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HOW SCIENTIFIC FINDINGS BECOME POLITICIZED

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THE EVIDENCE-CONTEXT INTERACTIONS:
HOW SCIENTIFIC FINDINGS BECOME POLITICIZED

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Abstract

This study examines how scientific evidence is presented and contextualized in the news coverage of Fukushima wastewater release in China Global Television Network (CGTN) and The Japan Times. While evidence boosts credibility and counters falsehoods, it is sometimes intertwined with political cues (e.g., ideologies, values) and used to favor political actions. Based on the framing theory, this study conducts content and network analyses and finds that 1) CGTN is more likely to report anti-water release scientific evidence and associate them with science skepticism, public fear and anger, and environmental concerns; 2) The Japan Times is more likely to report pro-water release scientific evidence and associate them with safety assurances and water release legitimacy; 3) the two outlets show consistent patterns of evidence-context interactions and both confirm their countries' diplomatic stances and actions. The findings contribute to framing and science politicization and carry implications for examining information clusters.

Keywords: evidence, context, framing, networks, science politicization

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The evidence-context interaction: How scientific findings become politicized

Evidence refers to facts or observations that indicate whether an opinion or proposition is true or valid (truth) (OED, 2026). Studies have acknowledged the significance of evidence, particularly given today's prevalence of inaccurate and misleading information. For instance, it is widely used in fact-checking, where information that fails to correspond with evidence is considered objectively false (Dierickx et al., 2026; Levine, 2020), and the strategy of providing (many, replicated) evidence effectively combats misinformation and enhances trust (e.g. Farrell et al., 2019; Schreiner et al., 2025).

However, evidence is vulnerable to politicization. Evidence may not always be perfect, but biased, tainted, or incomplete; more broadly, in scientific practices, research findings are subject to uncertainty, change, and controversy, as new findings question prior knowledge and different methodologies draw contradictory conclusions (Dierickx et al., 2026; Levine, 2020; Vraga & Bode, 2020). Moreover, political actors enter scientific discussions and advance evidence that favors their own agendas while rejecting disconfirming ones; they even situate science within political contexts (e.g., policy debates, government actions), which attaches evidence with political cues and signals and shifts scientific issues into political ones (Fowler & Gollust, 2015). For instance, the safety and efficacy of COVID-19 vaccines were linked to the presidential election, economic policies, and nationalistic sentiments, deviating vaccination from science to partisan implications and international conflicts, which ultimately undermined public trust (Bolsen & Palm, 2022). Furthermore, given that political sources remain influential, such politicization encourages audiences to interpret scientific information through political lenses.

This highlights the significance of studying how evidence is embedded within contexts. Previous studies have found that the presence (vs. absence) of evidence in science coverage

significantly increases perceived credibility and believability among audiences (e.g., Henke et al., 2020; Urban & Schweiger, 2014), especially among people with high science literacy (Trivedi et al., 2022); the coverage of competing evidence leads to confusion, uncertainty, and distrust (e.g., Clark et al., 2019). But the contexts of evidence have been underexplored. For one thing, political sources may report accurate facts but manipulate interpretations to credit or discredit evidence and even weave disinformation (He et al., 2026); for another, audiences may be led to evaluate evidence in biased ways when political cues trigger their existing values and beliefs, given that evidence is perceived as more credible and accepted at face value when it aligns with individual existing beliefs and views, regardless of its actual veracity (e.g., Lord et al., 1979; Munro & Ditto, 1997; Washburn & Skitka, 2018). What is most concerning is that people may believe incorrect or misleading content under an illusion of truth, especially people with low science literacy and credulous to manipulated content (Osborne & Pimentel, 2022; Trivedi et al., 2022). As human subjectivity affects the evaluation of evidence, how evidence is presented – whether objectively or paired with political cues – matters.

This study addresses this issue by examining the interactions between scientific evidence and its contexts. It specifically answers the questions of 1) what contexts scientific evidence is linked to and 2) how these contexts are linked to scientific evidence, based on a descriptive analysis of the mainstream news coverage of the Fukushima wastewater release in China and Japan. The following section offers definitions and operationalization of scientific evidence, context, and link (or association, connection). The findings shed light on how political actors and sources selectively report scientific findings, contextualize them in ways to favor particular claims and conclusions, and advance their political agendas. Future studies could further

examine the effects of such evidence-context interactions on credibility perception, veracity judgments, and media and political engagement.

Literature Review

Framing

The presentation of evidence and context essentially involves framing. According to Entman (1993), framing means to select and highlight some information about a reality or issue to promote a particular “problem definition, causal interpretation, moral evaluation, and/or treatment recommendation” (p. 52). In other words, framing simplifies complex realities down to a few central “frames” and delivers them to audiences by making them more noticeable and influential (Entman, 1993; Nelson et al., 1997; Scheufele & Tewksbury, 2007). A frame, therefore, refers to a specific aspect or interpretation of an issue or reality (Chong & Druckman, 2007), and Cappella and Jamieson (1997) suggest four criteria to identify a frame: having conceptual and linguistic devices, common in journalistic practices, reliably distinguished from each other, and having representational validity.

As a broad concept, frames could be classified. de Vreese (2005) suggests a distinction between issue-specific and generic frames: an issue-specific frame offers rich details of a specific issue, which, nevertheless, has been criticized for being too narrow and simple (Hertog & McLeod, 2001), while a generic frame generalizes common patterns across issues, such as conflict (Nelson et al., 1997) and responsibility (Nilsson & Enander, 2020) frames. Evidence can be conceptualized as a generic frame. An evidence frame refers to research discoveries and findings that advance people’s understanding of the world (Ngai et al., 2020; Shih et al., 2008).

Furthermore, this study analyzes the contexts of evidence frames. According to Entman (1993), salience refers to emphasizing certain frames “by replacement or repetition, or by

associating them with more culturally familiar symbols or concepts [highlighted by the author]” (p. 53). This implies that evidence is framed by selecting and highlighting not only facts but also associated information, including political, racial, and gender-related ideologies that affirm or attach science (Zhang & Horvát, 2025), scientific norms and values, such as skepticism and universalism (Erduran, 2025; Merton, 1973), specific social and political issues, and additional details that facilitate the understanding of evidence. This associated information may contain political cues and signals and provide immediate contexts for evidence.

Moreover, contextualizing evidence within existing values and beliefs would activate and transfer prior judgments (Graves-Sandriman, 2024). For instance, in a series of experiments, Voelkel et al. (2022) find that the facts about the impact of immigration on the economy significantly increase public support for legal immigration when paired with moral values such as loyalty and patriotism, compared to when facts are presented alone, which suggests that moral framing powerfully shapes the way people interpret scientific information. In social media, posts citing academic articles are more likely to be retweeted when coupled with political ideologies that attack (e.g., science denialism, homophobia) or affirm (e.g., climate change, racial and gender inequality) science (Zhang & Horvát, 2025). However, prior studies have paid little attention to the contexts of evidence and tend to reduce contexts to a few categories. This study offers a comprehensive analysis of evidence-context interactions based on natural data.

Scientific Evidence and Context

Evidence can be difficult to identify and operationalize in science. Scientific evidence offers a more specific conception: research findings produced through scientific procedures and certain actors or institutions (expertise) (Chang, 2016; Henke et al., 2020; Southwell et al., 2022). Specifically, it involves systematic observation and investigation and typically appears as

quantitative inference (National Academies of Sciences, Engineering, and Medicine, 2019; Paley, 2006; Taper & Lele, 2004), along with other procedures through which findings are generated, such as theories, reasoning, data, methods, variability, validity, and peer review (National Academies of Sciences, Engineering, and Medicine, 2019; Science Media Centre, 2015). These procedures matter as they transform raw observation into reproducible and replicable scientific knowledge (National Academies of Sciences, Engineering, and Medicine, 2019). In other words, individual observation, as factual and evidential as it is, cannot serve as scientific evidence.

Expertise refers to high levels of performance in a given domain achieved by experts, measured by knowledge, resources, skills, and individual characteristics such as talents (Bourne, 2014). Notably, expertise is usually distinguished from evidence (Vraga & Bode, 2020), but contributes to and is subordinate to scientific evidence (Bourne, 2014; Paley, 2006). Specifically, expertise serves as an important mediator to interpret and properly apply general scientific findings (Paley, 2006); for another, due to the diversity of research methods and conclusions (Dierickx et al., 2026), consensus among experts and/or research institutions is often recognized as, and empirically tested to be, more accurate (Vraga & Bode, 2017).

Association (or link, connection) refers to spatial adjacency. It indicates that two frames or pieces of information are proximate to each other within a content. For instance, after identifying a scientific evidence sentence, the context could be identified in (nearest) neighboring sentences of the scientific evidence by applying a fixed window filter. Specifically, a window filter locates a target sentence and retrieves spatially adjacent sentence(s) within a specific range, such as k sentences before and/or after the evidence. It captures immediate local semantics, enhances the accuracy of connection prediction, aligns with literature on information flows and cognitive processing, and has been widely applied in natural language processing (Wu et al., 2025).

Study Context

This study focuses on the Fukushima wastewater release. In 2011, an earthquake damaged the nuclear reactors in Fukushima, Japan and caused a hydrogen explosion; seawater was used to cool down the reactors, which made it radioactive, and was stored in tanks. In April 2021, Japan announced the plan to release the water into the Pacific Ocean, and the release is expected to last for 30-40 years. In July 2023, the International Atomic Energy Agency (IAEA) approved this plan as compliant with international standards. On August 24, 2023, Japan began the water release. The IAEA accident reports claim that the Advanced Liquid Processing System (ALPS) removes almost all radioactive materials except tritium, and the water will be diluted before discharging to bring the tritium below regulatory standards, which is consistent with IAEA Safety Standards and would have only a negligible impact on people and the environment.

The reports triggered wide disputes, mainly between Japan and China. On the one hand, the Japanese government is supported by IAEA reports and maintains that the water poses no risk to human or marine life; the then-Prime Minister also publicly consumed local seafood to promote water safety. On the other hand, the Chinese government strongly opposes the water release. It questions the IAEA's research independence, expresses concerns about potential long-term environmental and marine safety impact, and repeatedly condemns Japan on diplomatic occasions. As a response, China immediately imposed a ban on all seafood imports from Japan. In public spheres, public opinion in Japan remains polarized, with 53% of respondents supporting the water release and 41% opposing it, especially fishermen and environmental groups, according to a public survey; the Chinese public reinforces fear and anger (Tiezzi, 2023; Wong, 2023).

In this issue, the expertise is primarily represented by the IAEA. It is an independent organization working with the United Nations to promote peace and support nuclear safety. Meanwhile, alternative scientists and institutions are also recruited, mainly by China, to conduct research and produce evidence that either aligns with or conflicts with the IAEA. The most disputed scientific evidence centers on the treatment of nuclear water – whether it is safe and what the potential consequences are. These questions are intensively discussed in the IAEA’s accident reports, as well as other research reports.

The Fukushima wastewater release offers an ideal case study to examine evidence-context interactions. First, it provides the latest discussions following decades-long debates of the uncertainties and controversies of nuclear energy, especially in the aftermath of the Fukushima Daiichi accident in 2011. Second, this event features clearly identifiable scientific evidence, including assessments by the IAEA and alternative scientists, and contexts shaped by political discourses and media systems in China and Japan. Third, this event is closely tied to broader social issues such as climate change, food safety, and environmental pollution, which further enrich the context. Finally, this event offers a cross-cultural perspective to understand science politicization in the Global East, where media systems, political systems, and public trust in institutions differ from Western contexts.

Furthermore, this study focuses on mainstream media, specifically the China Global Television Network (CGTN) and The Japan Times. The mainstream media remains a major source for the public to understand and learn science due to its perceived high credibility (Brems, 2025; Garusi et al., 2025), but it is particularly vulnerable to political manipulation. In China, the mainstream media is state-owned and supervised by the Propaganda Department of the Chinese Communist Party, and CGTN is China’s official international broadcaster in multiple languages.

It is selected for analysis because it has intensively covered the Fukushima issue while representing the dominant political discourses in China, delivering diplomatic stances to global audiences, and exhibiting China's increasing socio-political influences (Colley & Moore, 2023). In Japan, the government routinely exerts pressure on media management, leading to heavy "self-censorship" (Buchmeier, 2024; CFOM, 2018; Reporters Without Borders, 2025), and The Japan Times is the largest and oldest English-language newspaper in Japan. It was established as an independent source free of government control, but government pressure has influenced its narratives, including revising descriptions of wartime events to align with pro-government perspectives (McCurry, 2018; O'Connor, 2007). In brief, both outlets play key roles in communicating with national and global audiences and reflect politicization with government intervention, which makes them well-suited for examining the coverage of scientific evidence within political contexts. Additionally, both outlets publish in the English language, which enables consistent data analyses and the applications of natural language processing techniques. This study proposes the following research questions:

RQ1: What contexts are likely to be linked to scientific evidence in the news coverage of Fukushima wastewater release in CGTN and The Japan Times?

RQ2: How are contexts linked to scientific evidence in the news coverage of Fukushima wastewater release in CGTN and The Japan Times?

Methodology

This study analyzes the news articles from CGTN and The Japan Times. The datasets are constructed following two steps. First, the keyword "fukushima" is used to retrieve news articles, including hard news, reports, opinions, editorials, stories, interviews, and subtitles of caricatures and videos, in CGTN and The Japan Times, respectively. Second, articles that contain the

keyword and fall within the time range from July 4, 2023, when Japan announced the wastewater release, to July 3, 2024 are finally included in the datasets. This retrieves 327 articles from CGTN and 322 from The Japan Times.

The first section conducts content and network analyses in Python (v3.12.12). Before this, the raw textual data are imported and preprocessed, which includes lowercasing, removing URLs, and normalizing whitespace. The first is to extract relevant information. The scientific evidence is often presented within each sentence (Ngai et al., 2020), but context can be either restricted to or diffused beyond the same sentence. Based on the semantic patterns of the datasets, this study 1) splits the text into sentences, 2) extracts sentences that indicate scientific evidence, and 3) extracts one adjacent sentence before and/or after evidence to capture broader contexts.

The evidence sentence extraction is based on keywords of 1) expertise and 2) scientific procedures. Specifically, three sets of keywords are created for expertise: the first set includes references to the IAEA, which yields 204 sentences from CGTN and 181 from The Japan Times; the second and third sets include references to names of scientists and/or institutions appearing in CGTN and The Japan Times respectively, which are recognized through Name Entity Recognition (NER) in spaCy (3.8.11) with manual selection based on relevance and yields 45 sentences from CGTN and 17 from The Japan Times. Two sets of keywords are created for scientific procedures: the first set includes terms that indicate scientific research, such as “analyses” and “case study”, and the second set includes issue-relevant terms, such as “fukushima” and “power plant”. Since not all scientific procedures in the news coverage are relevant to the Fukushima wastewater release, the extracted sentences have to contain at least one keyword from both keyword sets at the same time. This yields 73 sentences in CGTN and 57

sentences in The Japan Times. The final datasets contain 292 evidence sentences with 579 context sentences in CGTN, and 241 evidence sentences with 482 context sentences in The Japan Times.

The coding schema is created by calculating sentence similarity and manual interpretation. As the sentence extraction may 1) include irrelevant sentences that create noise and 2) not produce meaningful insights individually, this study calculates the cosine similarities for all extracted sentences using the sentence-transformers/all-mpnet-base-v1 model. To improve accuracy, the unit of analysis in this step is each sentence. The similarity scores are used to create similarity networks, with sentences representing nodes and scores weighted edges; the networks are clustered using the Leiden community detection algorithm. The Leiden algorithm identifies semantically connected groups and facilitates topic exploration by recursively assigning nodes to communities based on how densely nodes are connected in a community compared to a random network (Khawaja et al., 2025). The communities are interpreted as topics – each sentence may contain multiple topics, and topics are finally categorized into scientific evidence and the four dimensions of context: pro-water release scientific evidence (prose), anti-water release scientific evidence (antise), norms and values (nandv), ideologies (ideo), social issues (socio), and additional information (add).

The coding is conducted using Natural Language Inference (NLI)-based zero-shot text classification. NLI-based zero-shot text classification is a task of training a model to classify information based on whether it entails the given hypotheses. This study adopts the facebook/bart-large-mnli binary natural language inference model, which is pre-trained on the Multi-Genre Natural Language Inference (MultiNLI) corpus that consists of 433k entailed sentence pairs. The hypotheses are the topics. The unit of analysis is the sentence combination –

[context-evidence-context]. The results show the possibilities of entailing each topic within each sentence combination, and a probability threshold of 0.85 (Freeman & Moisen, 2008) is used to transform the raw values into 1 (present) and 0 (absent).

The second section conducts mixed-effect logistic regression analyses in R. The mixed-effect logistic regression models the relationships among variables with binary outcomes that are clustered or measured repeatedly, and the results show both fixed effects explained by predictors and random effects explained by subject variability. But instead of establishing causality, this study compares the probabilities of co-occurrences across topic categories while accounting for differences among sentence combinations (e.g., some may contain more categories than others). The model equation is shown as follows:

$$\ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_k \text{Topic}_{k,j} + \mu_j$$

Where $\ln\left(\frac{p}{1-p}\right)$ represents the log odds of the presence of topic k in case j , β_0 represents the baseline effects of the reference topic, $\beta_k \left(\ln\left(\frac{\text{odds}_k}{\text{odds}_{ref}}\right)\right)$ represents the difference of effects of topic k from the reference topic, and μ_j represents the random effects for case j .

Findings

The following findings answer RQ1 – what contexts are likely to be linked to scientific evidence in CGTN and The Japan Times. Table 1 shows the topic schema with descriptive statistics. Specifically, the pro-water release scientific evidence (prose) supports the water release and mainly consists of the IAEA’s research findings, while the anti-water release scientific evidence (antise) opposes the water release and mainly originates from alternative research conducted in China. CGTN covers more antise ($n = 170$) than prose ($n = 49$), especially the finding that some radioactive materials (e.g., tritium) in the water cannot be removed (t4, $n =$

160), while The Japan Times covers relatively similar numbers of prose (n = 79) and antise (n = 69), but more topics are associated with prose; notably, CGTN refers to more alternative scientists, and antise in The Japan Times mainly comes from references to China and the Chinese government.

Both media outlets intensively cover scientific norms and values (nandv) (CGTN: n = 196; The Japan Times: n = 144) but with distinct meanings. CGTN mainly denotes skepticism, including research uncertainty and limitation, while The Japan Times denotes universalism – IAEA’s research findings are legitimate. Similarly, the two outlets denote distinct ideologies (ideo): CGTN criticizes Japan, and The Japan Times criticizes China. CGTN (n = 228) covers social issues (socio) more intensively than The Japan Times (n = 97), especially environment-related issues (e.g., marine pollution). Moreover, the same topic is associated with different sentiments: for instance, CGTN highlights the harm to the environment and human health (t12, t13), while The Japan Times emphasizes the negligible impact on environment and people in the same topics. Finally, CGTN (n = 169) and The Japan Times (n = 190) both intensively cover additional information (add), where CGTN focuses on public backlashes and requests for monitoring, and The Japan Times, besides public backlashes, stresses more on strategies to maintain water safety, including conducting safety reviews and publishing monitoring data to the public. However, the raw frequencies cannot suggest topic associations.

Table 2 shows the probabilities of topical categories co-occurrences in CGTN and The Japan Times. When treating all topics as predictors, the model 1) poorly performs (marginal $R^2 = 0.273$, conditional $R^2 = 0.415$) and 2) fails to offer insights into evidence-context interactions. Instead, this study identifies four relationships: 1) prose (1, present) – others (0/1, present or absent) in CGTN; 2) antise – others in CGTN; 3) prose – others in The Japan Times; 4) antise –

others in The Japan Times. This estimates the possibilities of other topic categories occurring when scientific evidence is present. Model 1 in Table 2 shows the results of relationship 2). Specifically, *nandv* (e.g., skepticism; predicted probability = 0.71, SE = 0.04), *add* (e.g., public backlashes; pred. prob = 0.80, SE = 0.03), and *socio* (e.g., harm to environment; pred. prob = 0.90, SE = 0.02) are highly likely to co-occur with *antise* in CGTN, while *prose* (pred. prob = 0.07, SE = 0.02) is least likely to occur. Meanwhile, the co-occurrence probabilities of other categories are significantly different from the reference category *add*, except *nandv* ($\beta = 0.50$, SE = 0.26, $p > .05$). The entire model explains 52% of the variance, and the fixed effects explain 44% of the variance.

Model 2 in Table 2 shows the results of relationships 3). Specifically, *add* (e.g., safety assurance; pred. prob = 0.95, SE = 0.02) and *nandv* (e.g., universalism; pred. prob = 0.83, SE = 0.05) are highly likely to co-occur with *prose* in The Japan Times, while *ideo* (e.g., criticizing China; pred. prob = 0.11, SE = 0.04) is least likely to occur. Meanwhile, the co-occurrence probabilities of all other categories are significantly different from the reference category *add*. The entire model explains 53% of the variance, and the fixed effects explain 46% of the variance. Notably, the models for relationships 1 and 4 perform poorly, with random effects attributable to almost 30% of the variance, along with relatively small numbers of observations and groups. This indicates that *prose* in CGTN and *antise* in The Japan Times are unevenly distributed across the news content, and thus, a substantial part of the differences in topic co-occurrence is due to sentence combination variability.

The following findings answer RQ2 – how contexts are linked to scientific evidence. The results of topic entailment within each sentence combination are transposed into topic-topic matrices to indicate the frequencies of two topics co-occurring in the same unit, the values of

which are normalized using the Jaccard Similarity. Table 1 shows the degree centrality (C_{degree}) and strength centrality (C_{strength} , the sum of the weights of all direct connections) of each topic in CGTN and The Japan Times. Figure 1a and 1b show the topic networks in the respective media outlets. Notably, since all topics are connected to similar numbers of other topics in both media outlets, only edges weighted above the mean are retained for better visualization; this also indicates that the differences in strength centrality are more attributed to the intensity of co-occurrences.

The topic network suggests salient patterns of evidence-context associations. In CGTN, 1) the finding that some radioactive materials cannot be removed (t4) is associated with water release uncertainty (t5, weight = 0.52) and environmental harm (t12, w = 0.55) (see Excerpt 1).

Excerpt 1: *... initial analysis from China showed that there are more than 60 kinds of radioactive elements in Fukushima's contaminated water, some of which take centuries to decay and cannot be filtered with current technology. These radioactive substances will follow ocean currents and spread to the whole world, as the release of Fukushima water will likely take decades to complete, changing the ocean forever.*

2) The finding (t4, w = 0.43) and water release uncertainty (t5, w = 0.48) are also associated with public fear and anger (t15), which couples science with public backlash (see Excerpt 2).

Excerpt 2: *Concerns about the discharge plan focus on the radioactive materials which remain in the wastewater, treated by the Advanced Liquid Processing System (ALPS) ... The safety, effectiveness and sustainability of the so-called "treated" water have aroused doubts over the years.*

3) The long-term impact of water release (t3) is linked to questioning the legitimacy of the action of releasing water (t8, w = 0.4) (see Excerpt 3).

Excerpt 3: ... *Japan has yet to prove the legitimacy and legality of its ocean discharge decision, the long-term reliability of the purification facility, and the authenticity and accuracy of the nuclear-contaminated water data ... in disregard of the strong criticism and opposition from the international community, the Japanese government unilaterally started the release of the Fukushima nuclear-contaminated water into the ocean.*

4) The pro-water release evidence, the water meets safety standards (t1) and has a negligible radiological impact (t2), are strongly connected ($w = 0.41$) but weakly connected with other topics, which suggests that CGTN reports but isolates them in its news coverage (see Excerpt 4).

Excerpt 4: ... *the radiological impact of discharges of the treated water on the environment and population in neighboring countries would be “negligible” and consistent with international safety standards. The protestors ... argued that the IAEA’s report was irresponsible, as it not only failed to verify the performance of the Japanese multi-nuclide removal equipment, but also made it clear that it would not take any responsibility for the results of the report.*

In The Japan Times, 1) the finding that the water release meets safety standards (t1) is linked to interpretations that support the action of water release, such as the scientificness (t7, $w = 0.42$) and safety assurances (t19, $w = 0.39$) of water release (see Excerpt 5).

Excerpt 5: ... *The IAEA team, which includes experts from countries such as China and South Korea, is set to draw up a report on the safety of the release of the water that contains tritium, a radioactive substance, into the sea. An IAEA report compiled after the first review, last October, confirmed that the discharge was consistent with international safety standards.*

2) The compliance with safety standards (t1) and negligible radiological impact (t2, w = 0.30) are linked to topics such as water release approval (t6) to highlight the legitimacy of water release (see Excerpt 6).

Excerpt 6: ... the International Atomic Energy Agency (IAEA) had already given the green light earlier this month to Japan's plan to release more than 1 million tons of treated water from the Fukushima plants into the sea over the next 30 to 40 years. The water will be released after passing through a filtration system called the advanced liquid processing system (ALPS), which removes most radionuclides except tritium. The IAEA says this system is consistent with international standards and will have a negligible impact on the marine environment.

3) Notably, the environmental impact (t12) is weakly associated with scientific evidence but more with additional information such as releasing data (t19, w = 0.51) and conducting safety reports (t16, w = 0.39) to confirm the “negligible” environmental impact (see Excerpt 6). 4) The anti-evidence, radioactive materials cannot be removed (t4), is directly linked to topics such as scientific uncertainty (t5) and public fear and anger (t17), which is further situated within criticism against China (see Excerpt 7).

Excerpt 7: To address other countries' concerns about the impact of the release of treated water that contains radioactive tritium into the sea, the Japanese government has worked hard to offer explanations about the safety of the move. Thanks to an endorsement by the International Atomic Energy Agency concerning the safety of the release, Tokyo has gained a certain level of understanding from the global community. However, China, which was a major importer of Japanese fishery products, imposed a blanket import ban on such products, criticizing the water as being “nuclear contaminated.”

Finally, this study compares normalized topic category-category matrices between CGTN and The Japan Times. A Mantel test was conducted using Spearman's rank correlation with 999 permutations, and the result shows a significant correlation between the two networks (Mantel's $r = 0.61, p < .05$). This indicates that CGTN and The Japan Times exhibit consistent evidence-context associations.

Discussion

This study investigates the evidence-context interactions in the news coverage of Fukushima wastewater release in CGTN and The Japan Times. As science may be situated within political contexts, which intertwine evidence with ideologies, identities, and other political cues and signals (Bolsen & Palm, 2022; Fowler & Gollust, 2015), it is necessary to examine not only what evidence is presented but also how it is contextualized. Based on the framing theory (Entman, 1993), this study conceptualizes scientific evidence as a generic frame that highlights research findings produced through systematic procedures and/or expert approval, context as associated information – political ideologies, norms and values, specific social issues, and additional information, and associations as spatial adjacency, specifically one sentence before and after the scientific evidence.

Content and network analyses generate major findings. Both CGTN and The Japan Times cover contradictory scientific evidence. As the state-owned international broadcaster, CGTN highlights scientific evidence opposing the wastewater release (e.g., some radioactive materials in the water cannot be fully removed), while The Japan Times, an independent news outlet under increasing governmental pressure, presents a relatively more balanced coverage of competing evidence, with slightly greater attention to pro-evidence. The conflict and controversy over the safety of water release extend the discussions of research findings (e.g., the safety standards,

environmental impact), mainly conducted by the IAEA, to the legitimacy of governments' action (e.g., Japan releases the water, China criticizes Japan and bans seafood imports), where China and Japan present contradictory evidence and hold oppositional interpretations. The intervention of political actors, coverage of conflict findings, and the political contexts that accommodate evidence (Fowler & Gollust, 2015) indicate that the issue of Fukushima wastewater release has been politicized and deviated from pure science.

The findings contribute to the literature by further uncovering how scientific evidence is situated within contexts. For instance, CGTN heavily covers the alternative research findings that raise concerns about the safety of radioactive materials and link them to environmental harm, public backlashes, and long-term uncertainty, which oppose the water release and challenge the legitimacy of Japan's action. On the contrary, The Japan Times highlights the IAEA-supported findings, along with safety assurance strategies such as conducting safety reviews and publishing relevant data, to confirm the scientificity and legitimacy of water release. Moreover, competing findings are covered but not equally highlighted. Topic networks show that CGTN dominantly reinforces an anti-water release narrative, with relatively infrequent, scattered coverage of pro-water release findings, and the mixed-effect models further support this. The Japan Times, instead, is more likely to present competing claims, but mixed-effect models show that the anti-evidence is less likely to be consistently distributed across the entire media content; topic networks further show that the anti-evidence is more strongly connected to the criticism of China. These findings indicate that both media outlets tend to follow countries' political agendas; the coverage of competing evidence aims at conveying dominant narratives and leading to particular conclusions, rather than balancing perspectives (as shown in Excerpts 4 and 7).

Finally, the topic co-occurrences in CGTN and The Japan Times indicate consistency. The two outlets do not cover the issue independently; instead, they refer to and affirm or refute each other, which makes their coverage converge. For instance, while CGTN reports and links anti-water release findings to environmental harm and illegitimacy of water release, The Japan Times links anti-evidence to the criticism of China, which further emphasizes the negligible impact on the environment and the approval of water release. This indicates that the evidence-context interactions are similar in the two media outlets, but the structural consistency is insufficient to indicate semantic similarity. In fact, the topics and sentiments of categories vary the outlets.

This study has several limitations. First, sentence extraction through (combinations of) keywords has been proven to be efficient but may yield lower accuracy than human coding, especially for scientific evidence that has rarely been addressed in previous research. Future studies may benefit from comparing manual and computer-assisted evidence sentence extraction. Second, fixed-window filters in neighborhood extraction may fail to capture or accidentally include irrelevant information. Given that context may diffuse beyond a certain number of sentences or be confined to fewer, more advanced methods, such as Graph Neural Networks (GNNs), would help optimize neighbor selection and context extraction, such as uncovering the logical relationships among sentences. Third, this study focuses only on the issue of Fukushima wastewater release and the news outlets CGTN and The Japan Times. Notably, both outlets serve as official news sources for national and global audiences, which differ from other sources such as social media and commercial news.

Despite these limitations, this study carries implications for future studies. First, studies need to address not only whether and what evidence is reported but also how it is contextualized. Today, science has become less about science itself, but is subject to interpretations (Zhang &

Horvát, 2025), and politicization tends to be more subtle – strategically embedding misleading and false content in factual statements, the “truth-weaving” tactic (He et al., 2026), rather than obvious falsehoods and explicit propaganda. While many efforts have been made to promote evidence and fact-checking, this study suggests that evidence may still imply biases and misperceptions, making problematic content even harder to detect. More efforts are needed to address this.

Second, the effects of competing evidence need to be examined in information networks. Although media outlets sometimes cover contradictory perspectives, it may not cause confusion and distrust; instead, they constantly highlight the dominant discourses, with the distribution and effects of alternative perspectives being random and limited. For instance, the pro-water release scientific evidence in CGTN is covered but only weakly associated with other topics and limited to broader discussions. In this sense, studies need to consider the broad information flows and the strength of associations between different pieces of information. With this being said, it is still important to minimize disputes and conflicts, especially for emerging issues where expert consensus has not been reached and new evidence is emerging (Vraga & Bode, 2020).

More broadly, the effects of message effects in general need to be examined in information networks. While the presence of scientific evidence could boost credibility perception, the associated information, especially the identity-consistent, emotion-arousing, and morality-confirming information, may exert even stronger effects that strengthen or override people’s objective evaluation of evidence (Lord et al., 1979; Washburn & Skitka, 2018) and misguide audiences to understand science (Simon, 2020). In this sense, studies need to focus on the overall effects of information clusters on audiences, and science communication particularly needs to consider the contexts within which science is discussed.

In conclusion, this study examines the evidence-context interactions in the mainstream media in China and Japan, and the findings have uncovered several patterns of how media outlets present competing scientific evidence and contextualize them in ways to confirm the diplomatic stances and government actions in response to the Fukushima wastewater release. Future studies could further understand such interactions across cultures, media platforms, and social issues.

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Tables

Table 1a

The topic schema in CGTN

CGTN Topic Schema	Sum(n)	Percent(%)	Degree centrality	Strength centrality
Pro-water release scientific evidence (prose) (n = 49)				
t1 the water release meets safety standards	46	3.90%	12	0.890
t2 the water release has negligible radiological impact	23	1.95%	10	0.636
Anti-water release scientific evidence (antise) (n = 170)				
t3 the water release causes long-term harm	51	4.33%	14	2.858
t4 some radioactive materials cannot be removed	160	13.58%	15	3.397
Scientific norms and values (nandv) (n = 196)				
t5 the water release involves uncertainty	181	15.37%	15	3.544
t6 the IAEA report is limited or biased	33	2.80%	12	1.347
t7 Japan rejects alternative methods to water release	10	0.85%	12	0.549
t8 the water release lacks approval	89	7.56%	15	3.366
Ideologies (ideo) (n = 58)				
t9 Japan disregards public concerns or opposition	48	4.07%	15	2.160
t10 China urges Japan to stop the water release	15	1.27%	11	1.093
Social issues (socio) (n = 228)				
t11 the water release violates human rights	18	1.53%	12	1.382

t12 the water release has environmental impact	222	18.85%	15	3.598
t13 the water release has impact on public health	71	6.03%	15	3.059
t14 food imports are inspected or restricted	8	0.68%	11	0.355

Additional information (add) (n = 169)

t15 countries or people express fear, anger, or opposition	139	11.80%	15	3.454
t16 the water release requires international monitoring	64	5.43%	15	1.957

Table 1b*The topic schema in The Japan Times*

The Japan Times Topic Schema		Sum(n)	Percent(%)	Degree centrality	Strength centrality
Pro-water release scientific evidence (prose) (n = 79)					
t1	the water release meets safety standards	62	6.28%	17	2.868
t2	the water release has negligible radiological impact	34	3.44%	16	1.863
t3	the water is treated through scientific methods	15	1.52%	14	1.145
Anti-water release scientific evidence (antise) (n = 69)					
t4	some radioactive materials cannot be removed	69	6.98%	18	2.851
Scientific norms and values (nandy) (n = 144)					
t5	the water release involves scientific uncertainty	73	7.39%	17	3.390
t6	the water release has approval	31	3.14%	15	1.967
t7	Japan or the IAEA presents scientific evidence	80	8.10%	18	3.067
Ideologies (ideo) (n = 55)					
t8	China criticizes the water release	34	3.44%	18	2.708
t9	China questions IAEA credibility	9	0.91%	13	0.799
t10	China disseminates inaccurate or misleading information	21	2.13%	16	1.600
t11	Japan and China seek to maintain stable ties	16	1.62%	17	1.154
Social issues (socio) (n = 97)					

t12 the water release has environmental impact	86	8.70%	18	3.866
t13 the water release has impact on public health	11	1.11%	17	0.829
t14 the water release has impact on fishing industry	19	1.92%	18	1.844
t15 food imports are inspected or restricted	21	2.13%	17	1.411
Additional information (add) (n = 190)				
t16 IAEA conducts or reports safety reviews	148	14.98%	18	3.851
t17 countries or people express fear, anger, or opposition	96	9.72%	18	3.216
t18 IAEA continues to monitor the situation	43	4.35%	17	2.036
t19 water release data and information are published	120	12.15%	18	4.114

Table 2

The probabilities of topical categories co-occurrences in CGTN and The Japan Times.

Model 1: The probability of topical categories co-occurrence with anti-water release scientific evidence in CGTN (Reference = add)

	beta (log-odds)	beta SE	odds ratios	pred. prob	prob SE
intercept (add)	0.89***	0.19	1.00	0.71	0.04
ideo	-1.91***	0.27	0.15	0.27	0.04
nandv	0.50	0.26	1.65	0.80	0.03
prose	-3.44***	0.35	0.03	0.07	0.02
socio	1.32***	0.30	3.74	0.90	0.02
Model fit					
marginal R2	0.44				
conditional R2	0.52				
N. Observations	850				
groups (caseid)	170				

Model 2: The probability of topical categories co-occurrence with pro-water release scientific evidence in The Japan Times (Reference = add)

	beta (log-odds)	beta SE	odds ratios	pred. prob	prob SE
intercept (add)	2.91***	0.50	1.00	0.95	0.02
antise	-3.78***	0.57	0.02	0.30	0.06
ideo	-5.03***	0.64	0.01	0.11	0.04
nandv	-1.30*	0.56	0.27	0.83	0.05

socio	-3.29***	0..56	0.04	0.41	0.06
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Model fit

marginal R2	0.46
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conditional R2	0.53
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N. Observations	395
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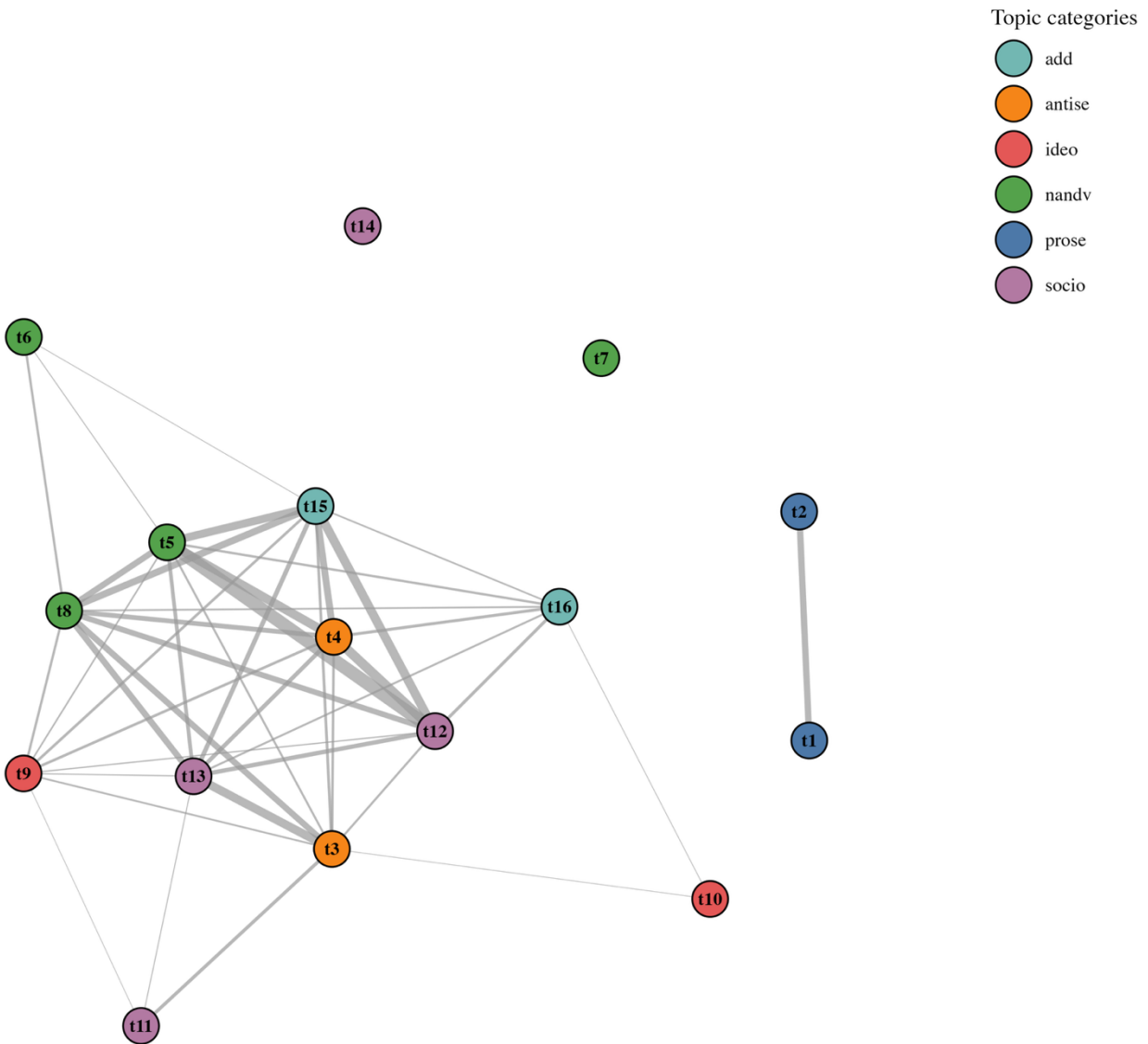
groups (caseid)	79
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Note: * $p < .05$; ** $p < .01$; *** $p < .001$

Figures

Figure 1a

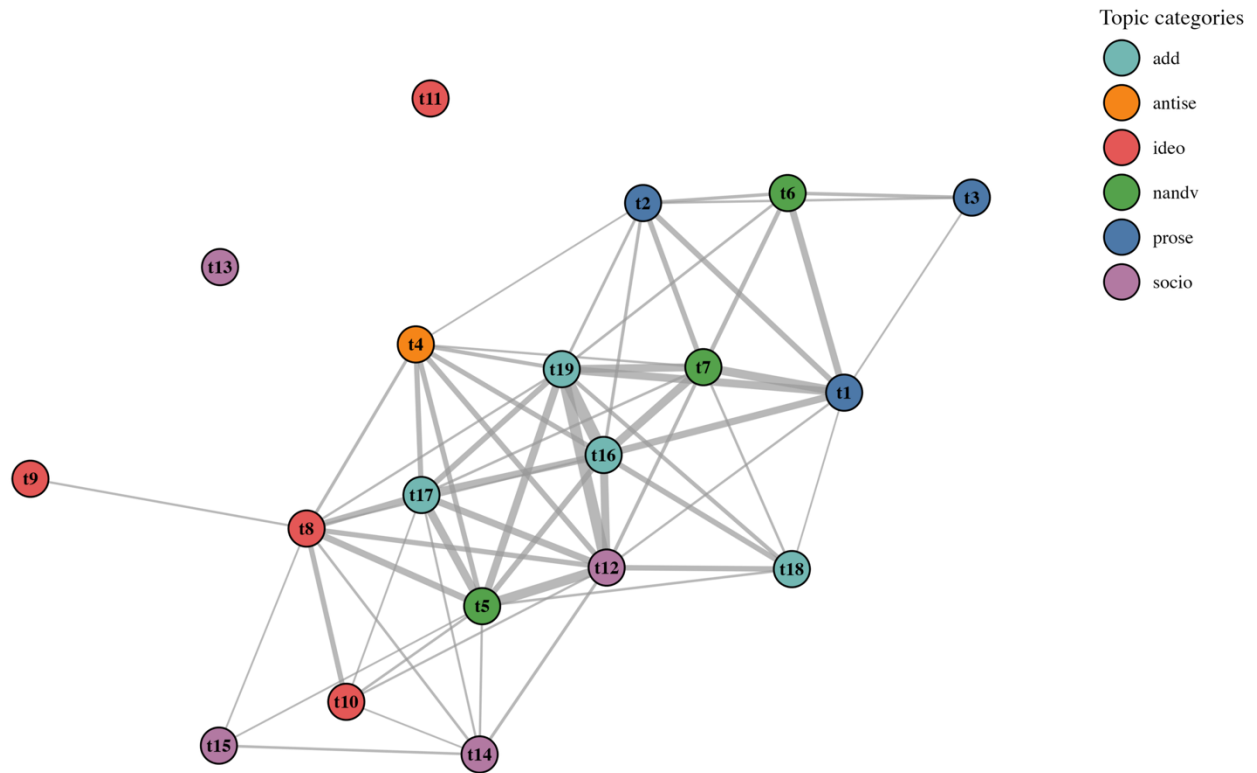
Topic co-occurrences in CGTN (density = 0.140; centralization = 0.114)



Note: The graph only shows edges weighted above the mean for visualization.

Figure 1b

Topic co-occurrences in The Japan Times (density = 0.130; centralization = 0.110)



Note: The graph only shows edges weighted above the mean for visualization.