Article

Are Transboundary Water Events Reported Differently in French and English News for Conflict and Cooperation Dynamics?

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Abstract: Media coverage of water events in transboundary river basins reflects the views of both riparian countries and beyond, and the conflict and cooperation dynamics could be biased due to the linguistic diversity. The aim of this study is to investigate whether any deviation exists in the depiction of water conflict and cooperation dynamics as reflected in the sentiments of French and English news articles, taking the Lancang–Mekong River basin and the Nile River basin as case studies. The results showed that news articles in English itself can reflect the trends of the cooperative or conflictive sentiments of the water events occurring within the basin, but French news is complementary in examining the attitudes and values of a few countries towards the shared river. The study would serve as an important reference for the perspective analysis of all riparian countries, as well as a basis for comprehending water conflict/cooperation dynamics in multiple languages.

Keywords: news media analysis; French news; English news; Lancang–Mekong River Basin; Nile River Basin; water conflict/cooperation

1. Introduction

Globally, there are a total of 310 transboundary river basins, shared by 150 countries and distributed areas, covering 47.1% of the Earth's land surface and home to 52% of the world's population [1]. And transboundary water accounts for approximately 60% of the global available freshwater resources [2]. Ensuring the security of transboundary water resources is related to the sustainable development of river basins and human society, as well as regional security and stability. According to the global risk reports of the World Economic Forum (WEF), the water crisis has been listed as one of the top ten most serious crises in the world for many consecutive years [3]. By virtue of climate change and turbulent geopolitical relations in the future, there is a growing concern that water-related risks may further increase, especially transboundary water conflict. Understanding the dynamics of transboundary water conflict and cooperation and transforming conflict into cooperation are of great significance to resolving the global water crisis and building a community with a shared future for humanity.

Many scholars have carried out a series of relatively comprehensive research on understanding transboundary water conflict and cooperation dynamics, such as concepts and methods for measuring water conflict and cooperation, spatial-temporal dynamics [4–6], drivers' assessment [7,8], hot spots identification and future tension recognition [9–12]. Often cited in the research is the Transboundary Freshwater Dispute Database (TFDD), a project of Oregon State University, that offers a vast repository of over 6400 global historical water events, both conflictive and cooperative, from 1948 to 2008. Each water event was manually screened and interpreted from existing political science datasets [13,14]. In recent years, a new research method for understanding water conflict/cooperation dynamics based on news media text mining (a news-based approach) has been very much in the international spotlight [15,16].

News media articles reflect and shape public opinion by defining and limiting public discourse around key events [17,18], accessing a wide range of viewpoints and perspectives, and contributing to the sense-making and informal learning of the community [19]. New articles are increasingly regarded as effective proxies for tracking societal values or public opinions on water issues [20–25] or other significant global issues [26–30], which are considered a powerful force for influencing public perceptions of risk [31]. Even though the news media may present different perspectives and biases, it is undeniable that the news media provides a rich and accessible repository of real-time data, offering a comprehensive snapshot of societal responses to water events. And news articles published by well-established media outlets remain the primary source of information on current events [32–34], serving as important records of societal viewpoints and attitudes.

Compared with TFDD, the news-based approach uses news media articles to track the conflict/cooperation dynamics and the attitudes/values of different countries/public within and outside the region towards water events that occurred in shared waters, depending on the option of language for the news articles. Wei et al. utilized English news articles to analyze the evolution of water conflict and cooperation dynamics from the perspectives of multiple countries, taking the Lancang–Mekong River basin as an example [15]. The research indicated that dam infrastructure frequently received negative coverage in reported articles. Conversely, events depicted in a positive light typically involved initiatives that facilitated connections among leaders and project developers across riparian nations, encompassing meetings, bilateral and multilateral collaborations, and development endeavors [15]. Through the analysis of English news articles published online by The Reporter about the Grand Ethiopian Renaissance Dam, Belay examined the prominent frames related to the dam project and how these frames reflect Ethiopia's dominant views on Nile politics [35]. El Damanhoury explored how the proximity of China, Qatar, and the UK to Egypt and Ethiopia relates to the framing of the conflict using English news articles focusing on the prolonged Nile Dam crisis [36]. However, except for English, the most widespread lingua franca (language used by people whose native language is different) [37], no other lingua franca or local/community language has been explored to reflect attitudes and values towards conflict/cooperation dynamics at this stage.

To probe the influence and role of other lingua francas as the carriers of news media articles in understanding transboundary water dynamics, French, close to English in terms of geographical distribution [38], is selected in this study. French is one of the working languages of the United Nations, together with Arabic, Chinese, English, Russian, and Spanish, and it often exists with other languages in multilingual environments. It is an official language in 29 countries, second only to English in this category [39], and shares with English the distinction of being taught as a foreign language in the education of most countries. And there are currently 321 million French speakers worldwide and about 144 million French learners, ranking fourth among the languages most widely used on the Internet [40]. Of all the French speakers, Sub-Saharan Africa and the Indian Ocean account for 47.2%, Europe for 31.3%, North Africa and the Middle East for 14.6%, America and the Caribbean for 6.6%, and Asia and Oceania for 0.3% in 2022 [40]. Owing to world population growth, the International Organization of La Francophonie (OIF) optimistically estimates that the number of French speakers will rise to 600 million by 2050 and approximately 750 million by 2070 [40].

By comparing French and English news articles related to transboundary water conflict and cooperation issues using sentiment analysis based on sentiment dictionaries, the Langcang-Mekong River basin and Nile River basin were selected as two case studies in this study. Two distinct analysis scenarios were set up: one that explored the dynamics of conflict and cooperation through the observed fluctuation trends of sentiments within both French and English news articles, as well as exclusively within English news articles, and another that examined the sentiment variations of the attitudes and values of different countries/publics towards water events occurring within the basin. Through this dual-layered analysis, the study aims to investigate whether there exists any deviation in the

depiction of water conflict and cooperation dynamics as reflected in the sentiments of French and English news articles.

2. Case Study Areas

The case study areas comprised the Lancang–Mekong River Basin in South-East Asia and the Nile River Basin in North-East Africa.

2.1. Lancang–Mekong River Basin

The Lancang–Mekong River (Figure 1), with a total length of 4880 km [41], is the longest transboundary river in Southeast Asia, the seventh longest river in Asia, and the twelfth longest river in the world [42]. It flows from the Tibetan Plateau in China, then flows through Myanmar, Laos, Thailand, Cambodia, and Vietnam, and finally flows into the South China Sea. More than 70 million people depend on the Lancang–Mekong River system for water supply, food production, and transportation [43,44]. The speaking languages of the Lancang–Mekong countries are shown in Table 1 [45–48].
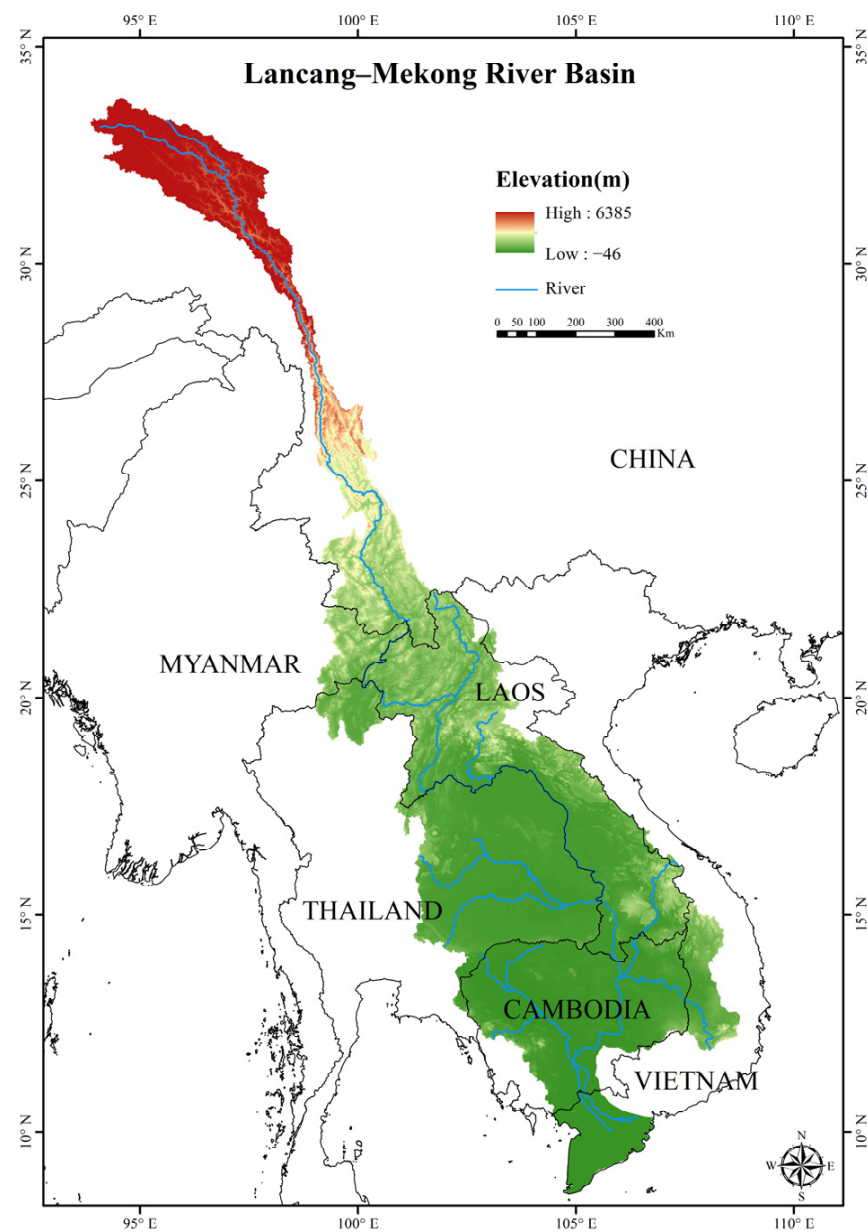

Figure 1. Lancang–Mekong River basin.

Table 1. Speaking languages of the Lancang–Mekong countries.

Riparian Countries	Language Speaking
China	Chinese (official)
Myanmar	Myanmar (official)
Laos	Lao (official), English, French (colonial language)
Thailand	Thai (official), English
Cambodia	Khmer (official), French (colonial language)
Vietnam	Vietnamese (official), English, French (colonial language)

In the Lancang–Mekong River basin, Laos, Cambodia, and Vietnam used to be French colonies, because of which there is a degree of influence on the French in these regions. Laos was a colony of France for half a century (1893–1945), while French became the official language and government documents, as well as announcements, were mostly written in French. The Royal Laotian Government continued to attach great importance to developing relations with France after gaining independence, especially educational ties, and reached cultural agreements with France. As a result, French speaking and teaching continued to be emphasized and strengthened [49]. In 2018, Laos had 63 radio, 37 TV broadcast stations, 11 daily newspapers, of which Lao News Agency is the main information source in the country and began to publish its daily bulletins in English and French after the establishment of Laos [50]. Cambodia turned into a French protectorate in 1863 and was colonized for 90 years. French was used as a colonial language in Cambodia during this time [51]. In the early years after independence, French remained the primary language of Cambodia's government, businesses, and schools [52]. In 2017, there were 15 television stations, 12 national mass-circulation dailies, 7 English-language newspapers, 15 English-language magazines, and 2 French-language newspapers in Cambodia. The Voice of the Cambodian People radio programs were broadcast in Cambodian, Vietnamese, French, English, Lao, and Thai [53]. Nowadays, French is still an important foreign language in Cambodian schools at all levels [51,54,55]. France colonized Vietnam for nearly a century, from 1859 to 1954. Hence, during the French occupation, the spoken language and writing system of Vietnam were heavily influenced by French [51], and French was extensively used in all sectors of Vietnamese society. In the area of media, Vietnam had 67 TV broadcast stations and 199 newspapers by 2018. The Voice of Vietnam (VOV) is the most famous TV broadcast station in Vietnam. At present, the VOV broadcasts in English, French, etc. all day long. As the government agency and the only news agency in Vietnam, Vietnam News Agency once set up a website for its regular bulletins in Vietnamese, English, French, and Spanish [56,57].

2.2. Nile River Basin

The Nile River (Figure 2), measured at 6670 km, is the longest transboundary river in the world [58]. It originates from the plateau in Burundi and flows northward through Rwanda, Tanzania, Kenya, Uganda, the Democratic Republic of the Congo, South Sudan, Sudan, Ethiopia, and Egypt, and then it flows into the Mediterranean Sea [59,60]. A total of 300 million people are relying on the waters of the Nile River [61]. The speaking languages of the Nile countries are shown in Table 2 [62–66].

Among the Nile River basin countries, Burundi, Rwanda, and the Democratic Republic of the Congo were Belgian colonies in history, and these three countries speak Belgian French [67–69]. Following the First World War, the Belgians were awarded control of Burundi. Under the Belgian colonial administrators, French had an important role in government, business, education, and other formal contexts. The only official daily newspaper in Burundi, Le Renouveau du Burundi, is published in French. Burundi National Radio and Television is the national broadcaster, broadcasting in Kirundi, French, English, and Swahili, internally and externally [70]. French took over as the language of the administration of Rwanda between the First World War and Rwanda's independence in 1962. In the field of press and publishing, notable publications include the Rwanda Herald and New Times

(English), La Relève (French), and Kinyamateka (Kinyarwanda). The Rwandan government maintains one broadcast station, offering programming in Kinyarwanda, English, and French. Radio Rwanda, the state-operated radio station, broadcasts in Kinyarwanda, Swahili, English, and French [71]. Belgium annexed the Congo in 1908, which marked the beginning of actual Belgian colonization. At that time, French was the working language of the colonial government and the teaching language of middle schools. French has been maintained as the official language of the Democratic Republic of the Congo since the time of independence; as a consequence, French is widely spoken in the country. The Democratic Republic of the Congo now has the largest concentration of French speakers in all of Africa, and has the largest population of any country with French as the official language [72]. The Democratic Republic of the Congo had more than 500 radio and television stations and over 700 titles of newspapers in 2019. Radio is the primary media format in the Congo, and a large part of these media outlets publish in French [73]. Egypt was conquered for a brief period during Napoleon's early career, and French rule extended to the immediate area around the Nile River [74,75]. Beginning in 1858, French journals in Egypt began to dominate [76]. As well as during the period of British influence (1882–1922), French was actually the language of communication between foreigners and Egyptians [77]. The Middle East News Agency, which was founded in 1956, served as the primary provider of news bulletins and reports covering politics, business, and culture in the Middle East and was presented in Arabic, English, and French [78].
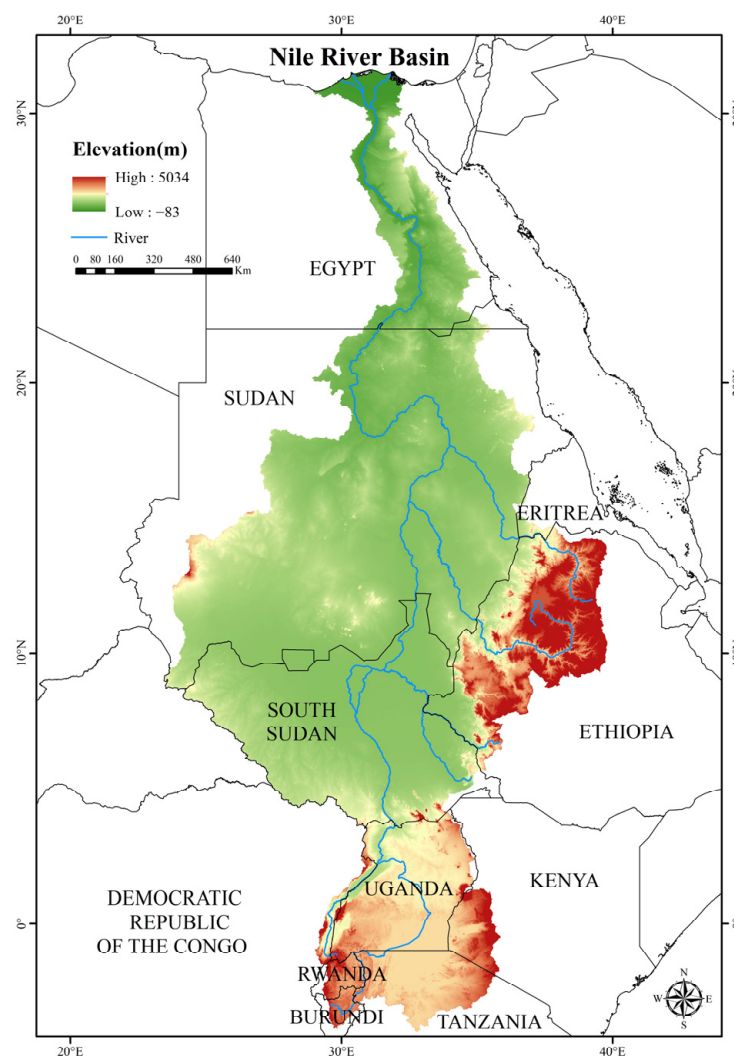

Figure 2. Nile River basin.

Table 2. Speaking languages of the Nile countries.

Riparian Countries	Language Speaking
Burundi	Kirundi, English, French (all official)
Egypt	Arabic (official), English, French (colonial)
Eritrea	Tigrinya, Arabic, English (all official)
Ethiopia	Amharic, Oromo, Somali, Tigrigna (all official)
Kenya	English, Kiswahili (both official)
Rwanda	Kinyarwanda, French, English, Swahili (all official)
Sudan	Arabic, English (both official)
South Sudan	English (official)
Tanzania	Swahili, English, Arabic (all official)
Uganda	English, Swahili (both official)
Democratic Republic of the Congo	French (official)

3. Methods

3.1. Data Retrieval and Cleaning

The LexisNexis Database, one of the most widely used databases in the field of social sciences, was chosen for the news articles. It includes newspapers, magazines, academic journals, legal research, and so on. Guo et al. have built a methodological framework for news media datasets to track conflict and cooperation dynamics on transboundary rivers [16], providing a mass amount of relevant news articles for analysis. The method for retrieving and obtaining news articles on water conflict and cooperation between the Lancang–Mekong River and Nile River in this study followed the protocol in the same vein as Guo et al. [16]. The five blocks search terms include which transboundary (Block 1: basin name), who is involved (Block 2: riparian countries), regarding what issues (Block 3: terms related to water), resulting in a conflict/cooperation status (Block 4: terms related to water conflict or cooperation), and some noisy terms (Block 5: terms needed to be excluded), satisfying the requirements of retrieving related news articles. An example of the specially designed English search terms for the LexisNexis Database is shown in Table 3, and the components of the French search terms (Table A1) are the same as the English terms.

The designed search terms have greatly reduced the number of news articles downloaded while ensuring the relevance of the topics on water conflict and cooperation in the Langcang-Mekong River or Nile River. Originally, a total of 10,203 English and French news articles were downloaded from the LexisNexis database, covering the period from 1979 to 2021. Then, each news article was reviewed by at least two reviewers to assess its relevance to transboundary water conflict/cooperation issues. News articles that provided objective descriptions of water events such as floods or droughts were removed because they had no sentiment polarities. The thorough review process ensured that only news articles with a clear focus on transboundary water conflict and cooperation issues were included in the final dataset. After the relevance inspection, the number of news articles ultimately analyzed in this study was 6828 (6264 English news articles and 564 French news articles); the specific number of news articles is presented in Table 4. The annual numbers of English and French news articles after relevance inspection for the Lancang–Mekong and Nile river basins are shown in Appendix A, Tables A2 and A3, respectively. The French news articles accounted for about 2.6% of the total news articles in the Lancang–Mekong River basin, and the French news articles accounted for about 11.5% of the total news articles in the Nile River basin. To establish the correspondence among news media articles, their respective news publications/agencies, and countries, each news article utilized for analysis was manually tagged with the news publication/agency to which it belonged, followed by the country to which this news publication/agency was affiliated. Then the news articles were categorized as originating from publications/agencies within the river basin or from external, non-riparian countries.

Table 3. The search terms used in the LexisNexis database (taking English news searching of Lancang–Mekong River Basin as an example).

Content in Search Terms	Specific Search Terms
Bain name	Mekong OR Lancang
Riparian countries	China OR Cambodia OR Laos OR Myanmar OR Burma OR Thailand OR Vietnam
Terms related to water	water OR river OR lake OR dam OR stream OR tributary OR diversion OR irrigation OR pollution OR "water quality" OR flood OR drought* OR channel OR canal OR fish OR "fish rights" OR hydroelect* OR hydropower OR reservoir OR "water allocation" OR "water sharing" OR "water rights" OR "water diplomacy" OR "water hegemony"
Terms related to water conflict or cooperation	treaty OR agree* OR convention OR "framework directive" OR negotiat* OR resolution OR commission OR secretariat OR "joint management" OR "basin management" OR peace OR "peace accord" OR settle* OR cooperat* OR collaborat* OR bilateral OR multilateral OR dispute* OR conflict* OR disagree* OR sanction* OR war OR troops OR "letter of protest" OR hostility OR "shots fired" OR boycott OR protest*
Terms needed to be excluded	sea OR ocean OR navigat* OR nuclear OR "water cannon" OR "mineral water" OR "hold water" OR "cold water" OR "hot water" OR "water canister" OR oil

Note(s): drought* signifies any English words beginning with "drought" can be searched, such as "drought", "droughts" and the same applies to others.

Table 4. The statistical table of the initial and final number of news.

River Basin	Initial Number of English News	Final Number of English News	Initial Number of French News	Final Number of French News
Lancang–Mekong	4221	2436	268	66
Nile	5054	3828	660	498

3.2. Sentiment Analysis

Sentiment analysis of news articles obtained is conducive to better understanding the attitudes and values of countries within or outside the Lancang–Mekong River and Nile River in both English and French. Sentiment analysis based on a sentiment dictionary was adopted in this study to realize the division of different sentiment polarities according to the polarity of sentiment words provided by different sentiment dictionaries. As there is no specific sentiment dictionary for the research field of transboundary water conflict and cooperation [15], two relatively general sentiment dictionaries were used in this study. AFFIN, a scoring system ranging from −5 (very negative) to +5 (very positive) sentiment dictionary (1598 (65%) negative words, 878 positive words, and a single phrase labeled with 0), was applied to the analysis of the final English news articles [79], while Chen's French sentiment dictionary, involving 4653 sentiment words (3038 negative words with a sentiment score of −1 and 1615 positive words with a sentiment score of 1), was utilized in the analysis of the final French news articles [80]. Due to the varying lengths of news articles, the sentiment score of a news article was represented by calculating the average score of the sentiment words appearing in the news articles from the sentiment dictionary, reflecting the intensity of attitudes and values towards water events occurring within the basin in the locality (riparian countries and beyond). Given that the initial sentiment scores calculated for French news articles ranged from −1 to 1, to align them with the sentiment scores obtained for English news articles (−5~5), multiplicative scaling was applied to the sentiment scores derived from the French news articles. News articles with a calculated sentiment score of 0 were not included in the analysis. News articles

with cooperative sentiments mean the attitudes and values of the country/public towards water events are positive, while conflictive sentiments are the opposite. And through the fluctuations in sentiment scores, which serve as indicators of the evolving attitudes and values expressed by different countries/publics, we can gain insights into the dynamics of water conflict and cooperation within the basin, as well as the sentiment landscape of different countries/publics.

4. Results and Discussion

4.1. Dynamics of Water Conflict and Cooperation Sentiment over Time

4.1.1. Lancang–Mekong River Basin

After considering the French news articles, the ratio-changing tendency of news articles with cooperative sentiments and conflictive sentiments obtained from the two scenarios was basically the same for the years 1979–2021 (Figure 3), which was intelligible because of the small portion of French news articles (2.6%). Among them, the proportion of French news articles with cooperative sentiments was relatively high in 1994, 1995, 2000, 2004, and 2006, while the proportion of French news articles with conflictive sentiments was relatively high in 2002. Both French news articles and English news articles possessed cooperative sentiments in 1994 (Figure 3a).
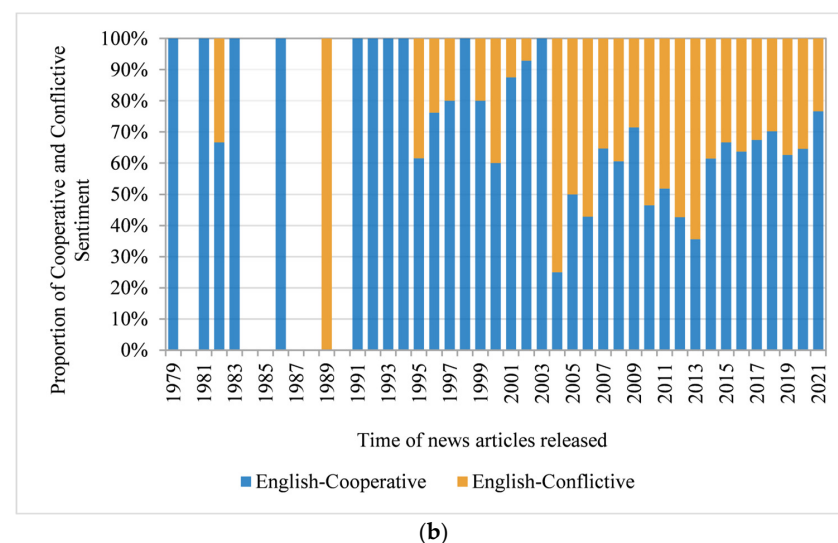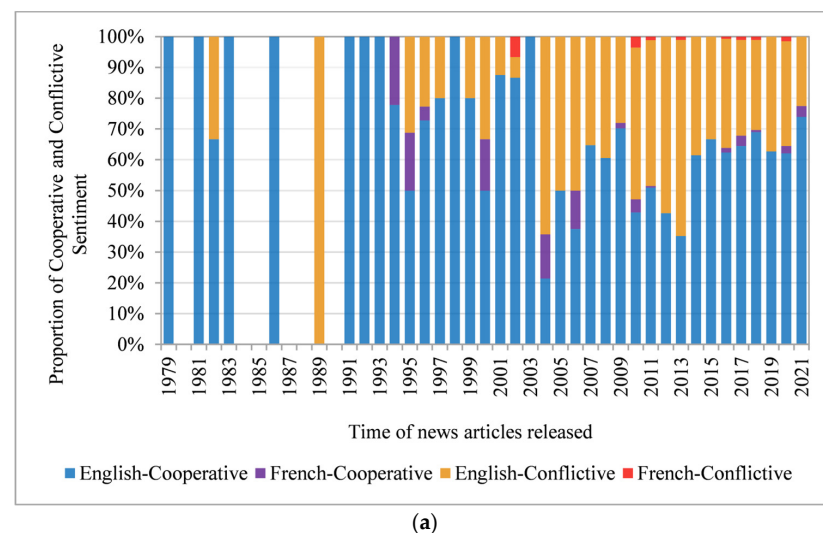

(a)

(b)

Figure 3. The proportion of cooperative and conflictive news articles released on the Lancang–Mekong River basin (both French–English news articles (**a**) and only English news articles (**b**)).

From 2009 to 2021, the proportion of news articles with cooperative sentiments displayed the tendency of declining at the beginning and then rising up and after, as repeated in both analysis scenarios. The proportion of news articles with cooperative sentiments was comparatively high in the years 2009, 2015, 2017, 2018, and 2021, all of which were above 65%, while the trough appeared in the year 2013 (Figure 3). The proportion of news articles with cooperation or conflictive sentiments was closely related to the water events in the region. In the year 2009, US and Mekong countries held the first US–Lower Mekong Ministerial Meeting and launched the Lower Mekong Initiative (US, Myanmar, Laos, Cambodia, Thailand, Vietnam). In the same year, Japan stated the Mekong–Japan Summit (Japan, Myanmar, Laos, Cambodia, Thailand, and Vietnam) [81]. The Langcang–Mekong Cooperation (LMC) framework, an important initiative put forward by China in 2015 to facilitate multilateral cooperation and regional integration (China, Myanmar, Laos, Cambodia, Thailand, and Vietnam) [82]. Nowadays, the Langcang–Mekong Cooperation (LMC) mechanism has become one of the most crucial platforms for the six countries to jointly promote peace, stability, and sustainable development. The high proportion of news articles with conflictive sentiments in the year 2013 was due to the plan for hydropower construction in the Lancang–Mekong River [83], which caused the downstream countries to worry about the amount of water available.

Apart from the consistency of the ratio-changing tendency about conflict/cooperative dynamics, it was observed that French news articles exerted a certain influence on the proportion of cooperation or conflictive sentiments in individual years. In the year 2002, when considering only English news articles, the proportion of news articles with cooperative sentiments constituted more than 90%, an increase from 2011 (Figure 3b). Yet, upon broadening the scope to include both French and English news articles, the proportion of news articles with cooperative sentiments dropped below 90% for the same year, indicating a decline from the year prior due to the conflictive French news articles (Figure 3a). In the year 2006, focusing solely on English news articles, the proportion of news articles with cooperative sentiments was below 50% (Figure 3b). However, the more cooperative news articles in French released in the year 2006 led to an increase in the proportion of news articles with cooperative sentiments that year (Figure 3a). It provides a more comprehensive perspective for understanding water conflict and cooperation dynamics in the Lancang–Mekong River basin.

4.1.2. Nile River Basin

Surprisingly, as in the case study of the Lancang–Mekong River basin, the changing trend of the proportion of news articles with cooperative sentiments and conflictive sentiments was consistent in two scenarios from the year 1979 to 2021 (Figure 4). Since 1997, there had always been more news articles with cooperative sentiments than news articles with conflictive sentiment. The proportion of French news articles with cooperative sentiments was relatively high in the years 1994, 2005, 2012, 2020, and 2021, all of which were more than 10%. In 1995, the proportion of French news articles reported mainly on water resource allocation with conflictive sentiments was 25%, the highest of any year with French news articles (Figure 4a), intensifying the overall tendency towards conflict for that year. A similar trend was also evident in the years 2007 and 2008.

Focused on the proportion of news articles with cooperative sentiments in 1996. The proportion of news articles with cooperative sentiments was 50% in both French–English news articles (Figure 4a), while it was 46% in only English news articles (Figure 4b), less than 50%. This created two different sentimental tendencies in the Nile River in the year 1996, one more moderate and the other more conflictive, which was attributed to the conciliatory effect of the French news articles.
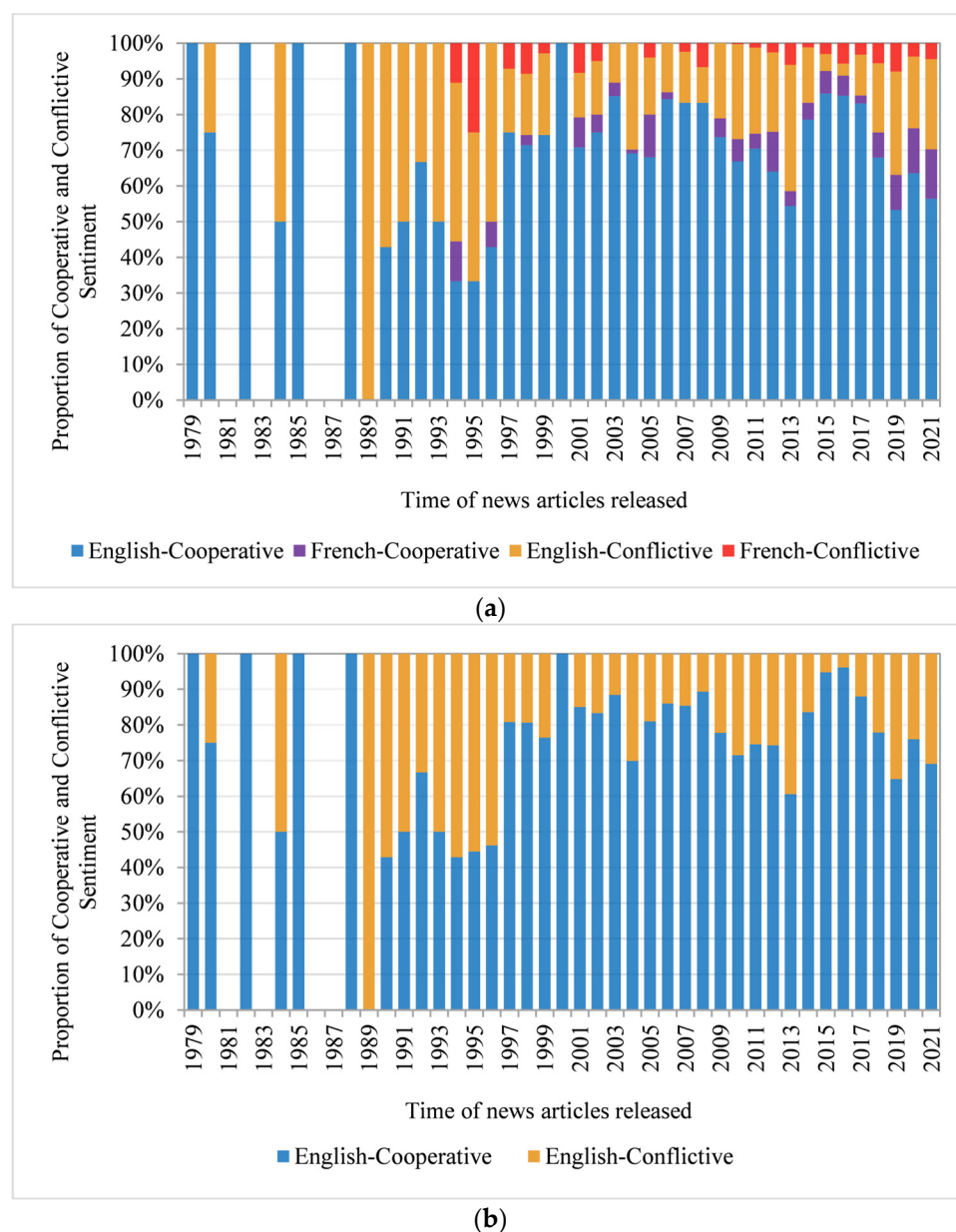
(**a**)

(**b**)

Figure 4. The proportion of cooperative and conflictive news articles released on the Nile River basin (both French–English news articles (**a**) and only English news articles (**b**)).

From 2009 to 2020, the proportion of news articles with cooperative sentiments also decreased first, then increased, and was then repeated in two analysis scenarios. Thereinto, peak values occurred in the years 2009, 2016 and 2020, and troughs were found in the years 2013 and 2019 (Figure 4). The sentiments of news articles concerning regional water events were primarily influenced by pivotal developments around the Grand Ethiopian Renaissance Dam and associated diplomatic engagements. Initially, in 2011, Ethiopia announced the construction plan of the Renaissance Dam [84], which caused strong dissatisfaction among downstream countries, especially Egypt and Sudan, due to fears of reduced Nile water flow. This period marked the first notable decrease in cooperative sentiments in media coverage as tensions escalated over potential impacts on water availability. In an effort to mitigate these tensions and address the deadlock in diplomatic negotiations over the Renaissance Dam, the appointment of Egyptian President Abdel Fattah al-Sisi in 2014 signified a pivotal turn [85]. President Sisi's proactive stance to rejuvenate dialogue with Ethiopia aimed to safeguard Egypt's water resource interests and enhance the voice of

the Renaissance Dam. This shift contributed to a resurgence in cooperative sentiments, as reflected in news articles. In the year 2015, the leaders of Sudan, Egypt, and Ethiopia signed a declaration of cooperation in Khartoum [86], serving as the basis for the three countries to negotiate on the allocation of Nile waters and the construction and operation of the Renaissance Dam, which marked a continued increase in positive sentiments in media coverage. Despite these efforts, nearly a decade of negotiations has not culminated in a definitive agreement, leading to a second significant decrease in cooperative media sentiments. Egypt announced that the trilateral negotiations had reached an impasse and asked the international community to intervene in 2019 [87,88]. Subsequently, the African Union participated in the tripartite negotiations on the issue of the Renaissance Dam in 2020, and the three countries resumed the negotiations but failed to reach a consensus [88]. The Grand Ethiopian Renaissance Dam was officially put into operation on 20 February 2022 [89]. It can be predicted that the drama of "one river, one dam, three countries" will continue in the future.

4.2. Sentiment Landscape of Both Internal and External Countries

4.2.1. Lancang–Mekong River Basin

Of the six countries in the Lancang–Mekong River basin, news articles from China and Vietnam have been published in both French and English, all expressing a greater cooperative sentiment. News publications/agencies in Cambodia, Myanmar, and Thailand published only English news articles, of which the news articles from Myanmar reveal conflictive sentiment. There were no news articles sourced by Laos on the water conflict and cooperation of the Lancang–Mekong River basin (Figure 5). Nearly 70% of the news articles in French and English released by news publications/agencies in Lancang–Mekong countries have cooperative sentiments, and their themes were mostly about the water resources cooperation in the Mekong region, such as China releasing water for drought-hit Mekong countries. The higher prevalence of conflictive sentiments in news articles from Myanmar can be attributed to Myanmar's proposals to purchase significant amounts of electricity from Laos, which would add to environmental problems in the Mekong region, and also partly because of the concerns of the Mekong countries about the construction of the Xayaburi Dam in Laos.

Many news publications/agencies from external countries have expressed concern about the water conflict and cooperation of the Lancang–Mekong River basin and put out press releases in English to discuss the relevant topics. Specifically, English news articles sourced by Australia, Brunei, Canada, Germany, Iraq, Italy, South Africa, and Spain had more conflictive sentiments, while news articles from Armenia, Bangladesh, India, Japan, Jordan, Korea, Malaysia, Nepal, Oman, Pakistan, the Philippines, Singapore, the UK, and the US were more cooperative. News publications/agencies in Belgium have not published English news articles but have published French news articles on water conflict and cooperation in the Lancang–Mekong River basin (Figure 5). News publications/agencies from different countries outside the region released news articles with different attitudes and views on the water events in the Lancang–Mekong River basin. Compared to news articles from other external countries, more than half of the news articles sourced by the US portrayed a positive image of its involvement in Mekong cooperation, such as the US Department of the Interior's International Technical Assistance Program. Approximately 57% of the news articles with conflictive sentiments from Germany discussed the possible negative impact of dam construction on the Lancang–Mekong River.

An interesting phenomenon was that French news articles from France showed a preference for cooperation (median sentiment score of 0.345), while conflict in English news articles (median sentiment score of −0.509). News publications/agencies from France published 39 French news articles and 39 English news articles on the topic of water conflict and cooperation in the Lancang–Mekong River basin. Even if the number of French news articles and English news articles were equal, the results of sentiment scores would differ greatly. In the French news articles, France emphasized the need for basin countries to

collaboratively address the challenges of floods and droughts by strengthening water resource cooperation, so the news articles showed more cooperative sentiments. The controversies surrounding dams on the Lancang–Mekong River were more frequently described in English news articles, leading to a higher proportion of conflict sentiments in English news articles.
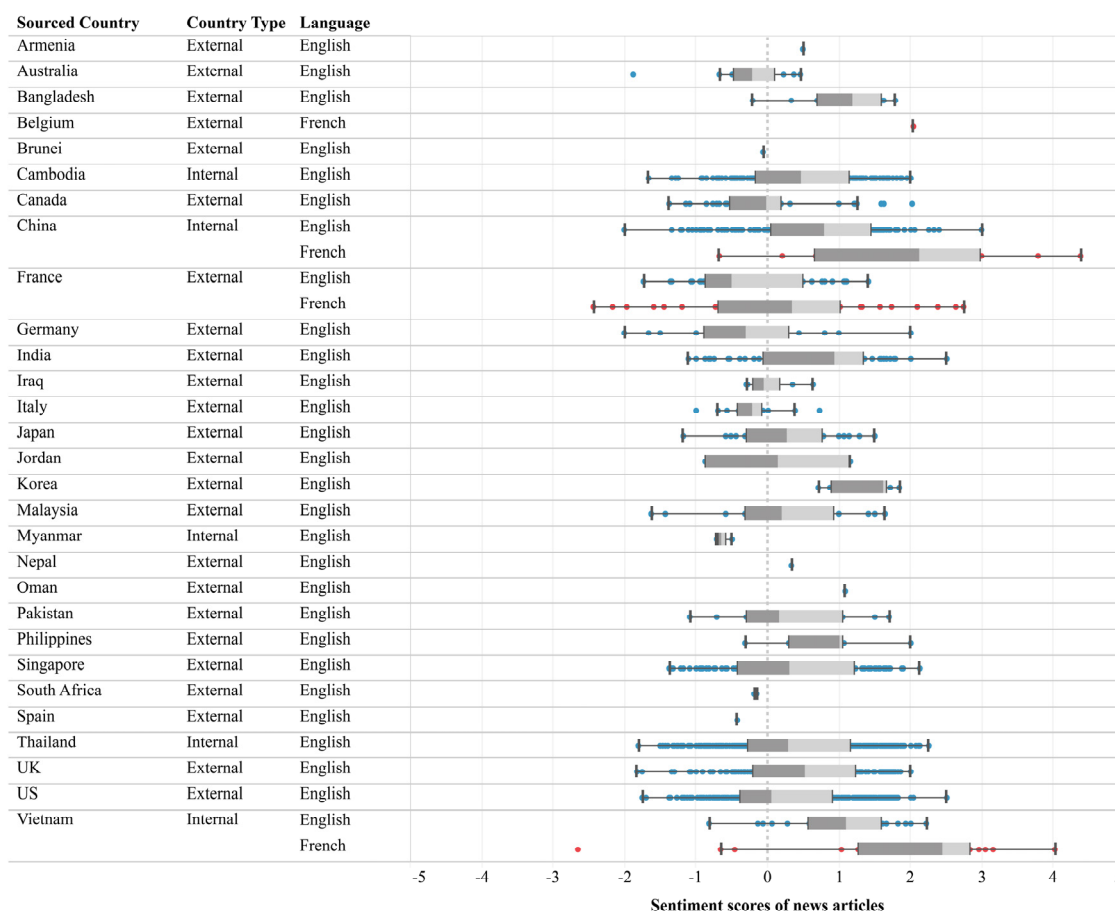
Sourced Country	Country Type	Language
Armenia	External	English
Australia	External	English
Bangladesh	External	English
Belgium	External	French
Brunei	External	English
Cambodia	Internal	English
Canada	External	English
China	Internal	English
		French
France	External	English
		French
Germany	External	English
India	External	English
Iraq	External	English
Italy	External	English
Japan	External	English
Jordan	External	English
Korea	External	English
Malaysia	External	English
Myanmar	Internal	English
Nepal	External	English
Oman	External	English
Pakistan	External	English
Philippines	External	English
Singapore	External	English
South Africa	External	English
Spain	External	English
Thailand	Internal	English
UK	External	English
US	External	English
Vietnam	Internal	English
		French

Figure 5. The distribution of sentiment scores of news articles (English news articles: blue; French news articles: red) sourced by countries inside and outside the Lancang–Mekong River basin.

4.2.2. Nile River Basin

Among the internal countries of the Nile River basin, news articles sourced by Egypt, Kenya, and Rwanda were released in both French and English, all of which showed much more cooperative sentiment. News publications/agencies from Ethiopia, Sudan, Tanzania, and Uganda published English news with more cooperative sentiments. The French news articles from the Democratic Republic of the Congo (DR Congo) were also more cooperative. News publications/agencies from Burundi, Eritrea, and South Sudan have not issued a press release about the water conflict and cooperation in the Nile River basin (Figure 6). About 80% of the French and English news articles sourced by Nile countries were cooperative, reflecting the willingness of the regional countries to strengthen Nile cooperation in water resource development. These news articles with cooperative sentiments are mainly concerned with Nile talks on water allocation and the Renaissance dam, the Cooperative Framework Agreement of the Nile Basin countries, aiming at replacing the colonial-era deals that awarded the lion's share of the Nile waters to Egypt and Sudan, ministerial meetings of Nile countries, and the celebration of regional Nile Day.
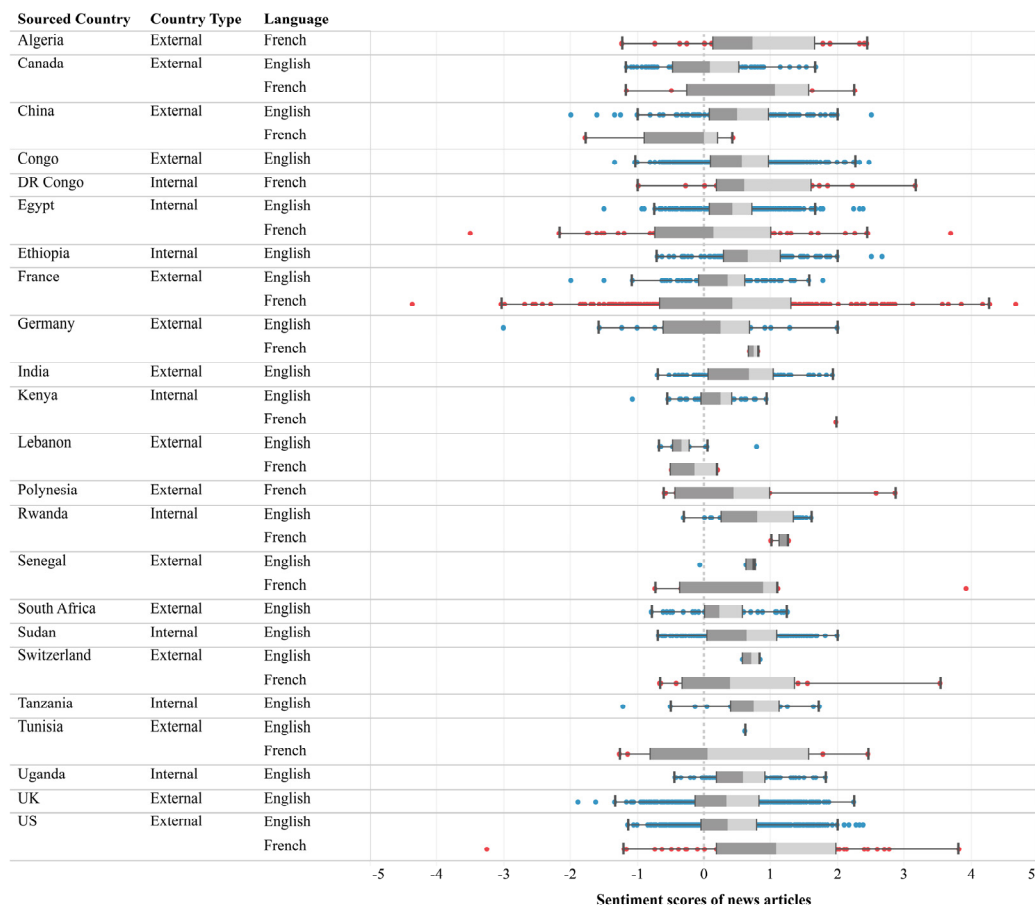
Figure 6. The distribution of sentiment scores of news articles (English news articles: blue; French news articles: red) sourced by countries inside and outside the Nile River basin.

In addition to the countries in the Nile region, other countries also paid special attention to the water conflict and cooperation in the Nile River basin. News publications/agencies from Canada, China, France, Germany, Lebanon, Senegal, Switzerland, Tunisia, and the US posted news on relevant topics in both French and English, of which only the French and English news sourced from Lebanon possessed more conflictive sentiments, basically talking about Egypt's dominance over Nile waters challenged by upstream countries and the pressure over the Egypt–Ethiopia dam dispute. News publications/agencies from the Republic of the Congo (Congo), India, South Africa, and the UK issued press releases only in English with more cooperative sentiments, while news articles from Algeria and Polynesia were only in French with a more cooperative bent (Figure 6). News publications/agencies from the Republic of the Congo (Congo) stood out for disseminating the highest volume of news articles, although Congo is not a regional country. All these news articles were reported by Africa News, a multi-lingual African multinational news station that was headquartered in the Pointe Noire of the Republic of the Congo (Congo).

Compared with only four countries' news publications/agencies that published French news articles on conflict/cooperation in the Lancang–Mekong River, more news publications/agencies released French news articles around the Nile River, owing to the fact that French is more widely used in the Nile region. Conflict/cooperation sentiment dynamics within internal and external countries of the Nile River showed more similarities in French news articles and English news articles. Specifically, the country's news publications/agencies that issued news articles in both languages tended to maintain consistent attitudes and values in their media coverage.

5. Conclusions

By comparing French and English news media articles using sentiment analysis based on sentiment dictionaries and taking the Lancang–Mekong River and Nile River as case studies, the study uncovered the nuanced sentiment fluctuations reflected in news articles across different languages and shed light on the diverse sentiment landscapes of the attitudes and values of different countries/publics towards water events occurring within the basin. The main conclusions of this study are listed below:

There were pronounced parallels in the depiction of the conflict/cooperation dynamics between the analysis of both French–English news articles and solely English news articles. The changing trends of the proportion of news articles with cooperative sentiments and conflictive sentiments exhibited a fundamentally identical trajectory in the two analysis scenarios (both French–English news articles and solely English news articles) of each case study. In the case study of the Lancang–Mekong River basin, French news accounted for 2.6% of the total news articles, which had little impact on the change in the proportion of conflictive and cooperative sentiments compared with considering only the English news articles and could be relatively negligible. French news articles accounted for about 11.5% of the total news articles in the case study of the Nile River basin, which could not be ignored because of the relatively high proportion. Similarly, the findings obtained from the two analysis scenarios for the Nile River basin are highly consistent. In other words, although English is not frequently used by all countries of transboundary river basins, the changing trend of the cooperative or conflictive sentiments of the water events occurring within the region could almost completely be reflected in only English news.

French and English news articles displayed nuanced differences and can offer complementary insights in examining the perspectives and values of various countries towards water events occurring within the basin. It is observed that news publications/agencies in some countries publish news in both English and French to express attitudes and values about shared water, some only in English and others only in French. News publications/agencies from Belgium, China, France, and Vietnam released French news on relevant topics of the Lancang–Mekong River basin, of which China and Vietnam are countries in the Lancang–Mekong region. French news and English news about the Lancang–Mekong River sourced by France showed different sentiments. In the Nile River basin, French news articles were published by a broad array of news publications/agencies from both internal and external countries. Particularly, the DR Congo, situated within the Nile basin, articulated its perspective and values regarding the Nile exclusively through French news articles. Such information was absent from an analysis confined solely to English news articles but covered only a handful of countries, especially the countries within the river basin.

The variations in sentiments detected across French and English news coverage illuminated the intricate dynamics of transboundary water conflicts and cooperation, offering valuable references to comprehend the nuanced nature of such instances. The sentiment landscape of different countries can be generalized, structured, and quantified to be integrated into socio-hydrological models and ultimately contribute to understanding the evolutionary mechanism of transboundary rivers. In addition, the study can also offer valuable guidance for policymakers in devising strategies for sustainable water resource management, conducting diplomatic dialogues, mediating disputes, and promoting cooperative initiatives.

While the current focus of the study is on comparing French and English news articles, the insights gained from this study may extend to other languages and regions, providing a comprehensive understanding of how attitudes and values towards water events vary across different countries or publics with different languages and cultural backgrounds. For future research, except for French and English, more local/community languages should also be taken into account in the news-based approach when analyzing the true perspectives of extremely individual countries. For instance, but not limited to, the Lao language of Laos in the Lancang–Mekong River basin.

Appendix A

Table A1. The search terms used in the LexisNexis database (taking French news searching of Lancang–Mekong River Basin as an example).

Content in Search Terms	Specific Search Terms
Bain name	Mékong OR Lancang
Riparian countries	Chine OR Cambodge OR Laos OR Myanmar OR Birmanie OR Thailande OR Vietnam
Terms related to water	eau OR l'eau OR rivière OR lac OR barrage OR fleuve OR affluent OR diversion OR irriga* OR pollu* OR qualité d'eau OR inond* OR sécheresse OR canal OR canaux OR "cours d'eau" OR "cours de l'eau" OR "cours principal" OR poisson* OR "droits de pêche" OR hydro* OR réservoir* OR "réserves d'eau" OR "réserves de l'eau" OR "allocation d'eau" OR "allocation de l'eau" OR "allocations d'eau" OR "allocations de l'eau" OR "partage de l'eau" OR "partage d'eau" OR "droit* sur l'eau" OR "droit* de l'eau" OR "droit* d'eau" OR diplomat* OR hégémonie
Terms related to water conflict or cooperation	traité OR accord OR convention OR cadre OR négoci* OR résolution OR commission OR secretariat OR "gestion conjointe" OR "gestion de basin" OR paix OR "accord de paix" OR régler OR résoudre OR coopérat* OR bilateral OR multilatéral OR dispute OR Conflit OR désaccord OR sanction OR guerre OR troupes OR "lettre de protestation" OR hostilité OR "coups de feu" OR boycott OR manifest*
Terms needed to be excluded	mer OR océan OR navigat* OR nucléaire OR "Canon à eau" OR "eau minérale" OR "tenir l'eau" OR "bidon d'eau" OR "bidon de l'eau" OR "eau froide" OR "eau chaude" OR huile

Note(s): irriga* signifies any French words beginning with "irrga" can be searched, such as "irrigate", "irrigation" and the same applies to others.

Table A2. Annual number of news articles in English and French after relevance inspection in the Lancang–Mekong River basin.

Time of News Articles Released	Number of English Articles	Number of French Articles
1979	1	
1981	1	
1982	3	

Table A2. *Cont.*

Time of News Articles Released	Number of English Articles	Number of French Articles
1983	3	
1986	1	
1988	1	
1989	1	
1991	1	
1992	2	
1993	5	
1994	8	2
1995	13	3
1996	22	2
1997	10	
1998	2	
1999	5	
2000	5	1
2001	8	
2002	14	1
2003	9	
2004	12	2
2005	13	
2006	7	1
2007	17	
2008	36	
2009	56	1
2010	133	11
2011	172	3
2012	131	
2013	99	1
2014	158	
2015	91	
2016	268	6
2017	89	4
2018	275	7
2019	219	
2020	328	13
2021	217	8
Total	2436	66

Table A3. Annual number of news articles in English and French after relevance inspection in the Nile River basin.

Time of News Articles Released	Number of English Articles	Number of French Articles
1979	2	
1980	5	
1982	2	
1984	2	
1985	5	
1988	2	
1989	3	
1990	7	
1991	2	
1992	3	
1993	2	
1994	7	2
1995	9	3

Table A3. *Cont.*

Time of News Articles Released	Number of English Articles	Number of French Articles
1996	16	1
1997	26	2
1998	32	4
1999	35	1
2000	20	
2001	20	5
2002	20	2
2003	28	1
2004	98	1
2005	22	4
2006	50	1
2007	42	1
2008	28	2
2009	91	5
2010	363	26
2011	229	14
2012	134	22
2013	534	67
2014	245	15
2015	277	29
2016	80	11
2017	174	11
2018	187	29
2019	180	42
2020	568	121
2021	278	76
Total	3828	498

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