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A Corpus-assisted Discourse Analysis of the American and British Media Reports on the Discharge of Water from Fukushima

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ABSTRACT

The Japanese government's announcement to discharge over a million tons of clean but still radioactive water into the Pacific Ocean has aroused substantial attention and has been extensively reported by media outlets worldwide. This study aims to shed light on how the American media and the British media differ in constructing the discourse in terms of linguistic choices and functional features. AntConc 3.5.9 is used to analyze keywords and collocates. UAM Corpus Tool 6.2j is employed to annotate the texts and conduct transitivity analysis. Our study finds that the American media tend to convey a mix of assurance, confidence, and endorsement towards the implementation of the water release. The British media appear to present factual information including the details of the water processing, the environmental consequences of the water release, and the concerns of other Asian countries.

INTRODUCTION

The Fukushima nuclear plant was seriously damaged in the 2011 magnitude 9.0 earthquake and tsunami which left around 20,000 people killed or gone missing in northeast Japan. Three years ago, the Japanese government announced plans to dump more than a million tons of cleaned but still radioactive effluent from the wrecked Fukushima nuclear reactor into the Pacific Ocean. According to the Japanese government, the practice meets international standards and has been approved by the International Atomic Energy Agency. On 24th August 2023, Japan officially started releasing the water. Up to now, Japan has already discharged four rounds of the water. The practice of Japan has aroused substantial attention and has been extensively covered by media outlets around the world (Zeng, 2023). Among these media sources, the American and

British news reports stand out for their influential coverage and distinct perspectives on the matter.

As a platform for disseminating information, news report is an ideological communication tool which serves the power group and represents the interests of the country to which it belongs (Tian, 2018). It also plays a crucial role in shaping public understanding and perceptions of the issue. Through a systematic examination of language use and discursive strategies employed in the two countries' news coverage, this analysis aims to shed light on how these media outlets construct and convey narratives surrounding this complex and contentious issue differently. In addition, there is only a handful of previous research which conducts a comparative analysis of news reports related to Japan's discharge of water among different countries. The present study attempts to contribute to this emerging

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scholarship by focusing on the American and the British media reports.

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Critical Discourse Analysis and News Reports

Critical Discourse Analysis (CDA) is a subfield of discourse analysis that examines the manner in which individuals employ language from a critical perspective (Fairclough, 1995). As an interdisciplinary framework for examining discourse, CDA endeavors to illuminate the functions that discourse fulfills in establishing and challenging structural relationships of power, control, dominance, and discrimination in societies (Fairclough, 1995). Fairclough (1992) developed a three-dimensional framework for CDA: analysis of discourse as text, as discursive practice (processes of text production, distribution, and consumption), and as social practice. Therefore, textual analysis is inextricably linked to the social context and discursive practice in which it is generated. Since the inception of CDA, critical linguists have placed significant emphasis on the examination of non-literal discourse, (e.g., advertisements and news reports). The news reports serve as the primary channel for the government’s foreign-oriented publicity and disseminate information about real events to the public, in which case they satisfy the public’s curiosity about current affairs and influence the trend of public sentiment (Tian, 2018). As a product of social practice, news re-

ports, similar to other forms of discourse, exhibit the perspectives and positions of the reporters. The choice of information resources and reporting strategies in news texts would influence the formation of the international communication discourse system and national identity. Numerous studies have applied discourse analysis to news reports such as sports news (e.g., Zhang and Caple, 2021), ecological news (e.g., Zeng, 2023; Zhang, 2022) political news (e.g., Bosworth, 2023; Park, 2021), and military news (e.g., Tian, 2018), as analyzing their linguistic characteristics and interpreting them in light of social and historical contexts helps to reveal the concealed ideology within language, which can simultaneously improve readers’ linguistic awareness and critical thinking.

Transitivity

Halliday and Hasan (1985) claimed that language had three major meta-functions, namely, ideational, interpersonal, and textual functions. Ideational function refers that language can be used to express the experience of the inner and external world, and it includes two categories: experiential and logic functions. The transitivity system is the main manifestation of the “experiential function”. Halliday and Hasan (1985) expanded the notion of transitivity to the clause level, viewing the transitivity system as categorizing the actions humans observe, hear, and perform in the real world. The transitivity consists of six processes: material process, relational process, verbal process, mental process, behavioral process, and existential process (Halliday and Hasan, 1985), as shown in Table 1. Mate-

Table 1 | Process types and participant roles

Process type	Participant roles
Material	<i>China [Actor] bans [Process] seafood [Goal] from Japan [Circumstance] after Fukushima nuclear plant begins releasing wastewater [Parataxis].</i>
	<i>South Korea’s government [Actor] has also [Circumstance] endorsed [Process] the safety of the Japanese plan [Goal].</i>
Mental	<i>He [Sensor] acknowledged [Process] concerns over how the plan would play out in reality [Phenomenon] and ...</i>
	<i>We [Sensor] know [Process] that Indo-Pacific security and European security are indivisible [Phenomenon].</i>
Relational	<i>China [Carrier] is [Process] the biggest buyer [Attribute] ...</i>
	<i>Additional details from the meeting [Carrier] weren’t [Process] immediately [Circumstance] available [Attribute] as reporters were asked to leave after opening statements [Circumstance].</i>
Verbal	<i>Japanese officials [Sayer] say [Process] the tanks must be removed to make room to build facilities for the plant’s decommissioning and to minimize the risk of leaks in case of another major disaster [Verbiage].</i>
	<i>Hong Kong [Sayer] has warned [Process] it will ban some Japanese sea products if Japan discharges the water [Verbiage].</i>
Behavioral	<i>The government [Behaver] hasn’t listened [Process] to fishing communities in deciding how to deal with the water.</i>
	<i>However [Circumstance], there is [Process] no practical way to filter out tritium [Existent], a radioactive isotope of hydrogen.</i>
Existential	<i>There are [Process] roughly 440 operating nuclear reactors in 32 countries, with upwards of 60 more currently under construction [Existent].</i>

rial process refers to the process involving physical actions, and the main participants are an “actor” and a “goal” of the action. In some cases, the material process can have only the “actor”. Mental process refers to the process representing the mental activities and the sensory actions such as perception, reaction, and cognition. Verbs for mental processes include *see*, *look*, *like*, *know*, *believe*, and *convince*, to name just a few. Relational process is used to describe what kind of relation is between different things. Participants in this process consist of a “carrier” and an “attribute” or “the possessor” and “the possessed”. The verbal process is used to transmit and exchange information in verbal forms, such as *say*, *tell*, *praise*, and so on. The participants consist of the “sayer” and the “target”, and sometimes there might be a “receiver” and a “verbiage”. Behavioral process refers to physiological activities like *cry*, *breathe*, *listen*, *watch*, etc. It has only one participant, the behavior. The existential process indicates the presence of something. Verbs for the existential process include *be*, *exist*, *arise*, and so forth.

According to Fairclough (1995), transitivity analysis can provide valuable insights into how language depicts events as a system of options among various process types and participant roles, and selecting a specific way to depict an event over others can hold ideological importance.

Previous Research on the Discourse Related to Japan’s Release of Nuclear Water

The Japanese government’s intention to release nuclear water quickly garnered significant global attention and was extensively reported by media organizations worldwide (Zeng, 2023). Alongside the coverage of the event, media in each country are constructing their own national image through their reports, which inspired an emerging scholarship of analyzing the media discourse to reveal the linguistic features and ideology realized by them.

Zhang (2023) examined how attitudinal resources were distributed and expressed in news coverage about the Fukushima nuclear-contaminated water discharge plan from *China Daily* using Martin’s Appraisal theory. Zhang (2023) discovered that *China Daily* tended to have a negative and apprehensive attitude regarding Japan’s discharge plan by utilizing attitudinal resources. Some researchers investigated the social media discourse (e.g., Sina Weibo and Twitter) by using sentiment analysis and latent dirichlet allocation (LDA) to analyze netizens’ attitudes towards Japan’s plan (e.g., Lyu and Lu, 2023; Pu et al., 2022; Zhu et al., 2023). For instance, Zhu et al. (2023) basing on the public opinion life cycle theory, found that netizens’ public opinion about Japan’s discharge of nuclear wastewater extracted from Sina Weibo could be categorized into three stages: incubation period, outbreak period, and recession period. Their sentiment analysis revealed that the general sentiment of the public toward the Japanese nuclear wastewater discharge incident was predominantly negative. This sentiment fluctuated at different stages of the event, with “disappointed” being the most prominent emotion. Similarly, by analyzing Weibo users’ perspectives on “Japan’s plan to dump nuclear wastewater into the sea”, Pu et al. (2022) identified three major themes of public concern: international responsibility and public ethics; seafood imports and food safety; and nuclear pollution and marine ecology. They also found that the majority of individuals exhibited negative emotions in response to the plan by using sentiment analysis.

A handful of scholarship which is more similar to the present study conducts a comparative analysis of news reports related to Japan’s discharge of water among different countries. Zhang (2022), for instance, compared Chinese and American news reports discourse from the perspective of transitivity and thematic structure, and found that China tried to strike a balance be-

Table 2 | The description of the two corpora

The American media reports		The British media reports	
Word Types	Word Tokens	Word Types	Word Tokens
5,287	51,248	4,272	50,057
Sources	Number	Sources	Number
The New York Times	19	The Guardian	19
Newsday	18	The Independent	17
American News	9	The Financial Times	10
Washington Post	6	The Listener	6
The Los Angeles Times	6	Mirror	4
USA Today	2	Times	4
New York Post	2	The Telegraph	2
St. Louis Post	1	The Sun	1
Herald Journal	1	The Daily Express	1
Total	64	Total	64

tween natural ecology and social ecology while repeatedly pointing out that the Japanese government put its neighboring countries and the marine ecology at great risk. The U.S. media, on the other hand, tried to politicize this issue, characterizing nuclear wastewater as a less harmful matter.

RESEARCH METHOD

Data Collection

We compiled two corpora for this study with the news reports collected from the American media and the British media. Each corpus consists of 64 news reports which were posted from 2021 to 2024. **Table 2** shows the basic information of the two corpora.

Data Analysis

In order to analyze how the American media and the British media discursively construct news reports on Japan's action, the software AntConc 3.5.9 (Anthony, 2020) is used to analyze the keywords and collocates.

Keywords in corpus linguistics refer to words in a corpus with special frequencies that are measured by comparison with another reference corpus. They can be calculated by Log-Likelihood ratio (LL) as the following formulas show. LL can uncover the overuse in the ob-

Table 3 | Contingency table for Log-Likelihood calculation

	Observed corpus	Reference corpus
Frequency of a Word	F_1	F_2
Word Tokens	N_1	N_2

$$E_1 = \frac{N_1(F_1 + F_2)}{N_1 + N_2}; E_2 = \frac{N_2(F_1 + F_2)}{N_1 + N_2}$$

$$\text{Log-Likelihood} = 2(F_1 \times \ln \frac{F_1}{E_1} + F_2 \times \ln \frac{F_2}{E_2})$$

served corpus relative to the reference corpus. With a higher LL value comes a more significant difference between the two frequencies (Rayson and Garside, 2000).

The reference corpus we choose is the Brown Corpus (Francis, 1965). Unlike the American media corpus (among the top 50 most frequent words, 18 of them are notional words) and the British media corpus (among the top 50 most frequent words, 15 are notional words), the top 50 most frequent words in the Brown Corpus are all functional words. The description of its corpus size and the top 10 high-frequency notional words are shown in **Table 4**.

We will then conduct a collocate study to better understand some essential keywords. There are several approaches to determine the significant collocates (e.g., Log-Likelihood, mutual information (MI), T-Score, Z-Score). Among all these, MI, which is more suitable for micro-corpora like the two used in our study, is chosen

Table 5 | Value table for MI calculation

Co-occurrence frequency of node word and collocate	$f(xy)$
Total frequencies of node word in the corpus	$f(x)$
Total frequencies of the collocate in the corpus	$f(y)$
Word tokens of the corpus	N_{corpus}

$$MI = \log_2 \frac{f(xy) \times N_{corpus}}{f(x)f(y)}$$

to help us determine the significant collocates of the words. The MI formula used is shown below. In addition, the collocates we ferret out need to meet the standard of $MI \geq 3$, which are very likely to be linguistically interesting (Church and Hanks, 1990).

In addition, UAM Corpus Tool 6.2j software program (O'Donnell, 2008) is used to automatically annotate the sentences. As there is no behavioral process in this software, we manually annotate the sentences with behavioral processes. Then, we quantify the percentage of process types to get the dominant patterns. Qualitative analysis of specific examples is conducted to help us gain deeper insights into the two countries' attitudes and ideologies.

Table 4 | The description of the Brown Corpus

Corpus size			Word tokens		
Rank	Word	Frequency	Rank	Word	Frequency
1	said	1,961	6	first	1,389
2	time	1,696	7	do	1,374
3	new	1,646	8	man	1,364
4	some	1,617	9	any	1,345
5	two	1,516	10	like	1,339

ANALYSIS AND DISCUSSION

The Key Notional Words

The selection of words by reporters is not arbitrary. Rather, they choose language that maintains congruence with their stance. Exploring the semantic significance attributed to those words can reveal the implicit ideological values, thereby bolstering the discourse analysis of this study. Considering the impracticality of meaning in functional words (e.g., conjunctions, pronouns, and prepositions), this study only examines notional words (i.e., nouns, verbs, and adjectives) in the corpus.

Table 6 shows the 20 strongest keywords in the American media Corpus and the British media Corpus respectively, ranked by the LL. As there is no functional word that ranks top 20 in the keyword statistical process, the checking process of excluding functional words is not necessary herein. They all meet the standard of significant difference that is LL over 3.84 at the level of $p < 0.05$ (Rayson, 2003).

Table 6 shows the shared concerns of the two countries' reports and the specific topics each country focuses on. The common high-frequency keywords between the two countries' media include *Japan, nuclear, Fukushima, water, plant, release, radioactive, Japanese, Tepco, China, wastewater, Tokyo, discharge, and seafood*. Except for "China" and "seafood", all the other words are directly related to the Fukushima nuclear water issue. The intense disagreement between

Japan and China on this event has garnered considerable interest. It has been reported frequently that neighboring countries of Japan have imposed seafood bans. Furthermore, the higher rank of "water" in comparison to "wastewater" indicates that the American and British media both tend to categorize the nuclear wastewater from Fukushima as "water", which will be discussed in detail in the following section.

The key nouns that are in the top 20 of the American media corpus, but not in the top 20 of the British media corpus are as follows: *safety, power, Korea, reactors*; the key verbs: *treated, said*. The key nouns that are in the top 20 of the British Media Corpus, but not in the top 20 of the American Media Corpus are as follows: *tritium, ocean, pacific, government, IAEA*; the key verb: *contaminated*.

The high frequencies of "China" and "(South) Korea" in Table 6 may indicate that the American media place greater emphasis on the responses of neighboring countries. The keyword "said" leads to a variety of statements made by relevant scientists, national leaders, and Tepco company representatives. The keyword "safety" emphasizes the security of the water release procedure. It also suggests that the effects of the nuclear water on Japanese, other foreign citizens, and marine life are negligible. While the British media do acknowledge China's significant involvement in this event, their primary focus may be on the environmental consequences, including the tritium threat and the discharge of water into the Pacific Ocean. Rather than re-

Table 6 | Keyword list

the American media reports					the British media reports			
Rank	Keyword	F ₁	F ₂	LL	Keyword	F ₁	F ₂	LL
1	Japan	520	38	2891.9	water	748	467	3013.1
2	nuclear	466	115	2270.09	Fukushima	398	0	2440.84
3	Fukushima	360	0	2191.66	Japan	440	38	2436.71
4	water	550	467	1990.89	release	319	37	1722.33
5	plant	369	130	1686.69	nuclear	341	115	1587.21
6	release	262	37	1374.81	radioactive	272	10	1582.64
7	radioactive	214	10	1222.07	Japanese	267	53	1355.22
8	Japanese	240	53	1189.26	plant	304	130	1346.88
9	TEPCO	180	0	1095.83	TEPCO	180	0	1103.9
10	China	191	73	858.6	tritium	170	0	1042.57
11	wastewater	143	2	849.67	China	214	73	993.88
12	treated	188	77	832.64	ocean	166	35	835.5
13	Tokyo	144	18	765.4	discharge	153	19	820.59
14	safety	152	48	709.62	seafood	128	3	756.69
15	power	240	351	697.05	pacific	136	33	670.31
16	discharge	123	19	638.9	government	248	441	662.64
17	Korea	112	12	604.17	contaminated	109	3	641.12
18	reactors	97	6	545.36	wastewater	105	2	624.25
19	seafood	92	3	533.75	IAEA	100	0	613.28
20	said	418	1961	524.63	Tokyo	116	18	607.38

garding the Fukushima water safe, they suggest that efforts are still underway to ascertain its properties.

Collocates of the Keywords

We will examine the top 10 collocates of the node words “water” and “wastewater” respectively, with a minimum co-occurrence frequency of 4 times, as shown from **Table 7** to **Table 10**. The span we choose is from 5L to 5R, i.e. the five words before the node word, and the five words after the node word. In the tables, FreqL stands for the frequency of the collocate before the node word (on the left side of the node word). Similarly, FreqR stands for the frequency of the collocate after the node word (on the right side of the node word). Hence, the sum of FreqL and FreqR equals $f(xy)$. All the collocates below meet the standard of $MI \geq 3$ (Church and Hanks, 1990). Note that $f(y)$ does not have to be larger than $f(xy)$, because a collocate can appear between two node words that are fewer than or equal to 5 words apart, and therefore be counted twice.

- 1) *The contaminated water will be treated to remove most of the radioactive materials.*
- 2) *Most recently, 1.5 metric ton of highly radioactive water escaped in early February during valve checks...*

- 3) *People are exposed to tritium in small amounts in tap water and in rain.*

The collocate “tritiated” is employed to denote the internal characteristic of the water. As a technical term, its meaning is likely to elude the average person without additional clarification. Consequently, such an expression can make non-specialists unable to discern whether the water is hazardous or secure. The frequent use of the adjectives “tainted” and “contaminated” stems primarily from direct quotes of the Chinese government. As the first example demonstrates, it tends to elaborate in certain instances that such “contaminated” water has been adequately treated. The collocates “pumped”, “escaped” and “treating” indicate what has happened to the “water”, while “continuously” and “metric” is related to the amount of this kind of water. The collocation “tap water and rain” is found when experts are trying to explain the influence of tritium, as shown in example (3).

For the node word “wastewater” in **Table 8**, the coverage posted by the American media tend to employ the collocates: “safer”, “diluted” and “treated”. In this way, emphasis is placed on Japan's efforts to process nuclear wastewater before “discharging/discharged”, and reduces the harmful semantic feature of “wastewater”, as shown in the following two examples.

Table 7 | Collocates of water in the American media reports

Rank	Collocate	$f(y)$	$f(xy)$	FreqL	FreqR	MI
1	tritiated	4	5	4	1	6.86385
2	pumped	7	8	2	6	6.73457
3	escaped	4	4	1	3	6.54192
4	drinking	9	9	7	2	6.54192
5	tainted	8	7	7	0	6.34928
6	contaminated	68	59	50	9	6.3371
7	rain	6	5	3	2	6.27889
8	continuously	5	4	2	2	6.21999
9	treating	9	7	2	5	6.17935
10	metric	8	6	6	0	6.12688

Table 8 | Collocates of wastewater in the American media reports

Rank	Collocate	$f(y)$	$f(xy)$	FreqL	FreqR	MI
1	accumulate	7	5	0	5	7.99991
2	controversial	13	5	4	1	7.10683
3	ruined	14	5	0	5	6.99991
4	safer	12	4	1	3	6.90037
5	batch	16	5	5	0	6.80726
6	diluted	24	7	6	1	6.70773
7	discharging	22	6	5	1	6.61087
8	discharged	15	4	1	3	6.57845
9	causing	19	5	5	0	6.55934
10	treated	188	48	45	3	6.51571

- 4) ...the discharged **wastewater** is far safer than international standards...
- 5) It began discharging treated and diluted **wastewater** into the ocean on Aug.

The collocate “controversial” of the node word “wastewater” indicates the negative reactions to “...TEPCO’s treated controversial **wastewater** discharges...” from neighboring countries. “Ruined” pertains to what happened in Fukushima, the epicenter of the situation. The collocates “accumulate”, “batch”, and “causing” are also related to the amount of wastewater, as shown in the following examples.

- 6) its ongoing discharges of treated radioactive **wastewater** at the ruined Fukushima Daiichi nuclear power plant.
- 7) ...causing large amounts of radioactive **wastewater** to accumulate...
- 8) ...the release of a third batch of treated radioactive **wastewater** into the Pacific Ocean...

Based on what we have observed, it can be inferred that despite the incontrovertible pollution of the wastewater, the American media place considerable emphasis on its safe handling.

- 9) ...a naturally occurring radioactive form of hydrogen that is technically difficult to separate from **water**.

- 10) The “treated” **water** – Japanese officials object to the use of the word “contaminated”.

- 11) ... Alps (advanced liquid processing system) extracts tonnes of newly contaminated **water** each day and filters out most radioactive elements.

- 12) ... an isotope of hydrogen that cannot be easily separated from **water**.

- 13) “It certainly is well below the World Health Organization drinking **water** guidelines,” he said.

- 14) ...with dilution the **water** poses no scientifically detectable risk.

- 15) ...explain how Fukushima Daiichi’s waste **water** would be dealt with.

The above sentences provide examples for the collocates of **water** which are shown in Table 9. Concerns regarding water treatment are prominent in the British media. It emphasizes the description of water treatment in minute detail. Significant collocates of “water” are frequently found in technical and event reporting.

- 16) Energy Agency says nuclear plants around the world use a similar process to dispose of **wastewater** containing low-level concentrations of tritium and other radionuclides.

- 17) ...Tepco completed releasing a second batch of **wastewater** from the plant...

Table 9 | Collocates of water in the British media reports

Rank	Collocate	$f(y)$	$f(xy)$	FreqL	FreqR	MI
1	regulator	3	4	2	2	6.47943
2	technically	6	6	6	0	6.06439
3	object	4	4	0	4	6.06439
4	newly	5	5	5	0	6.06439
5	filters	4	4	0	4	6.06439
6	extracts	4	4	4	0	6.06439
7	easily	4	4	2	2	6.06439
8	drinking	16	16	15	1	6.06439
9	detectable	4	4	0	4	6.06439
10	dealt	4	4	0	4	6.06439

Table 10 | Collocates of wastewater in the British media reports

Rank	Collocate	$f(y)$	$f(xy)$	FreqL	FreqR	MI
1	similar	16	9	9	0	8.06696
2	dispose	17	9	9	0	7.9795
3	concentrations	15	6	0	6	7.57511
4	batch	14	5	5	0	7.41161
5	low	18	6	0	6	7.31208
6	level	25	6	0	6	6.83815
7	containing	25	6	0	6	6.83815
8	process	54	12	11	1	6.72711
9	own	18	4	4	0	6.72711
10	began	37	5	2	3	6.00951

18) *Scientists have pointed out that China's own nuclear power plants release **wastewater** with higher levels of tritium...*

The collocates of “wastewater” further corroborate the British media's focus on the event itself, the processing of Fukushima water, and statements from the agency, company representatives, and scientists.

From what we have mentioned above, we can adumbrate that the American media tend to reach a qualitative conclusion on the event and more often pay attention to the statements from other nations, which demonstrates the dominance of the USA in global discourse. The American media are eager to inform the world that the wastewater has been well-processed and is permitted to be released into the ocean. It believes that the negative responses from China and South Korea indicate a sense of unscientific attitude.

In contrast, the coverage from the British media illustrates a more objective standpoint. They attempt to elucidate on Fukushima's history and the intricacies of its water treatment. By using multiple sources to report the event, they allow the audience to determine whether the diluted Fukushima water is toxic or suitable for human consumption.

Transitivity

Table 11 shows the distribution of process types in two countries' media reports. The present study will analyze the material process, verbal process, and relational process which have the top three proportions in both countries.

Material Process

Material process refers to the process involving physical actions, and the main participants are an “actor” and a “goal”. The actor is the logical subject, the person who does things, and the goal is the object to which it is directed. There are 949 material process clauses in the American media reports and 1462 material process clauses in the British media reports, which make up the highest percentage in the two countries' media reports respectively. It makes sense because one of the main goals of news reports is to inform readers about the news itself, which is something that the material process can realize (Zhang, 2022). Based on UAM Corpus Tool 6.2j, there are mainly two types of actors (notional words): Japan-related actors (e.g., Japan, Fukushima, Tepco, the government, the plan, the release, and kishida) and other countries/organizations-related actors (e.g., China, South Korea, Beijing, Hong Kong, and the Chinese government). Some examples

of material process with Japan-related and other countries/organizations-related actors are shown in Table 12.

The examples of Japan-related actors show that the American media emphasize the water has been well treated/filtered and the plan is safe enough. Particularly, the actor of the third sentence is “our Japanese friends and partners” and the material process is “fighting”, which suggests that the U.S. is in alliance with Japan and praises Japan's efforts. In terms of the examples of other countries/organizations-related actors, the American media make the contrast between the attitudes of China and International organizations, with the former being extremely negative (e.g., “bans seafood from Japan”) and the latter being positive (e.g., “welcomed Japan's announcement”). In the eighth example, the American media point out that China is “exaggerating the risk”, which demonstrates the position of the U.S. is opposite to that of China.

The above examples of material processes show that the British media appear to present factual information regarding the situation, including details about the treatment of the water, the presence of tritium, Fukushima's radiation testing regimes, and international reactions. The British media mention the controversy surrounding Japan's plan to release nuclear water, particularly due to concerns about “the presence of tritium”. The British media also acknowledge the safety measures implemented by Fukushima authorities, such as “radiation testing regimes”, indicating an assessment of the efforts made to mitigate potential risks associated with the nuclear water release.

Verbal Process

The verbal process is used to transmit and exchange information in verbal forms, such as *say*, *tell*, *praise*, and so on. The participants consist of the “sayer” and the “target”, and sometimes there might be a “receiver” and a “verbiage”. Reporters employ the verbal process to improve the objectivity and persuasiveness of their reports (Zhang, 2022). Based on UAM Corpus Tool 6.2j, the different sayers could be divided into two types: Japan-related (e.g., Tepco, Prime Minister Yoshihide Suga, Tepco, Japanese Foreign Ministry) and analyst-related (e.g., The International Energy Agency, energy expert, climate expert, spokesman). Some examples are given below.

In verbal processes, the majority of the processes are various tense forms of the word “say”. Both TEPCO and the Japanese government are portrayed as actively involved in the planning and execution of the wastewater release. Their statements emphasize confidence in the safety measures taken and the overall manage-

Table 11 | Distribution of process types in the American media reports and the British media reports

		Material process	Relational process	Verbal process	Mental process	Behavioral process	Existential process	Total
The American media	frequency	949	180	200	97	15	17	1458
	percentage	65.1%	12.3%	13.7%	6.7%	1.0%	1.2%	100%
The British media	frequency	1462	277	329	139	442	22	2671
	percentage	54.7%	10.4%	12.3%	5.2%	16.5%	0.9%	100%

Table 12 | Examples of material processes from the American media reports

No.	Actor	Process	Goal	Circumstance
1	Tepco	is putting	the water	through a powerful filtration system.
2	Japan	has invited	the I.A.E.A.	to help monitor the release, and this is welcome.
3	Our Japanese friends and partners in the nuclear movement	have been fighting	/	really hard.
4	The International Atomic Energy Agency	welcomed	Japan's announcement	/
5	Japan	will start releasing	treated and diluted radioactive wastewater	from the Fukushima Daiichi nuclear plant into the Pacific Ocean.
6	The government	had done	everything	to ensure the plan's safety.
7	The U.S. Food and Drug Administration	has been testing	products from the Fukushima area	and last month reported "none of these samples contained detectable levels of Cesium".
8	China	is exaggerating	the risk	because Japan gave them the opportunity to do that
9	China	bans	Seafood from Japan	after Fukushima nuclear plant begins releasing wastewater.

Table 13 | Examples of material processes from the British media reports

No.	Actor	Process	Goal	Circumstance
1	Those assurances	have been endorsed	by the United States.	/
2	The treatment	has removed	most radioactive elements	from the water, except for tritium.
3	Japan	has nonetheless escalated	an international conflict	over the issue.
4	The plan	has caused	controversy	because the water contains tritium.
5	Fukushima authorities	have introduced	some of the world's strictest radiation testing regimes.	/
6	Some neighbouring countries	have expressed	skepticism	over the safety of the plan.
7	The International Atomic Energy Agency (IAEA)	has approved	the discharge.	/
8	Brussels	has gradually removed	controls on food items	coming from regions affected by the nuclear explosion

ment of the situation. By citing experts who assert that tritium and treated radioactive wastewater pose minimal health risks, the media seek to provide a balanced perspective and alleviate public concerns. These expert opinions are presented as authoritative and credible sources of information, contributing to the overall narrative of safety and minimal risk associated with the plan. The IAEA's endorsement of Japan's plan adds an additional layer of credibility to the safety standards implemented. The American media may frame the IAEA's assessment as an important external validation of Japan's regulatory compliance and adherence to international safety standards, reinforcing the narrative of responsible management and oversight.

Taken together, the American media's attitudes towards Japan's plan, as reflected through statements

from Japan-related and analyst-related "sayers", convey a mix of assurance, confidence, and endorsement towards the implementation of the release. These perspectives contribute to shaping public perception and understanding of Japan's plan in the context of safety, environmental impact, and regulatory compliance.

In the British media corpus, a great number of "sayers" are those analyst-related entities and other Asian countries' representatives. The British media's mention of scientists expressing concerns about the long-term impact of low-dose radioactivity remaining in the water highlights a cautious approach and a focus on potential environmental and health risks. The concerns voiced by local fishers about the detrimental effects of pumping water into the Pacific Ocean on their industry emphasize the economic and social implications of Japan's

Table 14 | Examples of verbal processes from the American media reports

No.	Sayer	Process	Circumstance	Verbiage
1	Experts	say	/	tritium does not harm human health in small doses.
2	The International Atomic Energy Agency	said	in July	that the government's plan met the agency's safety standards.
3	Both Tepco and Japan's fisheries agency	have said	/	they will monitor the ocean water for radioactive levels.
4	Experts	say	/	Japan's discharge into the ocean of treated radioactive wastewater will not pose health risks to people who eat seafood.
5	TEPCO	says	/	the start of the process is a milestone.
6	Japan's government and TEPCO	say	/	the discharged wastewater is far safer than international standards.
7	TEPCO	said	this time	it did not expect any of the toxic water to reach the sea.
8	Chief Cabinet Secretary Yoshimasa Hayashi	has repeatedly emphasized	/	the plant was safe.

Table 15 | Examples of verbal processes from the British media reports

No.	Sayer	Process	Verbiage
1	Some scientists	say	the long-term impact of the low-dose radioactivity that remains in the water requires attention.
2	Shaun Burnie, senior nuclear specialist at Greenpeace East Asia	said	Japan's government has opted for a false solution.
3	Local fishers	say	pumping water into the Pacific Ocean will destroy their industry.
4	Sakamoto	said	his group's opposition to the plan had "not changed one bit".
5	The customs agency	says	it risks the "radioactive contamination of food safety".
6	Hong Kong's chief executive, John Lee,	said	releasing the water into the ocean was "irresponsible".
7	Kazue Suzuki, the group's climate and energy campaigner.	said	the Japanese government has once again failed the people of Fukushima.
8	Greenpeace	said	"it strongly condemned the water's release, which completely disregards the human rights and interests of the people in Fukushima, wider Japan and the Asia-Pacific region".

plan. This perspective highlights the importance of considering the interests and livelihoods of local communities. Statements from Hong Kong's chief executive and Kazue Suzuki criticize Japan's decision as irresponsible and a failure to protect the people of Fukushima and the wider region, which suggests a broader concern about the potential transboundary impacts of the plan and underscores the need for accountability and consideration of broader regional interests.

Overall, the British media include various perspectives such as scientific, environmental, and international "sayers", which contributes to a nuanced and critical assessment of the proposed plan.

Relational Process

Relational process is used to describe what kind of relation is between different things. Participants in this process consist of a "carrier" and an "attribute" or "the possessor" and "the possessed". Carrier refers to an entity possessing particular attributes. The possessor and the possessed are the two participants involved in

the possessive relationships. The data based on UAM Corpus Tool 6.2j shows that in the American media reports, the relational process consists of 151 attributive relational processes and 28 possessive relational processes, accounting for 84.4% and 15.6% respectively, as shown in Table 16. In the British media reports, the relational process consists of 219 attributive relational processes and 49 possessive relational processes, accounting for 81.7% and 18.3% respectively, as shown in Table 16. Obviously, attributive processes make up the majority of relational processes. Hence, this study will focus on analyzing the attributive relational processes.

In the American media, attributive processes are used mainly to express America's positive and supportive attitude towards Japan. There are several commendatory words such as "milestone", "safe", and "praise". "Milestone" is often used to denote a significant point in development, which indicates America's approval of the Japanese government's decision. Statements emphasizing that the planned release is in line with global safety standards and endorsed by the United Nations

Table 16 | Distribution of relational processes in the two countries' media reports

Source	The American media		The British media	
	Attributive	Possessive	Attributive	Possessive
Frequency	151	28	219	49
Percentage	84.4%	15.6%	81.7%	18.3%

Table 17 | Examples of attributive relational processes from the American media reports

No.	Carrier	Process	Attribute
1.	Today's decision by the government of Japan	is	a milestone that will help pave the way for continued progress in the decommissioning of the Fukushima Daiichi nuclear power plant.
2.	A planned release of a million tons of water from there into the sea	was	safe.
3.	Mr. Biden's praise of Mr. Yoon's diplomacy	was	"a kind of message not only to President Yoon but to Kishida", said Junya Nishino.
4.	The planned release	was	in line with global standards
5.	Treated Fukushima water	is	safe, U.N. says.
6.	Japan's proposal	was	consistent with global safety standards

Table 18 | Examples of attributive relational processes from the British media reports

No.	Carrier	Process	Attribute
1.	The US	was	supportive, describing Japan's decision-making process as "transparent".
2.	The impact of long-term, low-dose exposure to radionuclides	is	unknown
3.	The hostility of neighbouring countries, notably China,	will have	a bigger economic impact.
4.	The safety of Fukushima's wastewater	has been	a sensitive issue for years between South Korea and Japan.
5.	Japanese fishers	are	understandably worried about the damage to their reputation.
6.	The ocean	is	the common property of all humanity.

suggest a narrative of international validation and compliance. This framing positions Japan's proposal as responsible and in accordance with established norms and regulations. While some critical voices and concerns may exist, the predominant narrative of the American media reflects confidence in Japan's decision-making process and the perceived responsible management of the Fukushima situation.

The British media report the supportive stance of the United States towards Japan's decision. In the meantime, they also acknowledge the scientific uncertainty regarding the impact of "long-term and low-dose exposure to radionuclides". They objectively discuss the potential economic impact of the hostility expressed by neighboring countries, particularly China and South Korea. The last example demonstrates the British media's perspective on global responsibility and shared stewardship of natural resources.

As to the two countries' media reports both show few behavioral and existential processes, we speculate there are several reasons. First, media outlets tend to prioritize action-oriented reporting that focuses on

events, developments, and direct quotes from sources to keep their reporting engaging and relevant to their audience. However, existential processes, which often convey states or processes of being, may not align with the fast-paced and dynamic nature of news reporting. Similarly, behavioral processes, which describe behaviors or interactions, may not always be as prominent in news reports compared to descriptions of concrete events or outcomes. Furthermore, media reports are often targeted at a general audience with varying levels of education and background knowledge. Existential processes may rely on a deeper understanding of linguistic structures and grammatical concepts, which could potentially confuse or alienate some readers. By using simpler and more familiar language structures, media outlets aim to ensure that their content is accessible and easily comprehensible to a wide range of readers. In addition, media outlets often face space constraints. Descriptions of behaviors may require more space and detail than other types of language structures, making them less practical for inclusion in concise news articles.

CONCLUSION

This study compares the discourse features of the American and British media reports in terms of keywords, collocates, and transitivity. Through the analysis of keywords and collocates, we found that the American media place considerable emphasis on the safety of the water and the statements from other nations, which demonstrates the dominance of the USA in global discourse. In contrast, the British media primarily focus on the details of the water processing and environmental consequences of the water release. Rather than regarding the Fukushima water safe, they suggest that efforts are still underway to ascertain its properties.

In terms of transitivity analysis, both of the two countries' media mainly adopt material processes, verbal processes, and relational processes. Through those processes, the American media convey a mix of assurance, confidence, and endorsement towards the implementation of the release. While the British media appear to present factual information regarding the situation, including details about the treatment of the water and the concerns of other Asian countries. In the meantime, the scientific uncertainty regarding the impact of the water release is also manifested by the British media.

The U.S. and Japan share a longstanding and close strategic alliance, particularly in matters of defense and security. Thus, supporting Japan's decision to release nuclear water can be seen as a way to demonstrate solidarity and support for a key ally in the Asia-Pacific region.

However, the present study is not without its limitations. First, we only explored the discourse of western countries. Future studies could expand the scope by taking some Asian countries (e.g., China and South Korea) into consideration. In addition, our study did not analyze the thematic structure which is also an important function provided by UAM Corpus Tool 6.2j. The study of thematic structure is crucial as it can predict the progression of the discourse and enable the readers to grasp the essence accurately (Zhang, 2022).

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