset projects (Figure 1). Although studies have studied carbon neutrality in various fields and perspectives, people's perceptions and attitudes towards carbon neutrality on Twitter remain unclear.

Social capital in social media

Zhang et al. (2022) examined the role of information and communication technology (ICT) in environmental quality in developing countries during 1996–2019. It recommended that policymakers should invest more in ICT infrastructure and develop modern information systems to reduce unsustainable practices and increase public awareness of environmental quality. Lu and Wang (2018) found that appropriate media promotion changed people's perception of carbon neutrality and their behaviours. Social media, such as Twitter, has become a prosperous source of data to investigate people's behaviour in the physical world (Singh et al., 2020). Thus, we might consider a social network as a kind of social capital, that is, the connection to resources people have accessed to a social network (Lin, 2002). These resources consist of the strength of the network, people's relationships, and how people access information (Coleman, 1988).

There are two kinds of social capital: bridging and bonding. Bridging social capital refers to the weak ties that individuals with heterogeneous limited interactions form. Bridging social capital is more likely to provide valuable new information (Moshkovitz and Hayat, 2021). Bonding social capital refers to strong ties: the intimate relationships people feel close to and trust (Lu and Lee, 2021; Le, 2022). With the development of social media, users obtain a significant volume of information. Thus, online social capital is more effective than offline social capital, and previous research examined how people develop their online social networks through different uses (Ellison et al., 2007). De Zúñiga et al. (2017) found that online social capital exhibited different behaviour patterns.

As one of the most popular and influential social media, Twitter requires no reciprocity to follow or be followed by other users (Marwick and Boyd, 2010). This feature gives the Twitter user more social capital (Hofer and Aubert, 2013). Previous studies have investigated the strategies of what to post and share on social media. These strategies facilitate the management of users' self-image and help users accumulate social capital from social networks (Huvila et al., 2014). Moreover, Twitter enables connections with a wide range of people, and the information they reach can broaden their horizons, which increases their online bridging social capital (Hofer and Aubert, 2013). Thus, to understand the users with higher social capital and influence on Twitter and their characteristics in the carbon neutrality discussion networks,

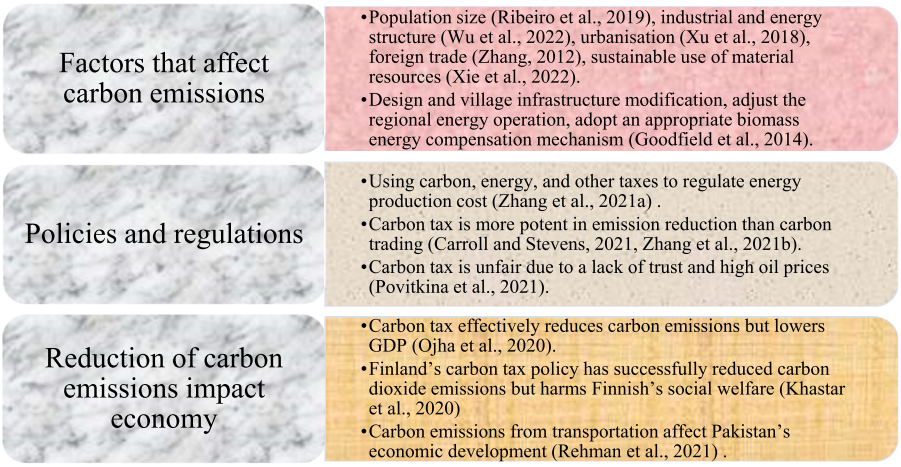

FIGURE 1
An overview of carbon-related research (authors' figure).

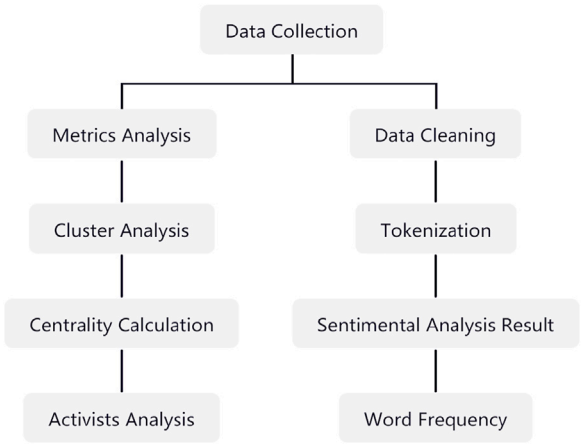

FIGURE 2
Methods applied in this study.

this study applied data mining, social network analysis and sentiment analysis.

Data collection and analysis

Social network analysis of English and French tweets

In the past two decades, the rise of social media has led to massive communication data, allowing academia to investigate social networks from a broader scope (Hayat et al., 2017). Social media also enables the non-disruptive data collection from various social platforms such as Facebook, Twitter, YouTube, etc., (Yao et al., 2021). One method for analysing social network data is social network analysis (SNA). SNA is used to present the logical structure of the two-dimensionally data visually. More importantly, researchers can visualise meaningful results to offer insights in the form of graphs for further study (Song et al., 2022). Another advantage of SNA is that it can process many social ties and describe the comprehensive relational network structure (Yao et al., 2022).

Moreover, clusters, relations, and positions of social media users can be manifestly characterised by analysing nodes (Suratnoaji et al., 2020). This study analysed both networks' activists, sentiment, and word frequency. The methods applied in this study is shown in Figure 2.

In order to have enough data that can be filtered or sampled, previous studies suggested using the keywords that return all potentially relevant tweets (Shelton et al., 2014; Grace et al., 2019). Thus, this study chose two keywords, namely "carbon neutrality" and "neutralité carbone", to collect sparse metadata. The data was collected from 1 January to 31 March 2022 *via* Twitter API. The data was then saved in the "vertices" and "edges" worksheets. Vertex is a node, referring to an individual, organisation, institution, or team (Hansen et al., 2010; Nodexl, 2022), and this study refers to the Twitter user. As shown in Table 1 English and 8647 French users were included. Edge is the link or connection that exchanges information between two vertices (Nodexl, 2022). This study collected 26425 English and 20331 French tweets separately. Average geodesic distance refers to the average number of paths connecting two vertices. It measures how many intermediate users may be required between any two users (Yao et al., 2022). The average geodesic distance between the English and French Twitter network was 7.150551 and 4.705047, respectively. This result indicated that the distances between any two users in the English

TABLE 1 Graph metric of English and French networks.

Graph metric	Value (English)	Value (French)
Vertices	17521	8647
Total Edges	26425	20331
Average Geodesic Distance	7.150551	4.705047
Modularity	0.749081	0.643406

network were more significant than that of the French network. The relationship between users in the English network was less intimate.

When investigating the social capital in Twitter, one of the critical metrics is modularity. Modularity examines the fitness of the groups in a network (Park et al., 2020) and quantifies the actual community structure in a network corresponding to a statistical arrangement of edges. Modularity can be positive or negative, and positive ones indicate the possible presence of community structure (Newman, 2006; Ouest France, 2022). If the modularity metrics are high, the connections within a group are dense, but the connections to other groups are sparse (Park et al., 2020). In this study, the modularity of the English network is higher than French, indicating that when discussing carbon neutrality issues, users in English networks tended to discuss, and interact in their clusters rather than others. On the other hand, the French users preferred to discuss with various clusters and different people. In this study, both English and French modularity were positive, evidenced the existence of the online community and English (0.75) was stronger than French (0.64).

This study clustered the vertices and analysed the characteristics of both networks *via* the Clauset-Newman-Moore (CNM) algorithm, which is suitable for extensive network analysis (Ahmed et al., 2020). The result was then visualised by Harel-Koren Fast Multiscale layout algorithms (as shown in Figure 3).

3627 English clusters and 903 French clusters were found. Although there were more clusters in the English network, most users only interacted in their own "small circles", the information flow between clusters was limited (this result was consistent with the modularity analysis), and their social capital was relatively low. On the contrary, the number of French networks was small, but the users were willing to go to other circles to discuss carbon neutrality issues. In other words, although the number of users and clusters was not as large as in the English network, the French network had more social capital and was likely to exert more influence than other users.

Activists of English and French networks

Recuero et al. (2019) stated that in-degree centrality manifests the number of mentions or retweets received by a vertex and is also an essential metric measuring social capital. This study selected nodes with the highest in-degree centrality in the top 10 clusters to study the attributes of the activists with more social capital. It analysed the role they play in carbon neutrality discussions on Twitter.

As shown in Table 2, among the top 10 activists, three were government officials, three were media, three were companies or company representatives, and only one was an individual. The activists with the most followers were the media; two came from China (despite this study only covered English and French Tweets). The nodes with the most social capital mainly used Twitter to spread carbon neutrality-related policies, plans, and progress. Politicians call for environmental protection and the realisation of carbon neutrality, and Twitter is a tool for publicity. Companies or company representatives use Twitter to advertise their products. Therefore, we can conclude that those with high social capital only used Twitter to send information in the English network. There were not many incentives in individual users' discussions. That is, to say, the activists

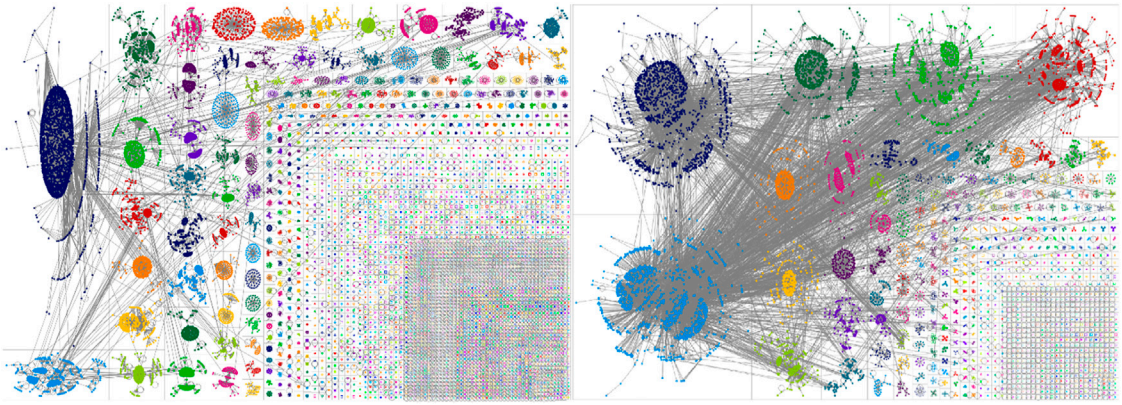

FIGURE 3
Characteristics of English (left) and French (right) networks.

TABLE 2 Top 10 activists in the English network.

ID	Followers	Attribute	Companies/individuals
antonioguterres	1677289	Secretary-General of the UN	Individual (global organisation)
xhnews	12308687	China state-affiliated media	Private company
kallemets	1928	CEO of an energy company	Individual (senior management, businessman)
huaweisolar	58980	Solar energy company	Private company
pdchina	6861898	China state-affiliated media	Organisation (government related, news)
mrkrudd	1579412	Former Prime Minister of Australia	Individual (politician)
phantasmachain	43822	NFT and gaming company	Private company
Afp	2294364	Agence France-Presse	Organisation (news)
timmermanseu	198811	Executive Vice-President for the European Green Deal	Individual (EU)
buweekulaprody	8495	Individual	Individual

TABLE 3 Top 10 activists in the French network.

ID	Followers	Attribute
emmanuelmacron	8143200	The President of France
Ademe	128532	The French Agency for Ecological Transition
audreygarric	57515	Journalist of Le Monde
bonpote	41656	Independent media
goldbergnic	15715	Senior manager of an energy consulting company
laydgeur	27974	Individual
maxcordiez	17635	Energy engineer
Cnrs	201152	French National Centre for Scientific Research
olivierdavid_ec	11014	Head of Directorate General of Energy and Climate
clemsenechal	20520	Spokesman of Greenpeace France (NGO)

in the English network did not consider carbon neutrality a general topic. There were not many active interactions between clusters. Scattered clusters decreased weak ties and interaction between groups, limiting people's access to different opinions and reducing the influence of activists (Wojcieszak and Mutz, 2009).

It can be seen from Table 3 that the activists in the French network with the highest number of followers were mainly government departments (or politicians) and companies (or company representatives), journalists and NGOs who diverted the discussion topics. Like activists in the English network, government departments (or politicians) promoted carbon neutrality policies and invited people to participate in carbon neutrality. Companies (or company representatives) promoted their technology and questioned the government's current policies. Journalists, NGOs, and individuals criticised the government's carbon neutrality actions and fossil energy companies. Because of these individual activists, the interaction between clusters in the French network was high. These activists with higher social capital can also better attract the attention of other users. Table 3 lists the top 10 activists in the French network.

Sentiment comparison of English and French tweets

This study conducted sentiment analysis to examine users' sentiments about carbon neutrality issues and whether there were differences between English and French networks. Sentiment analysis is often applied to identify opinions, feelings and attitudes in unstructured written texts such as Twitter comments (Soo-Guan Khoo et al., 2012). SentiStrength, which was used in this study, is a lexicon-based sentiment analysis tool. After analysing each word, SentiStrength can generate positive and negative scores for texts written in English, French, Portuguese, etc., (Yao et al., 2021). The scores range from +5 (extremely positive) to −5 (extremely negative).

After deleting tweets that could not be processed (containing only emojis or web links), 26243 English and 20198 French tweets were analysed. Among all the English tweets, 5815 (22.2%) were positive, 12013 (45.7%) were neutral, and 8415 (32.1%) were negative. Meanwhile, in the French network, 1930 (9.6%) were positive, 9365 (46.3%) were neutral, and 8903 (44.1%) were

TABLE 4 Independent samples t-test result.

		Levene's test for equality of variances		t-test for equality of means				
		F	Sig	T	df	Sig. (2-Tailed)	Mean difference	Std. Error difference
Sentiment Distribution	Equal variances assumed	0.003	0.958	−0.418	14	0.682	−755.62500	1808.80642
	Equal variances not assumed			−0.418	13.677	0.683	−755.62500	1808.80642

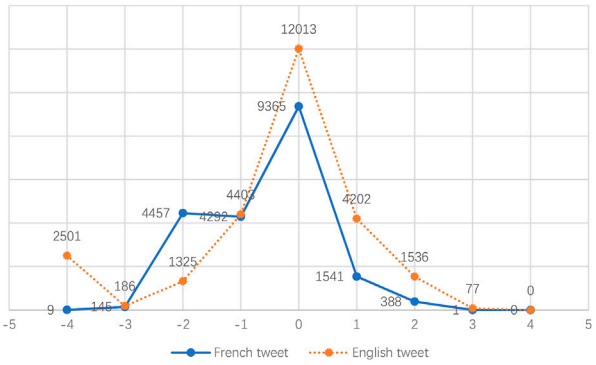

FIGURE 4
Sentiment distribution of English and French networks.

negative. As shown in Figure 4, most of the tweets in both English and French networks were neutral. The two networks also showed that negative sentiments exceeded the number of positive ones. In the French network, negative sentiments were almost five times that of positive sentiments. Previous studies shared similar findings: Peeters (2021) found that the French often shared their standpoints rather than kept them private. Song et al. (2022) also found that French speakers inclined to express their thoughts in a more extreme way.

As mentioned above, journalists and NGO spokespersons in the French network criticised the government's or certain enterprises' carbon neutrality policies and actions. However, most activists in the two networks were positively calling for and supporting the implementation of carbon neutrality. However, pessimistic tweets were more than positive ones in the two networks. An independent samples t-test was performed to compare sentiment distribution between English and French tweet networks. The result in Table 4 showed that there was not a significant difference in sentiment distribution between English and French tweets network; t (14) = −0.418, p = 0.682. In other words, despite the types of activists and the interactions between clusters being different, people's attitudes towards carbon neutrality were statistically the same.

To understand the detail of users' discussions on carbon neutrality, this study studied the word frequency of all the tweets. As shown in Figure 5, essential timetables (as explained in Introduction) 2030 and 2050 were frequently mentioned in English and French networks, and "goal" and "ambition" also reflected the importance of carbon emission reduction targets. Words such as "catastrophe" and "devastating" emphasised the urgency of carbon neutrality. Unlike the English network, many "nucléaire" appeared in the French network, which was related to the current situation of French nuclear power plants. Studies have shown that France has many nuclear power plants to make it resilient in energy security (Krikštolaitis et al., 2022). However, as half of the nuclear power plants are approaching the end of their design life, the energy problem in France is becoming increasingly prominent. Since 2022, energy prices in France have been rising. According to a report from Le Parisien (2022), half of the nuclear reactors in France have been shut down or suspended. Affected by this, the total power generation in France has decreased sharply, and the local energy prices have continued to rise.

In addition, many "@" existed in the French network. On Twitter, "@" is used to mention or remind someone. Users can use @username in tweets to attract attention. "@" calls out usernames in Tweets by sending a message or link (Twitter, 2022). The users mentioned in the French network were environmental protection organisations (@greenpeacefr), non-profit associations (@notreaffaire) and politicians (@emmanuelmacron). This proved that users have high social capital. Other users tended to send their ideas about carbon neutrality to them. "Justice" and "greenwashing" also showed people's dissatisfaction with the status quo of carbon neutrality.

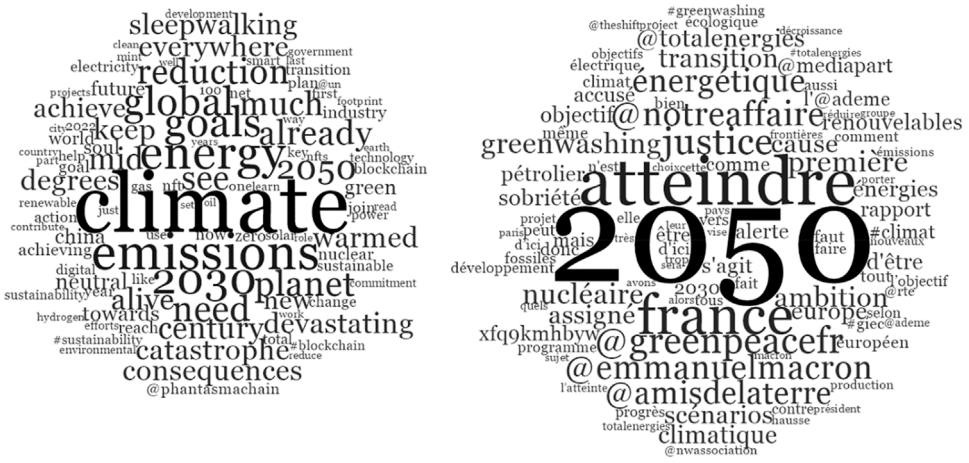

FIGURE 5
Word cloud of English (left) and French (right) networks.

Discussion and conclusion

This study emphasised individual perception and involvement in carbon neutrality on Twitter. Through social network analysis, this study attempted to find activists with high social capital. Coupled with the sentiment analysis of tweets, this study provided suggestions to raise public carbon neutrality awareness and knowledge sharing.

For the first research question, sentiment analysis revealed that many tweets were neutral and negative sentiments were more than positive ones in English and French networks, which was contrary to previous similar studies (Song et al., 2022). Negative sentiments came from users' concern about environmental damage, building new nuclear power plants and dissatisfaction with the government's existing carbon neutrality policy. The analysis indicated that most users expressed their views on carbon neutrality from an individual standpoint through Twitter, and their discussions mainly criticised the government's measures and expressed dissatisfaction with energy enterprises.

As per the second research question, after analysing the activists in the two networks, this study found that the activists in the English network mainly comprised government officials, media, and enterprises. They regarded Twitter as a publicity tool. Based on graph metrics, the activists in the French network had more social capital and influence. To answer the third research question, the analysis showed that although there were more users and clusters in the English network, users in French social networks interacted more frequently than in English ones, with various clusters.

To sum up, besides the efforts of governments and enterprises, social media might enhance people's awareness of environmental protection and turn the green concept into action to achieve carbon neutrality. Individual willingness is critical when dealing with carbon emissions and climate change. In addition to the general public through traditional media, the government, related organisations, and social media users with high social capital should share their knowledge *via* social media. Knowing the keywords that were shared more and the sentiment will be beneficial for successful knowledge sharing. Therefore, this research further reinforces that the carbon neutrality initiative has a broad social foundation and will be prosperous in the future, even though global warming is a universal challenge to humankind which is a long-term and complex process requiring systematic solutions.

This study has certain limitations. Abbreviations, words, and ambiguities in tweets may affect the accuracy of sentiment analysis. Implicit language, such as humour and irony, is sometimes complex for even real people to be detected; however, the implied meaning of a sentence might make it completely different from literal. Moreover, although SentiStrength is reliable, one of its disadvantages is that it does not use grammatical parsing to eliminate the ambiguity between different word meanings. Little words in the lexicon dictionary are also restricted to the value assignment of each word in the tweet. To widen observation of carbon neutrality issues, this study unavoidably used simplistic keywords, which might miss some subtle data when quantifying users' perceptions.

Besides, this study did not conduct a manual content analysis of tweets. There may be new and innovative findings if we go into detail for all tweets like Regona et al. (2022). Moreover, this study only focused on two languages, meaning there is room to expand the scope to other languages. Lastly, this study mainly utilised a qualitative method to compare the French and English contents. Modelling the tweets data might be another research gap.

In the future, sentiment analysis can convert qualitative texts into quantitative scores, which enables more innovative research

designs. Follow-up research should collect more tweets from languages such as Thai and Chinese in a more extended time range. In addition to positive and negative sentiment detection, future studies might also identify a new direction, such as the perception of carbon neutrality compliance. Using the PRISMA approach to remove the irrelevant ones, different topics of carbon neutrality could then be analysed. The problem of the implicit meaning of Tweets might also be identified in this process. For example, people may write that this policy is "excellent". Computer algorithms may consider this a positive word because excellent has a positive meaning. Humans might realise that the quotation marks imply a negative meaning by reading all the contents. To investigate motivations and perceptions behind social network structure, a combination with other quantitative econometrics, statistical modelling and machine learning approaches might be used to study carbon neutrality from other angles.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

QY: Original writing and conceptualization, research method. RL: Writing and revise paper, conceptualization, data curation. LS: Literature review, research method, data curation.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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