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Rethinking Communication in Post-Disaster Recovery: A Case Study from Fukushima, Japan

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Abstract: Crisis communication approaches that emphasize transparency, clear messaging, and visible recovery efforts are well developed for managing public risk perception during acute disasters. However, these approaches are less well equipped to address the challenges that persist long after physical recovery, particularly when a location becomes associated with a disaster in public consciousness. This paper examines Fukushima Prefecture, Japan, as a case study of post-disaster reputational recovery, drawing on field observations during a graduate practicum conducted approximately fourteen years after the 2011 triple disaster (earthquake, tsunami, and nuclear accident). Observations included field visits, conversations with residents and community stakeholders, and review of communication materials spanning disaster education, tourism promotion, and local and international-facing information channels. Our findings reveal two parallel information channels: disaster-era content dominates wider public-facing materials, while post-disaster recovery regional identity content is primarily circulated within local channels, with limited reach to international audiences. Field observations also indicate that disaster associations seem to weaken with direct experience of the place, suggesting that stigma operates through mental associations that informational reassurance alone may not fully address. We argue that effective post-disaster recovery communication requires a transition from risk reassurance to identity reconstruction, including strategies that increase direct engagement with the place, expand the visibility of post-disaster recovery narratives to wider audiences, and better align local self-perception with the current phase of recovery. This study is exploratory in nature, and further empirical research is needed to validate its findings across comparable post-disaster recovery contexts.

Keywords: disasters; social stigma; perception; health communication; Fukushima

1. Introduction

Major disasters in recent decades have underscored how far the consequences of hazard events can extend beyond the acute phase. Disasters in Germany, Belgium, the United Kingdom, and South Asia have demonstrated that communities continue to bear significant economic, social, and health-related losses long after floodwaters recede [1–4]. The health risks associated with long-term displacement and temporary sheltering, for instance, have received comparatively less attention than the immediate emergency response, despite persisting well into the

recovery period [5]. International frameworks have increasingly recognized this gap: the Sendai Framework for Disaster Risk Reduction 2015–2030 calls for sustained efforts across the full disaster cycle, including recovery, not only preparedness and response [6].

This challenge is particularly evident following contamination disasters, where public concern can persist long after the physical environment has been rebuilt. Following the 1968 Kanemi PCB contamination incident in Fukuoka, Japan, the consequences for affected communities continued well beyond formal legal resolution, shaping daily life in ways that outlasted the event itself [7]. The 1976 industrial dioxin release in Seveso, Italy, led to widespread avoidance of the region; residents were turned away at the Swiss border, hotel bookings were cancelled across Italy, and orders for local products were withdrawn. These were noted by local authorities at the time as a response driven by fear rather than actual risk [7]. Fukushima Prefecture's experience following the 2011 triple disaster (earthquake, tsunami, and nuclear accident) reflects a similar dynamic, though at a larger scale and with greater international visibility.

Crisis communication approaches designed for acute disasters typically emphasize rapid transparency, consistent risk messaging, and visible recovery efforts [8–10]. However, these strategies often prove less effective in addressing challenges that persist long after the acute phase, particularly when physical recovery, the restoration of infrastructure and environmental safety, does not align with public perception. Despite extensive monitoring systems and strict safety regulations [11], the disaster's reputational consequences continue to linger. Public discourse has frequently linked Fukushima Prefecture with radiation risks, food contamination, and long-term health concerns, extending stigma to its residents, products, and broader regional identity [12,13]. Although substantial recovery initiatives [14–18] and communication efforts [19,20] have been implemented, a gap remains between the region's physical recovery and its public perception. We refer to this challenge as reputational recovery: the process of rebuilding a place's public image following a damaging association. This case can be understood through Sandman's "risk = hazard + outrage" framework, which suggests that hazard-focused messaging alone fails to address the emotional dimensions of public concern [21]. When a place becomes strongly associated with a disaster, the challenge may be less about correcting information than about reconstructing identity.

Fukushima Prefecture's experience suggests that addressing long-term disaster stigma—the negative labeling or grouping of people affected by a disaster, which can lead to fear, exclusion, and negative social treatment—may require a different communication strategy that prioritizes identity reconstruction. This involves actively reframing a place's public image around present-day strengths, differing from continued risk reassurance, which primarily aims to reduce public concern through transparency and evidence-based safety information. Through the lens of behavioral science theory, this case study examines how current communication practices interact with cognitive mechanisms that sustain disaster imagery and contribute to persistent stigma [22]. It uses field observations to examine how the information-based approach underlying many crisis communication frameworks has been applied. The findings from the January 2025 field course have been reported previously by Isaji et al. [23], who documented course activities and key observations across Fukushima Prefecture. The present study builds on that foundation by applying behavioral science theory, including dual-process theory and institutional path dependence, to examine the cognitive and institutional mechanisms that sustain disaster stigma in the post-disaster recovery phase. Where Isaji et al. [23] focused on describing current conditions, this study aims to explain them.

This study examines how current communication practices in Fukushima Prefecture interact with cognitive mechanisms that sustain disaster associations and identifies communication strategies better suited to the post-disaster recovery phase. The findings offer practical recommendations for post-disaster recovery communication strategies that may inform future practice in comparable disaster-affected contexts.

Study Area

Fukushima Prefecture is located in the Tohoku region of northeastern Japan, approximately 270 km north of Tokyo, and is the third largest prefecture in Japan by area (Figure 1). It consists of three geographically and culturally distinct areas: the coastal (Hamadori), inland (Nakadori), and mountainous (Aizu) regions. Fukushima City, the prefectural capital, is located in the inland Nakadori region and has a population of approximately 280,000. It lies approximately 60 km northwest of the Fukushima Daiichi Nuclear Power Plant, which is situated in the towns of Ōkuma and Futaba on the Pacific coast [24,25]. Despite these distinctions, the three areas are frequently conflated in disaster-related public discussion.

Figure 1. Locator map of Fukushima Prefecture, Fukushima City, and the Fukushima Daiichi Nuclear Power Plant, Japan.

2. Methods

This study employs a naturalistic case study methodology [26], drawing on observations made during a three-week practicum in Fukushima City, Japan, in July 2025, fourteen years after the triple disaster. By this point, physical recovery and institutional reconstruction, defined as the restoration of governance structures, regulatory frameworks, and organizational capacity, were largely complete. The practicum was designed and supervised by staff from the Fukushima City Office and faculty from Fukushima Medical University and the Harvard T.H. Chan School of Public Health. The overarching goal of the practicum was to develop strategies to communicate the current state of Fukushima City to an international audience in preparation for 2026, marking 15 years since the nuclear disaster. Specifically, the practicum aimed to enable an intern (the first author) to deepen her understanding of the disaster and subsequent recovery, identify the strengths of Fukushima City that could be communicated globally, and develop practical proposals to support tourism promotion and the attraction of international conferences and events.

The training consisted of both online and on-site components and was structured around three main areas: local initiatives for communicating post-disaster recovery, understanding the current situation of post-2011 Fukushima City in a global context, and identifying the distinctive characteristics and strengths of Fukushima City from an international perspective. The online component was conducted from 23 June–4 July 2025, and included a review of current efforts related to international conference attraction, inbound tourism, post-disaster communication, and multilingual outreach by the city. The on-site component took place in Fukushima City from 9–23 July 2025, and involved field visits. The findings and strategies were presented to city officials and collaborators at the end of the practicum. Observations reported in the present study were informed by conversations with residents and stakeholders, including orchard and hot spring owners, junior high school students and teachers, university faculty, and city staff, as well as everyday observations of community life and tourism (Table 1). Observations and stakeholder conversations were documented through contemporaneous field notes taken during each session. These notes were subsequently reviewed and organized thematically to identify recurring patterns across communication channels, stakeholder perspectives, and everyday community observations.

Additional perspectives were gained during an earlier three-week field course in Fukushima Prefecture conducted in January 2025, which led the first author to continue collaboration with the Fukushima City Office. The field course findings have been reported previously [23]. In brief, the course was a credited program at the Harvard T.H. Chan School of Public Health, bringing together 15 students to examine post-disaster reconstruction in Fukushima Prefecture, with a focus on the “Build Back Better” framework and ongoing challenges more than

a decade after the 2011 triple disaster, including radioactive waste management and reputational issues. The course covered all regions of Fukushima Prefecture, not only Fukushima City. From 6–24 January 2025, students participated in lectures by diverse stakeholders and site visits to government offices, healthcare facilities, research institutions, and affected communities. They engaged directly with local residents and practitioners and developed group-based analyses on risk communication, health monitoring, and environmental decontamination. The course concluded with final presentations at Fukushima Medical University.

The results present the first author's observations and interpretations, which were discussed with course and practicum instructors (the third and last authors). Observational themes were identified inductively, through recurring patterns that emerged across stakeholder conversations, site visits, and everyday community interactions. To protect the privacy of individuals, all stakeholder conversations referenced in this study are reported without identifying information. These patterns were subsequently examined through the lens of behavioral science theory. The case study structure was supervised by the second author who had developed the "CAST-D—Reporting Guideline for Case Study in Public Health and Medicine related to Disasters" [27]. Of note, as the first author simultaneously held the role of practicum intern and researcher, stakeholder engagement was shaped in part by the institutional context of the practicum. This dual role might have influenced both the access granted and the perspectives shared by participants and should be considered when interpreting findings.

Because this study used field observations, it was considered not to meet the US federal definition of research, and therefore a Harvard Longwood Campus (HLC) Institutional Review Board (IRB) application was not required. Similarly, in Japan, research that uses anonymized processed information is outside the scope of the Ethical Guidelines for Medical and Biological Research Involving Human Subjects issued by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), the Ministry of Health, Labour and Welfare (MHLW), and the Ministry of Economy, Trade and Industry (METI), and does not require an IRB application.

Table 1. List of practicum collaborators.

No	Practicum Collaborators	Discussion Type	Number of Collaborators	Contribution to Study Observations
1	International Convention Division (Fukushima City Office)	Online presentation and discussion	2	Provided context on Fukushima City's designation as an international convention city and its planning.
2	Tourism Division (Fukushima City Office)	Online presentation and discussion	2	Provided an overview of Fukushima's current tourism recovery status and of city-led initiatives to attract visitors.
3	Disaster Recovery Communication Division (Fukushima City Office)	Online presentation and discussion	2	Provided an overview of current disaster recovery communication efforts and the challenges faced during implementation.
4	Marusei Orchard Owner	Informal group discussion	1	Provided first-hand accounts of the disaster's impact on agricultural production, including recovery strategies, food safety standards, and ongoing challenges in rebuilding consumer trust.
5	Matsushimaya Hot Spring Owner	In-person presentation and discussion	1	Provided firsthand accounts of the disaster's impact on the hospitality sector, community solidarity during recovery, and ongoing challenges and strategies for rebuilding visitor trust.
6	MICE Promotion Division (Fukushima City Office)	Informal discussion	2	Provided both institutional observations on tourism and personal accounts of life in Fukushima amid persistent stigma.
7	Hot Spring Owners	Informal group discussion	3	Provided collective accounts of the disaster's impact on the hot spring sector, recovery strategies, ongoing challenges, and future hopes.
8	Iino Junior High School Students and Teachers	Lecture and class discussion	2 teachers and approximately 20 students.	Provided generational perspectives on life in Fukushima from students with limited memory of the disaster.
9	Faculty of Food and Agriculture, Fukushima University	Informal discussion	1	Provided an academic perspective on post-disaster agricultural innovation and on strategies for promoting Fukushima's products.
10	Institute of Environmental Radioactivity, Fukushima University	Informal discussion	2	Provided a scientific perspective on radiation research and international research collaboration.

3. Results

The following observations draw on both materials encountered directly during field visits, including brochures, exhibition panels, and product labels, as well as publicly available online sources reviewed during and after the practicum, including government and municipal websites [28–32].

3.1 Information for Local Residents and Visitors

Post-disaster communication in Fukushima Prefecture emphasized transparency and accountability but remained largely anchored in disaster-era frameworks. The Great East Japan Earthquake and Nuclear Disaster Memorial Museum documents the disaster through photographs, timelines, video footage, and educational displays [28]. Similarly, an exhibition panel prepared by the Fukushima City Office for the field course highlighted the severity of the immediate post-disaster period, often featuring images of damaged infrastructure and evacuation zones. While some materials included recovery imagery, these were generally outnumbered by imagery of destruction.

Drawing on both field observations and behavioral science theory, Table 2 presents a conceptual comparison of crisis-phase and post-disaster recovery communication across five dimensions. Health-related information was communicated through multiple channels. Radiation monitoring data were publicly available on the prefecture's official website, which included a detailed English-language radiation safety page [29]. Food safety information was also widely communicated through product labels, government websites, and individual producers' websites [30,31]. Tourism and revitalization materials presented a different focus, with promotional brochures highlighting seasonal attractions, cultural festivals, and regional foods. However, most of the materials that we observed were available only in Japanese, limiting their reach to international audiences. Similarly, the city website, which lists tourist spots and local events, primarily targets domestic visitors and is not tailored for international tourists [32]. City officials are aware of this gap and have started a project to issue English walking maps, which were distributed to the 2025 field course participants.

Table 2. Differences in characteristics of crisis-phase and post-disaster recovery communication.

Dimension	Crisis-Phase Communication	Post-Disaster Recovery Communication
Communication objective	Manage risk perception and restore public trust	Rebuild regional identity and reputational recovery
Message framing	Transparency, hazard reassurance, remediation updates	Identity promotion, cultural vitality, present-day strengths
Processing route	System 2 (deliberative, analytical reasoning) [22]	System 1 (associative, experiential reasoning) [22]
Intervention approach	Informational; correcting beliefs through facts and data	Experiential; direct contact with place and community
Time orientation	Past and present; what happened and what has been done	Present and future; who we are now and where we are going

Together, these observations suggest two parallel information channels. Disaster education materials prominently feature historical trauma and recovery, while tourism promotion emphasizes present-day vitality, with limited integration between the two. This pattern suggests that visitors are likely to be first exposed to memorial narratives, which may frame Fukushima Prefecture primarily as a disaster site and only secondarily as a destination.

3.2. Information Accessibility

The imbalance between disaster education materials and tourism promotion is further reinforced by differences in information accessibility. Disaster-related content was prominently displayed, thoroughly documented, and frequently available in multiple languages. In contrast, information about contemporary attractions and cultural life was largely available through local channels and primarily in Japanese-language materials (Figure 2) [32]. From informal (but structured into the practicum) conversations with local government officials and during visits to local business owners, we did not observe or hear any clearly defined approach for engaging international audiences or any clear strategy for communication beyond disaster narratives. In addition, we observed a tendency among residents to speak modestly about Fukushima City's strengths rather than actively promote them.

Figure 2. Exhibition in Fukushima Station and information in a local restaurant. Both are only available in Japanese.

These observations carry two broader implications. First, reassurance-focused health communication may unintentionally reinforce the perception of Fukushima Prefecture as a place defined by risk, simply by being the most visible and accessible content available. Second, while cultural modesty may be valued locally, it may also contribute to the prefecture's limited recognition among international audiences, as present-day attractions are often promoted cautiously or not promoted at all beyond local channels.

3.3. The Proximity Gradient of Stigma

Perceptions of Fukushima Prefecture vary with proximity to the affected area. Concern about health risks tends to decrease with proximity. Locally, health-related concerns appear largely absent. At agricultural markets near Mount Azuma, to the west of Fukushima City, peaches sold out as soon as they were restocked. Earning "GlobalG.A.P." certification [33] allows orchards to sell their products through major supermarket chains, reflecting renewed domestic commercial confidence. Radiation monitoring displays were widely installed and consistently showed readings within normal ranges, and few residents appeared to consult them. Classroom discussions suggested that radiation concerns were rarely discussed among junior high school students, most of whom were newborns or unborn at the time of the disaster, suggesting a generational shift in perceptions. In contrast, field observations suggest that concerns about health risks persisted among individuals with more distant or indirect connections to the region. A recently observed interaction illustrated how radiation-related stigma continues to circulate outside Fukushima Prefecture, even as daily life within the prefecture has largely normalized [34]. Following a soccer match, a passenger on a shuttle bus made a remark toward Fukushima United supporters referring to them as being "affected by radiation," which was reported on social media. The comment reflected persistent misconceptions and stigma associated with the Fukushima nuclear disaster and caused distress to nearby supporters, including a child. The club issued a statement condemning such remarks and emphasizing that prejudice toward disaster-affected populations should not be tolerated [35]. Such interactions illustrated how secondhand stigma—disaster-related prejudice that spreads through stories and social media rather than direct experience—could persist and cause harm long after conditions in the region returned to normal.

As a practical output of the practicum, we developed an informational leaflet targeting international audiences (Figure 3). Rather than addressing disaster-related concerns directly, the leaflet frames Fukushima City as a destination defined by scientific innovation, natural beauty, and cultural warmth. It illustrates how identity reconstruction communication can be applied in practice.

Figure 3. A two-page informational leaflet developed by the first author as an output of the July 2025 practicum, aimed at international audiences. The leaflet reframes Fukushima City as a destination for science, learning, and seasonal experiences, illustrating an identity reconstruction approach to post-disaster communication.

4. Discussion

This study has identified three key findings. First, the persistence of disaster associations in Fukushima Prefecture can be partly explained by how people process risk. Behavioral science suggests that early, emotionally powerful disaster imagery tends to become a lasting mental reference point through anchoring bias, the tendency for an initial piece of information to disproportionately shape subsequent judgments even when newer evidence is available [36]. The continued visibility of disaster narratives further strengthens these associations through availability heuristics, where information that is frequently encountered feels more representative than it may be [36]. Interpreted through dual-process theory, both processes operate through fast and automatic thinking, known as System 1 in dual-process theory, rather than through careful and deliberate reasoning, known as System 2 [22]. This has implications for communication strategy. Factual reassurance, the dominant approach in Fukushima Prefecture's post-disaster communication, primarily engages System 2 reasoning and may therefore be less well matched to the automatic processes through which stigma forms.

Second, direct experiences appear to play a meaningful role in weakening disaster associations. This pattern may be understood through the proximity gradient: the observation that disaster stigma tends to be strongest among those with the least direct contact with the affected area and attenuates as familiarity with the place increases. For those living in or regularly visiting Fukushima Prefecture, daily exposure to ordinary life, such as functioning markets, schools, public spaces, and social routines, continuously introduces new sensory impressions that compete with the disaster imagery anchored during the acute phase. Over time this accumulation of direct experience may plausibly operate through System 1 processes by gradually replacing disaster-dominant associations with more recent impressions of the place [22]. Factual reassurance, by contrast, requires conscious belief revision through System 2 reasoning, a process that may be poorly suited to stigma that forms and persists through automatic association. The implication is that communication strategies oriented toward facilitating direct contact with Fukushima Prefecture may be more effective at reputational recovery than continued information-based approaches alone.

However, this observed pattern may also be partly explained by survivorship bias. Individuals most severely impacted by stigma in proximate communities may have permanently relocated, meaning that those who remained

or were accessible during field visits may represent a self-selected group for whom stigma has already been partially negotiated. The apparent weakening of disaster associations with closer proximity should therefore be interpreted with caution, as it may reflect who is present to be observed as much as a genuine reduction in stigma. Nevertheless, the available evidence tentatively suggests that post-disaster recovery communication may benefit from prioritizing opportunities for direct experience rather than relying solely on factual reassurance.

Third, the continued dominance of crisis-era communication in Fukushima Prefecture may also reflect how institutions tend to continue operating along established paths. Following the 2011 disaster, communication efforts in Fukushima Prefecture appear to have developed primarily around crisis management, reflecting the scale and urgency of the immediate post-disaster response. As these systems grew, they accumulated resources, expertise, and institutional legitimacy. However, communication efforts oriented toward post-disaster recovery identity did not develop comparable foundations. This pattern is consistent with institutional path dependence, which describes how organizations tend to keep operating according to the logic they were originally built around, often without recognizing that circumstances have changed [37]. The result in Fukushima Prefecture is not a lack of effort or willingness, but a gap in awareness and capacity. Existing systems continue to do what they were designed to do, while the communicative work needed in the current phase remains underdeveloped. Addressing this gap would therefore require not only new resources but also a rebalancing of communication goals that complements existing risk management efforts with greater investment in rebuilding regional identity. Figure 4 illustrates this proposed transition, mapping the shift from crisis-phase communication, centered on risk reassurance and System 2 engagement, toward post-disaster recovery communication, centered on identity reconstruction and System 1 processes.

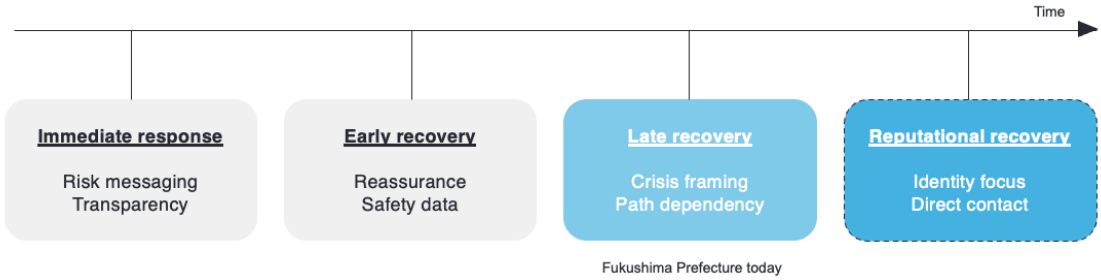

Figure 4. Phases of post-disaster communication transition.

Drawing on the findings above, three recommendations are offered for practitioners and policymakers working in post-disaster recovery contexts. First, given the observed dominance of disaster-era content in international-facing channels, present-day attractions, cultural vitality, and regional strengths should be given comparable prominence and multilingual accessibility [38]. This approach may be particularly useful in engaging international audiences or younger generations who have not yet formed established disaster associations about the region [22,36]. Practical steps include maintaining tourism and institutional content across international digital platforms and installing forward-looking exhibition materials at high-traffic entry points, such as Fukushima Station. Historical context should not be removed but rebalanced so that visitors' first and most accessible encounter with Fukushima Prefecture is not defined solely by the disaster.

Second, given that direct experience appears to weaken disaster associations, communication strategies should prioritize opportunities for people to visit and experience the region firsthand. This includes designing structured tourism and academic engagement programs that facilitate direct contact with contemporary Fukushima. One example is to position Fukushima Prefecture as a learning hub. Leading institutions such as Fukushima Medical University and the Institute of Environmental Radioactivity of Fukushima University regularly host international symposia and researchers [39]. Showcasing these activities to external audiences through leaflets or social media may help shift perceptions through what is known as the messenger effect, the tendency for positive associations with trusted figures to extend to the places and contexts they are seen engaging with [40]. When respected scientists and practitioners are seen engaging comfortably with Fukushima Prefecture, broader audiences are more likely to view the region positively. The planned 2029 convention center presents an opportunity to embed this identity into the region's physical infrastructure by creating a dedicated venue for international exchange.

Third, given that crisis-era communication systems have become institutionally well-established, reputational reconstruction requires dedicated institutional capacity, including roles focused on promoting regional identity and international outreach, multilingual content production, and policies that recognize post-disaster recovery reputation as a legitimate goal. For domestic audiences with established disaster associations, approaches that directly address common misconceptions, such as the Fact-Myth-Fallacy-Fact (FMFF) method [38] can

complement broader identity reframing efforts. This method structures messaging by first stating a fact, then naming the myth, exposing the fallacy, and restating the fact to ensure the accurate information is more memorable than the myth already in circulation. At the same time, communication strategies must account for the cultural modesty observed in regional promotion practices. Even well-designed initiatives will have limited impact if local actors remain hesitant to actively promote the region's contemporary strengths, particularly to external audiences.

While these recommendations are grounded in the specific conditions of Fukushima Prefecture, the underlying principles we drew from the onsite observation—rebalancing disaster-dominant narratives, facilitating direct contact, and building institutional credibility—may inform communication strategies in other post-disaster recovery contexts. This paper, however, has several limitations that should be considered when interpreting its findings. Observations were conducted across two field visits of three weeks each. Stakeholder conversations were semi-structured and did not follow a formal data collection instrument, and participants were purposively selected rather than sampled systematically. As a result, the perspectives captured may not fully represent the range of experiences and viewpoints within the region. The observations are also largely concentrated in Fukushima City and therefore may not reflect conditions in more rural or heavily affected areas such as the coastal municipalities closest to the Fukushima Daiichi Nuclear Power Plant. Additionally, as a single case study, the propositions offered in this paper have not been empirically tested and should be treated as starting points for practice rather than generalizable conclusions; future research might pursue visitor surveys, audience studies, structured interviews, or comparative case studies across other post-disaster contexts.

5. Conclusions

The case of Fukushima Prefecture highlights a challenge that crisis communication frameworks were not designed to address: the persistence of disaster-related perceptions long after physical conditions have improved. This persistence is not primarily informational and may not be fully resolved through factual reassurance alone. Cognitive associations formed during the acute phase continue to shape perception, while institutional practices may unintentionally reinforce disaster salience, creating a gap between lived recovery and public understanding. This suggests the need for a shift toward communication strategies that explicitly address the post-disaster recovery phase, moving beyond a primary focus on post-disaster risk communication. This study contributes a case-based argument for reframing post-disaster communication around identity reconstruction, offering Fukushima Prefecture as an illustrative example of a broader challenge that other disaster-affected regions may face and indicating a need for further study on long-term identity reconstruction.

Author Contributions

A.A.: conceptualization, data curation, investigation, writing—original draft preparation; Y.N.: methodology, supervision, writing—reviewing and editing; I.A.: supervision, writing—reviewing and editing; A.G.: conceptualization, supervision, writing—reviewing and editing. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

Because this study used field observations, an institutional review was not required.

Informed Consent Statement

Not applicable. This study is based on the first author's field observation notes and does not involve data collection from human subjects.

Data Availability Statement

Not applicable.

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Conflicts of Interest

The authors declare no conflict of interest.

Use of AI and AI-Assisted Technologies

During the preparation of this work, the authors used Claude Sonnet 4.6 for English proofreading. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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