

Tying Knots of *En*: An Ethnography among Uncertain Walls in Fukushima's Gray Zone in 2023

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Abstract: *Twelve years after the TEPCO nuclear accident in coastal Fukushima, the newly revised compensation policy and the discharge of water at the Fukushima Daiichi Nuclear Power Plant Station are threatening to produce social and political divisions among the residents in coastal Fukushima between scientific experts and lay public, and between countries. In a time of heightened societal divisions, what is the role of scholars? By sharing ethnographic stories in Fukushima's gray zone in 2023, the essay explores how scholars can learn from people on the ground to challenge narratives and systems that divide people from the environment and the land from the ecosystem to explore stories, voices, and perspectives that provide connections. (This article is based on Nuclear Ghost: Atomic Livelihoods in Fukushima's Gray Zone, recently published by the University of California Press).*

Keywords: Coastal Fukushima, Nuclear Accident, Water Discharge, Nuclear Compensation, *en*/^縁

"Trust the power of good stories"

Writing Fiction in the Time of Pandemic and War, Haruki Murakami

Proud to Be Back in Odaka

"One bullet train ticket to Sendai and a transfer ticket to the local Jyōban line to Odaka station, please!"

At the hectic JR Tokyo station ticket office in the early summer of 2023, I confidently ordered a one-way train ticket to Minamisōma. It was an elating moment. I could finally revisit my fieldsite for the first time since December 2019. Since then, the Covid-19 pandemic has discouraged many outsiders from visiting coastal Fukushima. When planning my trip, I had been especially concerned with the region's medically vulnerable, rapidly aging population. In some places, more than 40 percent of the population is made up of people older than sixty-five, and I had taken extra safety precautions to avoid introducing potential external risk to them.

It had been almost four years. I was eager to learn about the region's current state. I especially wanted to know how the updated nuclear compensation details of April 2023 and the heated debate on the water discharge¹ at the Fukushima Daiichi Nuclear Power Plant were impacting the community. But unlike my past trips, which were mainly about extracting information from residents, this time I was on a proud mission to deliver something to them: *Nuclear Ghost*, my ethnographic monograph about the people living in postfallout Minamisōma City.

"I am sorry, but what station again?" asked the

middle-aged JR staff man, his professional business smile noticeable even through his mask. Over my mask, I told him it was “O, DA, KA,” emphasizing each letter. I also added that it is in Minamisōma, hoping that could help evoke his memory of the 2011 nuclear accident that made rural Minamisōma known to the rest of the country and the world. Despite my efforts, however, the JR staff still gave me a puzzled look, as he reached out to a five-inch-thick “master book” of the entire JR train system and frantically flipped the pages, looking for my destination.

His reply shattered my sense of excitement. I asked myself why he might not have known Odaka. Were twelve years long enough to forget about the nuclear accident caused by the Tokyo Electric company in 2011? Am I an unusual person in Japan to care about such a thing in 2023?

JR Odaka station reopened on July 12, 2016; on average, 490 customers use the small but ordinary rural station daily (Japan Rail West 2018). Perhaps, people usually take a different path to Odaka: from Tokyo’s JR Ueno by the Super Hitachi express train en route to Iwaki city instead. About 292 kilometers northeast of Tokyo, it is an almost four-hour journey to Minamisōma, either way. Or, I thought, maybe there is an alternative explanation. In this information age, our minds are bombarded with competing events to remember or forget. And the four years of my absence had undoubtedly been eventful: Covid-19, the assassination of Shinzo Abe, the Russian invasion of Ukraine, the Turkey-Syria Earthquake, and countless aftershocks and climatological disasters in and outside of Fukushima, you name it.

Minamisōma is one of the twelve coastal Fukushima municipalities to have undergone radical and irreversible changes since the 2011 Great East Japan Earthquake and Tsunami and the TEPCO nuclear accident. The tsunami alone killed 636 people in the city, the highest

causality across coastal Fukushima. Taken together, the tsunami in the coastal regions and the series of hydrogen explosions in March of that year reduced the city’s population from more than 71,000 people to fewer than 10,000. By April of the same year, the population had returned to 40,000, when the state revised its emergency evacuation order and deemed central and northern Minamisōma “livable.” Over the last twelve years, more than 520 people have died from so-called disaster-related death (*shinsai kanren shi*). Those numbers together make Minamisōma the most disaster-stricken municipality in Fukushima (Minamisōma 2021).

Yet, many Minamisōma residents have stayed and lived in the city since March 2011 despite the accident and its shapeshifting aftermaths. As of my visit in June 2023, the city had over 57,500 registered residents and more than 6,600 old and new people in the formerly restricted residential zones, despite their significant losses. Minamisōma is located ten to thirty-four kilometers north of the stricken power plant station, known among plant workers as 1F. The contamination spread unevenly across 398.58 square kilometers of the cityscape (about the size of Denver, Colorado), and multiple evacuation zones followed this haphazard spread to divide the city. As a result, the postfallout compensation policy treated residents in the same city differently, emplacing invisible and uncertain walls along the lines of these zones. The patchy topography has shaped the residents’ often ambiguous and surreal postfallout experiences, and they talked about using the color gray to apprehend how nothing in postfallout can be explained by either black or white. In my book, I documented how and why they desired to live and die in this gray zone, despite—and often because of—the accident.

As my mind started to drown in the whirlpool of facts, the JR staffer’s retuned smile wrinkles pulled me back out as he informed me Odaka

indeed exists in the JR master book, and I was on my way.

That day, I was one of three passengers getting off at Odaka station at dusk. A group of high schoolers lightly crowded the station. Passing through the tiny station with a self-checkout machine emplaced in the unstaffed/*mujin* station, I was confronted with central Odaka's deserted-looking townscape, where most of its 3,850 returnees are supposed to reside. The memory of my first visit to Odaka station in July 2013, when Odaka was still uninhabitable, came over me. At that time, the Jyōban train was not operating, no one could stay overnight, no traffic lights were functioning, and no high school students were trying to get on the train to return home to other parts of coastal Fukushima. Sociologist Eiji Oguma (2013) once wrote, "Nobody dies in a ghost town." Nevertheless, I met many people who wanted to die nowhere else but in this once-ghost town, and I had now come back to meet them in person and in spirit.

While waiting for my pickup, I decided to walk along the main street, like I had in July 2013. Just like before, I was the only person on the road. As I passed the award-winning author Miri Yū's café/bookstore/theatre opened in April 2018, I noticed a volunteer safety patrol car stalking me from behind. Okada probably rarely hosted a solitary outsider with a suitcase walking on its main street after sunset. The heightened security perhaps signaled a countermeasure to the February 2023 group robbery incident in the other part of Minamisōma that made national news, where a group of young outsiders assaulted and stole 83,000 yen (around \$593) and a necklace from an elderly couple (Japan Times 2023). More reason that the JR Tokyo staffer should have remembered Minamisōma. Whatever the grounds for their suspicion of me, I felt proud to be back, carrying my books in the suitcase.

The Battlefield under Minamisōma's Two Moons

On December 20, 2022, the Nuclear Damage Compensation Dispute Review Board (2022) announced their fifth amendment to the nuclear compensation policy, last revised in December 2013. This revision, effective from April 2023, reflects the higher compensation granted in seven group lawsuits brought by victims of the TEPCO accident to the Supreme Court, asking for an acknowledgment of psychological damage sustained from the sudden evacuation and displacement, forced and voluntary, and inadequate risk communication about the threats of radiation. Yet, even in the 2023 revision, who sustained psychological damage and how much they suffered (and thus how much compensation they could now claim) was still determined by the original evacuation zoning enforced in April 2011. At that time, uncertain "walls" (Morimoto 2023, 51) drawn on a map divided Minamisōma residents into six evacuation zones: (1) Exclusion Zone, (2) Restricted Residence Zone, (3) Evacuation Instruction Release Preparation Zone, (4) Special Monitoring Spot Zone, (5) Emergency Preparation Zone, and (6) Outside the 30-km Zone. A figure provided by TEPCO to explicate the recent changes (Figure 1) renders this geographical fragmentation visible. Based on the distance to and from 1F and the technoscientifically measurable presence of contaminants for determining the degree of harm the accident caused, this old zoning and the revised compensation policy that was generated from this zoning kept in place previous inequalities in the city. Without reevaluating the existing zones, this revision could sustain and exacerbate social divisions in Minamisōma.

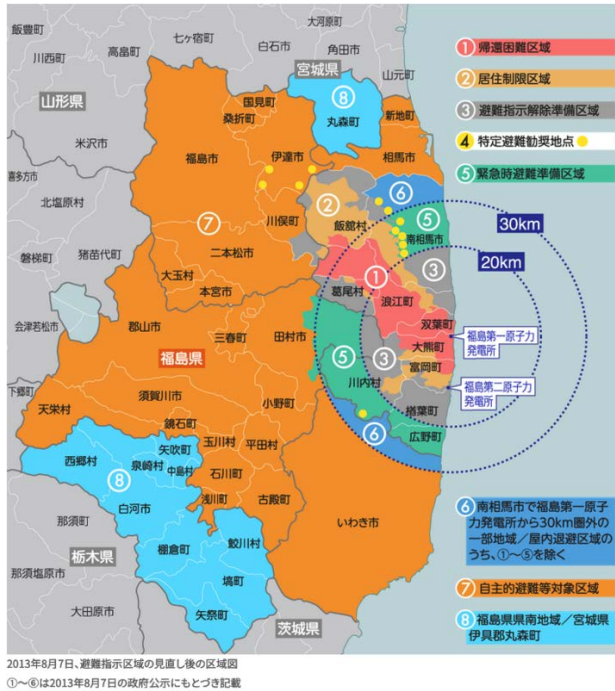


Figure 1: A Diagram of the Evacuation Zonings. Taken from TEPCO’s website “Announcement regarding the Fifth Amendment to the Interim Guidelines.” https://web.archive.org/web/20230510045411/https://www.tepco.co.jp/fukushima_hq/compensation/daigojitsuiho/index-j.html.

In all its forms, the postfallout zoning and related compensation policy together have damaged the preexisting social fabric of Minamisōma more acutely and tangibly than the presence of low-dose radiation damaged individual cells and DNAs. The dire need to reevaluate the damage beyond technoscientifically quantifiable risks of human exposure to account for the ongoing social, cultural, and ecological impacts of the TEPCO accident was one of the central arguments in my book. In it, I examined Minamisōma as a case study to understand how the post hoc technoscientific determination of the contaminant presence using tools like radiation monitoring posts and related legal designation

of victimhood have caused irreversible damage to the local community. In this visit, I wanted to understand how the new 2023 amendment might reinforce the techno-legal divisions and sustain underacknowledged harm by threatening to reproduce the social divisions in the city.

What I found was this. The compensation policy only acknowledges the psychological and physical damage already done by the accident to people from their “temporary” displacement in March 2011 up to the reopening of the zone. But it tends not to be concerned with ongoing and broader social harm to the community, like alienation from their ancestral land and social isolation from neighborhoods, friends, family, and so on, from the accident’s lengthy aftermaths, especially for those living “far” from the most profoundly contaminated area. Because of its emphasis on past damage, the dead people matter as much as—or more than—those surviving in the region. Even if nobody dies in a ghost town, as Oguma argues, the compensation policy revives the dead as “ghosts” and forces them to participate in the messy social and legal aftermaths of a nuclear accident.

“You returned just in time before meeting me as a ghost,” Tengo said jokingly as he welcomed me into his house in the western, more rural part of Odaka. As one of my primary interlocutors since 2013, Tengo and his family have been hosting me at their house since 2015. At that time, they lived in a temporary evacuation house in the Kashima district in Minamisōma, about 15 kilometers (9.3 miles) north of Odaka. After seven years of life as evacuees, his family resettled in their refurbished home in the early summer of 2018, two years after the official reopening of the Odaka district.

As soon as I arrived, I rushed to sit in front of the family Buddhist altar with a smiling portrait of Tengo’s mother, Naoko. Naoko passed in the

summer of 2020 at eighty-four after a sudden stroke (Morimoto 2021). I placed my book and a souvenir I had got at Tokyo station by the altar as my offerings. After lighting incense and ringing the singing bell to open up our spiritual channel, I reported to Naoko how her postfallout livelihood and words were the essential building blocks of my book.

“Was it in late 2019 when you last saw my mom?” Tengo asked. “It has been like we are on a battlefield/*senjyou* since,” he casually added.

Tengo’s war reference uncannily rhymed with my fond memories of Naoko. She had often told me about her childhood experience during World War II, including how she had lost her uncle, who had left many rare wartime documents behind. As we walked from the altar to the living room, Tengo enumerated those who had passed during my absence: “You knew X. He had passed. Y and Z. They passed too. Oh, I recently heard that V has passed as well. There are many others, but I will spare you. We are disappearing one by one.” The number seemed high, but then I had to remind myself of the skewed population curve in the region. In the Odaka district, more than 48 percent of its returnees and newcomers are older than sixty-five. Like Naoko, many of my interlocutors had been over seventy-five when I had first met them in 2013. Tengo had recently turned sixty-five, becoming the youngest member of the elderly league.

The region’s graying population was why I knew I had to visit Minamisōma as soon as possible. “Many of us here are much closer to death than birth,” Naoko used to tell me. Naoko taught me that, for our dignity and connection to our land, it is critical not how we resist the universal fact of death, but how we choose where we die. Like others in the region, Naoko was determined to welcome her death in her home, surrounded by her family and ancestors. For that, she patiently waited for the

reopening of Odaka and her resettlement. In the end, Naoko fulfilled her desire.

Dead souls were abundant in the aged town. To shake them off, I asked Tengo what was happening to those living. He took his time before responding, deliberately turning off the TV and reaching for a pile of letters in the corner of his living room. “We are now getting more money for the accident,” he said, and I nodded. Tengo did not offer much detail since he knew I knew it well. He had often discussed policy-related issues with me, as he was responsible for taking care of his family’s compensation.

This update meant that Tengo and his family, whose preaccident residence was in the former evacuation zone (number two on the map), are now qualified to receive at least 2,800,000 yen (around \$20,000) more per individual.² However, Tengo’s tone of voice suggested that the amendment was far from offering a resolution to the postfallout struggles experienced by the residents of Minamisōma. “You know how the compensation policy broke the community rather than healing it. With this new change, we are back to where we were ten years ago, and another drama awaits in this slowly recovering community,” Tengo sighed. Because Tengo and his family evacuated to and resided in the Kashima district, the northernmost part of Minamisōma, for seven years between April 2011 and July 2018, he knew intimately the social consequences of the compensation policy, which categorized most Kashima residents as least impacted, since they were outside of the mandatory evacuation zone.

Another one of my interlocutors, Saeki, has lived through this inequality. When I visited her at her family-owned restaurant, she articulated this old and now newly relevant local issue. The updated policy bothered Saeki, a long-term Kashima resident in her early sixties, since she thought it would reproduce the postfallout social inequality within Minamisōma and now

burdened her to resurrect the presence of the dead, as it were, and her associated memories. “The dead complicate the matter for the living,” she told me. Saeki explained how the amendment applies to all individuals, including those already dead and “no longer living,” who had once “lived through” the accident in the region, including Naoko and others and, in Saeki’s case, her husband. The dead in coastal Fukushima reveal the logic behind how the state and TEPCO measure and qualify the accident’s harm.

Because her residence is about 31 kilometers from 1F (number six on the map), Saeki and her family received the least accident compensation. According to the policy, until March 2023, Saeki would receive around 600,000 yen (around \$4,400) for psychological damage, while Tengo and his family received about 8,400,000 yen (around \$64,620) per individual.³ In this case, the distance between their residences is about 14 kilometers or 8.7 miles, but between April 2011 and July 2018, Tengo lived less than half a mile from Saeki. “The state wants us to remember how we have been and should continue to be treated differently,” Saeki complained. “You see, unlike Odaka people, we, the Kashima people, can now claim only 160,000 yen [around \$1,140].”

The 2023 revised compensation policy’s stubborn emphasis on past damage raised additional concerns for her. Saeki’s husband passed away suddenly a few years ago from cancer. As a result, she had to spend years settling the estates of his father, who also recently passed, while taking care of their family-owned restaurant all by herself. Now, to claim his part of the additional 160,000 yen, Saeki must prove that her husband lived through the nuclear accident. The act will inevitably cause her to remember his physical and psychological suffering. “I am busy trying to survive each day,” she said. “Is it worth it for me to go through all the trouble to get a small sum of money for myself and my husband?” I

did not know the answer.

Individuals like Saeki have to confront this dilemma. Their subjective sense of suffering is an insufficient qualification for nuclear compensation. Instead, qualification depends on how the state defines “nuclear”—in this case, what qualifies an individual’s connection to the nuclear accident. This definition (and thus the compensation) differs within the same city, according to location and/or technoscientifically and “objectively” measured levels of radioactivity. For example, a person from a coastal part of Odaka, where the ambient radiation level is much lower than the state-determined safety level of 1 microsievert per hour or not different from that of the Kashima district, is still considered a nuclear victim due to their residence’s physical distance (within 20 kilometers) to and from 1F. The discrepancy of the compensation policy, which Tengo hinted was a local drama, is one example of why the nuclear compensation policy has continued to cement the community’s divisions and failed to attend to individuals like Saeki. Observing Saeki’s postfallout life reveals the sheer force of the technopolitical processes that arbitrate what is and is not “nuclear.” Over this, residents living or dead, like Saeki or her late husband, have no control.

Historian of science and technology Gabrielle Hecht (2012) eloquently argues that politics, science, and technology are inseparable, and what is considered “nuclear” differs across time and space. For instance, uranium mined and processed in Africa does not make Africa “nuclear,” whereas the use of those materials for producing atomic bombs or generating nuclear energy, as in the United States or similar countries, does. The TEPCO accident complicates this observation because what is considered “nuclear” varies across scales and epistemological and ideological stances in real-time, such as local vs. national, national vs. international, individual vs. collective, science

vs. conspiracy theory, and pronuclear vs. antinuclear.

Although Saeki is a resident of Minamisōma, she is almost invisible to the state and TEPCO, compared to residents like Tengu, who are considered more harmed and thus more visible. However, these local politics, which fail to acknowledge her personal suffering, do not spare Saeki from the national and international imagination that she is a restaurant owner in a “contaminated place.” The 2011 nuclear accident raised long-term and worldwide doubt about food security in Fukushima as a whole (Kimura 2016; Sternsdorff-Cisterna 2020). It took ten years for the US Food and Drug Administration to lift its import ban on Fukushima products like rice and shiitake mushrooms. Only recently, in August 2023, has the European Union removed its import restrictions, no longer requiring test results. Meanwhile, neighboring countries, including Russia, China, Taiwan, and South Korea, still prohibit the import of products from Fukushima and surrounding prefectures.⁴

As Saeki’s case illustrates, Minamisōma residents must confront the state’s and TEPCO’s scientific and legal claims about the extent of the damage and local, national, and international concerns about the potential health, reputational, and ecological impacts of the accident. They must accept and navigate through the coexistence of their personal experience with the accident at home and the imagined adverse effects of the accident from afar. In Minamisōma, the real and surreal, the “nuclear” and “not nuclear,” play a constant hide-and-seek, as in the Murakami Haruki-esque world where “[o]verhead, the two moons worked together to bathe the world in a strange light” (Murakami 2011, 250). Tengu is right. Minamisōma had been and still is “a battlefield” of competing realities.

Trouble the Water

It is not an overstatement to characterize the last twelve years of the TEPCO accident as a ceaseless battle with water. Ever since the crippled reactors became somewhat stabilized, TEPCO has been trying to prevent the rainwater and groundwater from interacting with radioactive debris and being released from TEPCO’s plant facility into the ocean (Figure 2). By 2018, a drainage system, the Advanced Liquid Processing System (ALPS), and impermeable walls had been implemented, one by one, to remove contaminants, reduce contact, and decrease the volume of leakages. These countermeasures have helped reduce the production of contaminated water from 550 tons to 90 tons daily. Now, the state and TEPCO are planning to discharge “treated/contaminated” water from 1F. Locally, nationally, and internationally, the plan has already generated public protest, expert doubt, and political pressures to tighten existing import sanctions.

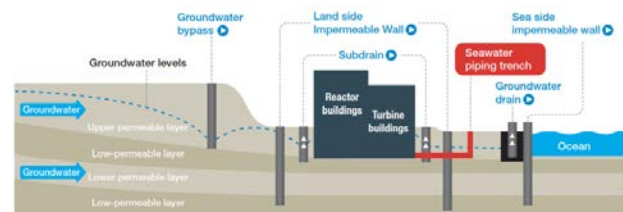


Figure 2: A Diagram of the Waterflow at 1F. Taken from the 2023 IAEA Comprehensive Report on the Safety Review of the ALPS-Treated Water at the Fukushima Daiichi Nuclear Power Station pg. 2.

https://web.archive.org/web/20230707043946/https://www.iaea.org/sites/default/files/iaea_comprehensive_alps_report.pdf

By artificially separating the natural water flow from land to sea, TEPCO has merely delayed the inevitable. By my visit in June 2023, more

than 1,000 makeshift tanks contained over 1.3 million tons of ALPS-treated water, radically transforming the 1F landscape in the process. Soon, though, total storage capacity will be reached, and the water will need to be discharged. Where should it go and how? To reduce the chance of contaminating the ocean irreversibly, the state and TEPCO have promised to adhere to a newly established contamination standard: from less than 60,000 becquerels per liter to below 1,500 becquerels. The becquerel is a unit of radioactivity, equivalent to one nucleus decaying per second; 60,000 becquerels of tritium is equal to 1 millisievert of additional exposure. TEPCO will dilute the water before discharge to stay at this level, which is 2.5 percent of the internationally regulated level before the accident, or around one-seventh of the WHO drinking-water standard. Such rigorous technoscientific treatments, TEPCO and the state argue, will prevent the ocean and its biota from being contaminated.⁵

At stake is the issue of tritium, or hydrogen-3, a radioactive substance with a half-life of about twelve years. Although it is naturally occurring, much of the tritium on earth is the byproduct of the legacy of the atomic age, and it exists everywhere. Like hydrogen, tritium also bonds with oxygen to form water, but unlike hydrogen, its atomic structure has two additional neutrons, making tritium radioactive.

Amid grave concern about potential “contaminated water” pollution from local fishing associations, anti-nuclear organizations, and neighboring countries such as China, South Korea, and the Pacific Islands, in July 2023, the International Atomic Energy Agency (IAEA) approved TEPCO and Japan’s plan for the annual discharge of the “treated water” with the total contamination level of 22 trillion (terra) becquerels. According to the IAEA report, it “will have a negligible radiological impact on people and the environment” since

the rigorous technoscientific measures taken by TEPCO can remove 62 radionuclides, and thus, the water about to be discharged to the ocean is not contaminated water but “‘treated water’ or ‘ALPS treated water’” (Figure 3) (2023: v, 3).⁶

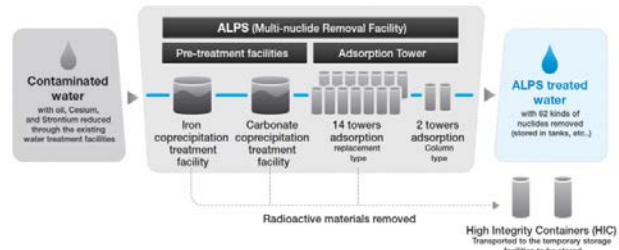


Figure 3: A Diagram of the Water Treatment Process at 1F. Taken from the 2023 IAEA Comprehensive Report on the Safety Review of the ALPS-Treated Water at the Fukushima Daiichi Nuclear Power Station pg. 4.

https://web.archive.org/web/20230707043946/https://www.iaea.org/sites/default/files/iaea_comprehensive_alps_report.pdf

When I asked Tengu about his opinion on the water discharge debate, he admitted frankly, “I do not fully understand it.” Then he said he was waiting for me to discuss this with him: “I told the TEPCO people who came to explain a week ago that I would rather learn about this from you.” Although residents like Tengu sometimes found TEPCO’s risk-communication campaign necessary for conveying the region’s safety to outside people, Tengu did not trust the corporate or state experts. He is not alone in this. Much of the residents’ postfallout experience has been a constant feeling of alienation from experts’ technoscientific discussions, filled with jargon (Das 2000) about radiological materials.

“All I know is that contaminated water/*osensui*, I guess they call it ‘treated’ water/*shorisui*, can no longer be kept at the 1F facility and needs to be discharged to the ocean. But this thing called tritium is like water and cannot be filtered completely,” Tengo shared, as he picked up a TEPCO-produced brochure with infographics designed to communicate potential risks or the lack thereof from the presence of tritium in water. “But it says here it is not dangerous,” Tengo asserted, pointing to the brochure.

According to TEPCO’s bilingual Treated Water Portal Site, which reiterates the same information given to the residents, “Tritium is all around us.”⁷ Nevertheless, TEPCO assures that “[s]ince the radiation given off by tritium is very weak and cannot even penetrate our skin, external exposure from tritium is not really a concern. There is also no risk of internal exposure since tritium is excreted from the body in the same manner as water and does not accumulate or concentrate inside the body.” The site notes that we are naturally and medically exposed to radiation in our everyday life, and the exposure from tritium is minuscule compared to other exposure events such as a CT scan and dental X-ray, or a round trip flight between Tokyo and New York.

Over the last twelve years, evacuees like Tengo have repeatedly heard a similar technoscientific narrative. This time, though, the radioactive agent under discussion is tritium rather than cesium-134 and 137, the primary sources of environmental contamination from the accident in coastal Fukushima and elsewhere. “Since the half-life of tritium is twelve years, wouldn’t there be less of it by now?” Tengo asked, demonstrating his over-a-decade-long experience with the science of radiation. Had the tritium come only from the initial accident in March 2011, Tengo would have been correct. However, the accident is ongoing. TEPCO has been unable to access or remove the melted radioactive fuel

and debris, which are in constant contact with the groundwater. 1F will not stop producing tritium until TEPCO completes its safe decommissioning, which will take at least forty more years. This year’s planned discharge is just the beginning.⁸

Having reviewed the technoscientific information together, Tengo looked at the part of the brochure where TEPCO discussed the state of water release in the world and expressed frustration with negative public focus solely on 1F, rather than other reactors in Japan and worldwide. Tengo thought that the name “Fukushima” automatically generated negative feelings in outsiders to the region, just like the rice farmer I had met in 2013, who told me that “[r]adiation came to fill the empty reputation of Fukushima, and there has not been any alternative to overcome it” (Morimoto 2023, 93). Tengo continued, “We are the target of criticism, but what is the issue if TEPCO releases the water little by little while sticking to the new safety standard? According to this document, aren’t all nuclear power plants in the world doing worse than this?”

As Tengo pointed out, the state and TEPCO argue that TEPCO’s plan to discharge around 22 terra becquerels of tritium annually is not unusual, compared to other nuclear facilities. Sellafield Magnox Reprocessing Plant in the United Kingdom released around 423 terra becquerels in 2019, the La Hague Reprocessing Plant in France released 11,400 terra becquerels in 2018, and the Kori Nuclear Power Plant in South Korea released 91 terra becquerels in 2019 (Figure 4). On average, Japan’s other nuclear power stations that operate boiling-water reactors like 1F discharge about 2.9 terra becquerels of tritium annually. Plant stations with pressurized water reactors release about 85 terra becquerels.⁹



Figure 4: An Infographic on the Tritiated Water Discharge in the World. Taken from “What TEPCO would like to convey regarding ALPS treated water.”
https://web.archive.org/web/20230707063423/https://www.tepco.co.jp/en/hd/alps_guid/index-e.html

“I do not think such comparisons are helpful,” I said to Tengen. He signaled his willingness to listen. I explained that these comparisons might dilute Japan’s and TEPCO’s commitment to safely decommission 1F. In their website copy, press releases, and communications to residents, TEPCO has expressed that “Fukushima decommissioning and revitalization are their top priority.” Their Japanese website claims to take responsibility to the accident: “The cause of the Fukushima nuclear accident should not be dismissed as a natural disaster simply because it was difficult to predict a massive tsunami, and the accident, which should have been prevented by all the precautions known to humans, was not prevented.”¹⁰

Based on TEPCO’s self-positioning as the

culprit, I reasoned to Tengen that if TEPCO is earnestly trying to live up to its commitment, it should be prepared for the entire world to scrutinize what is happening at 1F. The last twelve years since the accident have taught us that science is not the ultimate social contract among individuals, communities, and countries and the shape of science, like the meaning of “nuclear,” keeps changing in time and space. Therefore, I told Tengen, it is not enough to say that the discharged tritium complies with the current standard practices, however much lower it is compared to the existing international standard. Instead, TEPCO must work toward setting new global standards for safer nuclear-energy operations by fighting to achieve minimal impact on residents, current and future, and the environment. TEPCO should follow the lead of local farmers and fishing communities, who have set and adhered to lower contamination levels than internationally accepted, in order to combat Fukushima’s negative reputation.¹¹

In turn, the world should learn from TEPCO’s persistent trouble with the water. In the age of climate change, where the international community considers nuclear energy to be one of the “greenest” options available, discussions should consider its social and broader consequences. Nuclear energy is an unsustainable and uncontrollable structural threat that breaks the link between people and the environment and a community and individuals. What the TEPCO accident reveals to the public is this: whether or not we are notified, the water is diluted, or locally specific issues are acknowledged, nuclear energy generation will inevitably introduce contaminants, and contaminated water, into the ecosystem.

“I hope you wrote that down in your book,” Tengen teased me with gentle smile wrinkles.

Tying Knots of “En”

Since March 2011, I have witnessed experts fighting with each other about the situation at 1F and its collateral impact on residents' livelihoods, lands, and ecology; medical doctors disagreeing about risks from chronic low-dose radiation exposure; scientific and objective truth being challenged by gender, class, age, nationality, and geographical differences in perceived risks of radiation; and social and natural scientists battling over being pro- or anti-government.

Even before the Covid-19 pandemic, the TEPCO accident had not only challenged the democratic processes through which we make consensus within a society about not immediately sensible threats. It had also posed a question about how we should conduct research and whose perspectives and values we discuss or underplay when there is no right or wrong answer and when the criteria used for most decisions—whether or not to go through bureaucratic hoops to receive a small amount of compensation for the dead, for example—remain gray. When stories we hear in the field are often about constant struggles with social, cultural, political, and economic divisions, and our scholarly analyses or theoretical discussions have inadvertently contributed to and might help sustain such divisions in the academic and public imagination, what is our responsibility as researchers? In a time of heightened social atomization, such as the ongoing TEPCO accident and its aftermaths, what is the role of scholars and scholarship? I wrestled with this question when I was writing *Nuclear Ghost*.

In the summer of 2013, I met and spent time with people in coastal Fukushima who, unlike many others, had decided to remain in the region despite the potential risks of chronic low-dose radiation exposure. At first, I had naively approached the residents and the accident by trying to answer if, academically speaking, their decision to remain in the area was “right” or “wrong,” based on the TEPCO

accident's impacts on the local environment. After working with various residents for a decade, my question, and goal, changed. Now, I want to contribute to redirecting the global imagination of local lives, stories, histories, and cultures in coastal Fukushima that had become almost invisible due to the hypervizualized focus on radiation's possible adverse impact on individual health. I wanted to approach the residents not merely as the “ghosts” of the past, confined to telling, over and over again, the same nuclear stories that sustain our lopsided, damage-centered imagination of the accident. To work against the dominant emphasis on dire threats of individual and social disintegration, I explored new connections, meanings, and futurities, however weak and unexpected they might be, to consider ways to overcome “walls” that threaten to keep dividing people, things, spirits, and the environment.¹²

My interlocutors often glossed their encounters with me as *en*, or ineffable connections, and valued such chance encounters as what sustained them through countless hardships. Inspired by their way of living in the radioactive world, in my book, I incorporated *en* into my ethnography as a more expansive mode of relationality to overcome divisions and counter the dichotomous, black-and-white thinking that exacerbated them. “*En*,” I said, “is a mere possibility with which one can entertain a chance encounter of human and more-than-human kinds as meaningful. You may call it an efficacious fable, make-believe, or expansive form of kinship” (242). An activist and writer in Iwaki city, Fukushima Riken Komatsu (2021), calls this mode of relationality *kyōjisei/synchronicity*. Implied is the sense of humility or the “ethics of coordination” (Whyte 2021) that prioritizes establishing a meaningful and lasting relationship over exploiting people and their lives as objectifiable data. We may come to understand one another if, and only if, we can first acknowledge that others' lives are synchronous with ours. By some magical *en*, we

are living together despite our differences, and thus, their lives matter to us, and our opinions matter to their lives. This humble attitude, I now believe, is a hidden ingredient or precondition for any ethnography.

Notably, the concept and practice of *en* are not reducible to the local knowledge among coastal Fukushima residents living through the TEPCO accident, nor are they the unique manifestation of Japanese folk theory in a crisis. A similar reckoning of ecological connectedness is also prevalent in Indigenous studies. For example, in her novel *Ceremony*, Laguna Pueblo writer Leslie Marmon Silko (1977) offers a way of emphasizing connections across time, space, people, and things despite radiological injuries. Weaving the U.S. destruction of Japan by atomic bombs and the synchronous nuclear colonialism of the American southwest with the material residues from uranium mining, she writes, “Human beings were one clan again, united by the fate the destroyers planned for all of them, for all living things” (246). My search for *en* follows Silko’s lead in imagining connections *despite* and *because of* the accident. How are people living in Fukushima’s gray zone, and what do they think people like the JR Tokyo staffer should remember about the accident’s shapeshifting consequences twelve years later? To answer these questions, let me conclude my reflection on the last twelve years of the TEPCO accident with a story of *en* that I learned in June 2023 from Nishiyama, one of my interlocutors from Odaka.

Nishiyama is the head priest of the Hiwashi shrine emplaced in Odaka twenty-seven generations ago in 1364. I first met Nishiyama in 2013. One of the few people in the former evacuation zone near the tsunami-inundated area who kept visiting Odaka, I worked with Nishiyama as he returned to maintain the shrine and his house connected to it. He always told me that a community needs a shrine to know where to return to and a priest to witness the beginnings of things. For this reason,

Nishiyama said, he needed to return before everyone else. When Odaka officially reopened in July 2016, Nishiyama was one of the first permanent returnees.

On the day that I met him again in 2023 to present my book to him, Nishiyama greeted me with, “You came back at the right time. I have something special to give to you!” As soon as he saw me outside his shrine torii gate and even before I could offer him my book, Nishiyama handed me a beautiful, indigo-colored charm. Although it looked like any other charm one could buy at a shrine, Nishiyama assured me that it was the charm endowed with *en*.



The Hiwashi Indigo Charm and the Japanese description of the *en* that the charm animates. Photograph by author.

For Nishiyama, the TEPCO accident not only caused indescribable harm, but also animated unexpected connections and a deepened sense of connection to the land, people, community, and spirituality. He thought he had known the history of the Hiwashi shrine, until a group of strangers visited six years after the accident. As a retired high school teacher, he enjoyed

teaching others about the shrine's venerable origin whenever he had a chance. One of the oldest shrines in Minamisōma, it had migrated with the Soma domain lord from Chiba prefecture 659 years ago. What Nishiyama never asked himself, nor felt the necessity to explore, however, was how Hiwashi might have connections outside of the history of the Soma domain.

One day in late 2017 at Hiwashi, Nishiyama received a group of visitors from Tokushima prefecture, about 920 kilometers away. Nishiyama assumed they were another ordinary group of tourists curious to learn about the state of coastal Fukushima. But they weren't. "Doesn't your shrine worship *Ameno Hiwashi no Kami* [the god of fiber spinning] connected to the Inbe clan?" the group asked Nishiyama. Surprised and almost speechless, Nishiyama answered yes, and welcomed them to the shrine. Soon he discovered that they belonged to an indigo dye research group in Tokushima. One of their members had learned about Hiwashi through volunteer work to spread indigo dying to Minamisōma's residents.

The chance encounter led Nishiyama to receive indigo seeds in early 2018 from Hiroshi Hayashi, an owner of a reputable Awa Indigo craft company in Tokushima. No ordinary seeds, they were said to have been originally passed down to people by *Hiwashi no Kami*. This deity appears in one of the oldest records of Japanese (mythical) history, the Chronicle of Japan/*Nihon Shoki* from 697 CE, and it is the deity Hiwashi worships.

Awed by the magical connections between Tokushima and Odaka and the seeds and the shrine that might not have surfaced if not for the accident, in the spring of 2018, Nishiyama, his family, and the surrounding community undertook to plant the seeds and propagate them in Odaka. The community found it surprisingly healing to tend and till the indigo plants as they reconnected with the local soil,

which people had avoided due to radiation risk. And, as they were not going to consume the plants, contamination was not a worry. Growing the indigo plants unintentionally reaffirmed the historical significance of Hiwashi and Odaka and the community's commitment to return to and remain in the area to pass down its history to the next generation to come. In these ways, the Tokushima indigo seeds in Odaka's soil ended up cultivating a novel connection between Odaka and Tokushima and extending the history of Hiwashi into the mythical time of the *Nihon Shoki* in the process. They helped reconstruct ties between Hiwashi and its returning community of worshippers and between them and the land. Nishiyama called this knotting of the magical connections between people, things, and land *en*.

"We've learned to make the dye from scratch like in the old days and colored the charm you see to tie the knot of more than thousand years of forgotten connections," Nishiyama proudly announced. As his indigo story and the hue of indigo blue rendered tangible the manifold invisible connections of the charm, I was reminded of the sociocultural and affective force of telling stories that could interweave seemingly contradictory threads of visible and invisible, real and surreal, and painful and hopeful. Even in the ever-dividing world where what is and is not nuclear separates people, things, and the environment, we could still find agency and futurity in the act of tying knots, as it were, of relations, connections, and associations, however magical, unscientific, or subjective they might appear.

"I can't read English, but I bet my story is better than what you wrote here [in my book]!" Nishiyama joked as he finally remembered why I was visiting Hiwashi, and we laughed hard together.

Twelve years after the accident, coastal Fukushima and its residents still confront many

issues and uncertain walls. The revised compensation policy threatens to divide people like Tengo and Saeki, who happened to reside in different parts of the same city. At the same time, 1F's decommissioning continues to introduce new technoscientific and existential troubles, like the accumulation of contaminated water and its discharge, threatening, once again, to damage Japan's international relations, coastal Fukushima's reputation, the local economy, and the residents' morale.

When learning about the recent updates on the state of coastal Fukushima, each one of us has a choice. Some might selectively remember or forget the accident, its risks, TEPCO and the state, and nuclear energy. Some others might dismiss their broader connection to personal lives as irrelevant and unreal. But as I hope to have shown in this essay and <https://web.archive.org/web/20230221155110/https://www.jrest.co.jp/passenger/201807.html> regardless of an individual decision, you and I live synchronously with the coastal Fukushima residents, like Tengo, Saeki, and Nishiyama. Just like we are constantly changing, so are they. If they appear unchanged and our understanding of the accident and its impacts remains fixed, as the compensation policy does, we erect a wall that separates us from them and consigns them into the past.

Instead, it is my hope that we scholars will continue to challenge narratives and systems that divide people from the environment and the land from the ecosystem and instead, like Nishiyama, explore stories, voices, and perspectives that provide connections and the sense of *kyōji*, however unexpected, undefined, and gray they might be. *En* emerges, architect Kishō Kurokawa (1977: 28) once asserted, in a gray zone to tie a knot of conflicting things, ideas, and people.

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Notes

¹ This bilingual website by FoE Japan succinctly summarizes the recent debate. <https://web.archive.org/web/20230824213431/https://foejapan.org/en/issue/20230820/13971/>

² 300,000 yen more if you were pregnant or a minor by the end of December 2011.

³ See Nomura, Dogauchi, and Nomura (2022) for the detailed commentaries on the evolution of the nuclear compensation policy in Japanese. In English, see “Nuclear Compensation: Lessons from Fukushima” by The Buffett Institute for Global Affairs at Northwestern University at <https://web.archive.org/web/20220614221458/https://nuclear-compensation.northwestern.edu/>. Also, I offer ethnographic insights into how Minamisōma residents have dealt with compensation in Chapter 4 of my book.

⁴ See https://web.archive.org/web/20230405224337/https://www.maff.go.jp/j/export/e_info/hukushima_kakukokukensa.html.

⁵ See <https://web.archive.org/web/20230824183635/https://www.tepco.co.jp/en/decommission/progress/watertreatment/oceanrelease/index-e.html>.

⁶ Some scientists disagree with this assessment. For example, Ken Buesseler at the Woods Hole Oceanographic Institute and a long-term researcher of the water issue in coastal Fukushima raises concerns regarding traces of other radioactive isotopes, such as cobalt-60, accumulating on the seafloor. See <https://web.archive.org/web/20230706024054/https://www.newscientist.com/article/2380908-should-japan-dump-fukushimas-radioactive-water-into-the-ocean/>.

⁷ See <https://web.archive.org/web/20230702134256/https://www.tepco.co.jp/en/decommission/progress/watertreatment/tritium/index-e.html>. See also the Ministry of Economy, Trade and Industry website, “Let's get to know and understand about ALPS treated water” at https://web.archive.org/web/20230521041213/https://www.meti.go.jp/earthquake/nuclear/hairo_osensui/english/shirou_alps/no1/.

⁸ TEPCO’s first water discharge session had started on August 23, 2023, and ended on September 11, releasing 7,788 tons of water with a total radioactivity of 1.1 terra becquerels. For the monitoring data, see the IAEA monitoring website, at <https://www.iaea.org/topics/response/fukushima-daiichi-nuclear-accident/fukushima-daiichi-alps-treated-water-discharge/tepco-data>. In 2023, TEPCO plans to release 31,000 tons of treated water (around three terra becquerels of radioactivity and about ten water tanks) over four different times. This year’s discharge releases about 2% of tritium into the ocean compared to their planned release from 2024 until at least 2053. See <https://web.archive.org/web/20230828191538/https://www.pref.fukushima.lg.jp/uploaded/attachment/591602.pdf>.

⁹ TEPCO, Tohoku Electric, Chubu Electric, Hokuriku Electric, and Chūgoku Electric use boiling water reactors, while Hokkaido Electric, Kansai Electric, Shikoku Electric, and Kyushū Electric use pressurized water reactors.

¹⁰ See <https://web.archive.org/web/20230716022234/https://www.tepco.co.jp/fukushima/review/>. The original Japanese text reads: “巨大な津波を予想することが困難であったという理由で、福島原子力事故の原因を天災として片づけてはならず、人智を尽くした事前の備えによって防ぐべき事故を防げなかった” [The English translation by the author.

¹¹ See

<https://web.archive.org/web/20220928052226/https://www.pref.fukushima.lg.jp/site/portal-english/en01-01.html>.

¹² Newer scholarship on Fukushima is exploring hopes, changes, and new initiatives happening in coastal Fukushima. See, for example, Kumaki (2022) and Takahashi (2023).