

The Problem Science Cannot Solve: Fukushima's Wastewater Release and the Path Forward

Jeffrey Cheng

BA Project

Professor Broughton

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Fishermen at the Numanouchi fishery port in Iwaki, Japan. Photo by Hiro Komae via AP Photo

Dawn of Dilemma

As dawn breaks over the Numanouchi port in Iwaki city, 19 miles south of the Fukushima Daiichi nuclear power plant, a fisherman stands silently, gazing at the sea that has sustained generations. His thoughts are interrupted by the impending release of treated wastewater from the Daiichi plant. The sea, once a bustling hub of marine life, now carries the weight of a nation's nuclear dilemma.

On April 13, 2023, the Japanese government announced it would release treated water from the Daiichi plant into the Pacific Ocean. The plan is to gradually discharge over one million tons of treated wastewater — more than 500 Olympic-size swimming pools — into the Pacific Ocean over the next 30 years (Francis and Inuma, 2023).

The roots of this environmental catastrophe dates back a decade ago, when a devastating earthquake followed by a fifty-foot tall tsunami devastated the facility's power supply and cooling systems. This immense tragedy not only forced over 140,000 people to flee their homes, resulting in 2,000 deaths, but also led to the meltdown of nuclear fuel. This meltdown continues to emit significant radiation and heat, necessitating the perpetual flow of rain and seawater to manage the containment (Tateno, 2021). Today, the site still produces approximately 140 tons of

contaminated water daily (Brown, 2023). This contaminated water harbors significant amounts of radioactive substances, including cesium, strontium, iodine, among others, which are filtered out through an intricate purification system known as the Advanced Liquid Processing System – ALPS.

While the Japanese government and Tokyo Electric Power Company (TEPCO), one of the world's largest government-backed utility company, assert that this system effectively reduces the levels of radioactive materials to below safety thresholds, it remains incapable of eliminating tritium, a radioactive hydrogen isotope. The government's strategy involves diluting the water to ensure that tritium levels are substantially below the regulatory benchmark. Specifically, the diluted water's tritium concentration will not exceed 1,500 Becquerel per liter, compared to the standard of 60,000 Bpl (Yeung et al., 2023). Following this treatment process, the plan is to gradually release the water into the sea.

Releasing tritium is a common practice conducted by over 400 reactors worldwide, including those in China, Korea, and the US (Abukins, 2023). Tritium, a relatively mild radioactive substance, emits beta particles with energy low enough that it's hard to penetrate the typical thickness of the dead outer layer of human skin (Health Physics Society, 2020). Nevertheless, tritium is considered hazardous primarily when ingested, inhaled, or absorbed in substantial quantities. As such, tritium's behavior within the ecosystem is concerning. Tritium, specifically organically bond tritium, does not stay isolated in water but becomes increasingly concentrated as it moves up the food chain—from phytoplankton to zooplankton, and eventually to larger predators like tuna (Abukins, 2023). This bioaccumulation of tritium poses a sustained threat to regional fisheries and public health.

Extensive reports have scrutinized the science and safety of Fukushima's wastewater release plan. Nevertheless, the plan still sparked fierce debates both domestically and internationally, in part due to the lack of transparency in the decision-making process and communication with the public. Uncertainty and a lack of public trust have turned the wastewater release plan into a question which can be asked of science and yet which cannot be resolved entirely by science. The crux of the matter lies in how this decision reflects the broader challenge of managing nuclear legacies with minimal economic and social repercussions. Indeed, as Makoto Takahashi, assistant professor at Vrije Universiteit Amsterdam, notes, [Japan's nuclear waste]water does not need to be dangerous to do real economic harm" (Francis and Inuma, 2023).

Ripples of Repercussions

Local residents and fishermen, like Yasuo Yoshida from Iwaki, stand at the heart of this issue. Once thriving from a coastal fishing industry with annual revenue totaling \$69 million before the 2011 disaster, they have witnessed their livelihoods shrink dramatically, with revenues plummeting to around \$17 million in 2018, and only beginning to recover slowly to \$26 million

in 2022 (Jozuka et al., 2023). “All we can do from tomorrow onward is to fish and bring them to the market,” the 56-year-old said (Kyodo News, 2023). Yoshida raised concerns over the falling prices of fish, even before the wastewater release, underscoring a deep-seated anxiety about the future of fisheries in Fukushima. The specter of reputational damage casts a shadow over the hard-earned recovery efforts post-disaster. The situation was made worse after Japan’s discharge plan sparked public unrest in neighboring regions, and China implemented a total ban on all seafood imports from Japan.



Japan’s Prime Minister Fumio Kishida eats seafood from Fukushima Prefecture at a luncheon meeting, in Tokyo, Japan August 30, 2023. Photo by Kyodo/via REUTERS

In response to the challenges facing Fukushima fisheries, the Japanese government has intensified its support efforts by setting up a relief fund for unsold seafood, defining strict regulatory standards, and encouraging citizens to consume Japanese marine products while urging them to avoid spreading unfounded rumors. The government even published a video on social media of the prime minister himself eating Fukushima fish. These initiatives have seen a positive response from the public, with a significant surge in donations supporting Fukushima’s products (Francis and Inuma, 2023). However, social media campaigns promoting the

consumption of these products have faced some backlash, with critics labeling them as “tasteless.” The future of the long and painstaking recovery of the Fukushima fishery still looms ahead. As Haruo Ono, a fisherman from Soma city, Fukushima, explains “right now, people in Japan are supporting us. They probably think it is fine if they’re just eating Fukushima fish once. What’s going to happen tomorrow, this year, 10 years from now? If they [the government] didn’t release it, we wouldn’t have to worry about this” (CNA Insider, 2023). Ono’s concerns are widely shared, within days of the release, there have already been 151 plaintiffs filing a lawsuit against the government to stop the wastewater release (Yamaguchi, 2023).

Public discourse around food safety and the stigma associated with Fukushima’s products also reveals deeper societal tensions. It is hard for citizens to voice concerns about food safety, despite independent testing showing cases of localized radiation contamination. One resident of Fukushima shared the social pressures faced when questioning the safety of local products, “Other members of the community will tell you to stop spreading rumors. So, it’s quite hard to express oneself directly” (Polleri, 2023). Moreover, in some parts of Fukushima, there is social scrutiny over shopping choices; individuals who avoid local products are sometimes branded as unpatriotic or as obstructing the region’s recovery efforts. In the aftermath of the wastewater release, citizens often find themselves entangled in the complex interplay between community solidarity, personal health concerns, and economic recovery.

Meanwhile, TEPCO is fully aware of the considerable public distrust that looms over its plans to release treated wastewater. Junichi Matsumoto, the corporate officer in charge of treated water management for TEPCO, emphasizes the safety of the release, saying, “if we describe [the water release] in one word, it’s safe.” He acknowledges the company’s tarnished reputation, adding, “As the operator responsible for the accident, we must admit TEPCO is a company that is not fully trusted. We must keep up the effort and sincerely respond to any concern...It is our responsibility to demonstrate we can carry out the water release as planned, and that’s how we can regain public trust.” Matsumoto highlights that rebuilding trust hinges on their ability to communicate with local community clearly and patiently. “It is difficult, but we hope to make it as easy to understand as possible” (Yamaguchi, 2023).

TEPCO has faced longstanding criticism for its lack of transparency, highlighted by a history of falsifying safety records and downplaying the severity of operational issues. Between 2002 and 2007, TEPCO disclosed to the Nuclear and Industrial Safety Agency (NISA), the precursor to the current Nuclear Regulation Authority (NRA), several serious breaches of compliance. These included falsifying safety test results for the containment vessel of the Daiichi No. 1 reactor, concealing inspection data that revealed cracks in the reactors, and covering up the leakage of hundreds of gallons of radioactive water following a small earthquake (Shirouzu and Tudor, 2011). While TEPCO did undergo nationalization in 2012 following the nuclear disaster, when

the government bought majority stake of the company, this pattern continued post-disaster (Inajima and Okada, 2012).



SAKAE MUTO, Vice President of Tokyo Electric Power Company (TEPCO) attends a press conference on March 27, 2011. Photo by Asahi Shimbun via Getty Images

Despite the many public assurances, TEPCO's actions sometimes reflect a prioritization of maintaining its corporate image over comprehensive safety measures. For years the company has stated that results from the testing of treated water will be carefully explained to fishermen and other concerned parties, even promising that no disposal would occur without “the understanding of all parties involved” (Take, 2023). In practice, local fishermen, like Yoshida from Iwaki, feel excluded from meaningful dialogue. “The government and TEPCO have not given us any concrete plans in the end,” Yoshida laments (Kyodo News, 2023). Public hearings, held before and after final decisions, have often seemed more focused on justifying the decision to release the water into the ocean rather than genuinely engaging public opinion or addressing concerns.

Furthermore, TEPCO's reluctance to share critical data with the scientific community, even after its nationalization, implies a misalignment with governmental priorities. Dr. Dalnoki-Veress, adjunct professor at Middlebury Institute of International Studies who has extensively researched the Fukushima wastewater for over four years, criticizes the company for a lack of openness in scientific exchanges. “Operational transparency and the give-and-take which is normal in

scientific exchange on difficult issues has been lacking.” He adds that data provided by the Japanese government and TEPCO was delivered in a manner that “thwarted their investigations and an open scientific discourse with TEPCO scientists” (Lee, 2023). Such actions reflect a significant internal conflict within TEPCO between government public safety commitments and corporate interests, undermining efforts to rebuild trust.

An abyss of distrust and frustration has divided citizens, fishermen, TEPCO, and the government, one that scientific narrative alone cannot bridge. These are not issues of science, but concerns about the future, how recovery can be achieved, and who is expendable along the way. To truly understand the roots of these entrenched divisions, we must rewind the narrative and trace the sequence of decisions and policies that have sculpted this landscape of contention and distrust. This journey back in time is crucial for unpacking how and why certain paths were chosen, shedding light on the complex interplay of economic, environmental, and social forces at work.



A protestor holding signs reading “Don’t throw polluted water into the sea” and “keep your promise.” Photo by Kazuhiro Nogi/AFP via Getty Images

The Trust Chasm

The lack of public trust was evident even before the cleanup efforts began following the Fukushima disaster. The National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission (NAIIC) was tasked with investigating the causes of the 2011 nuclear

disaster and making future prevention recommendations. After 900 hours of public hearings, interviews with over 1,100 individuals, and visits to various nuclear plants, the NAIIC concluded that the disaster was man-made, fueled by collusion among the government, regulatory bodies, and TEPCO (World Nuclear Association, 2024).

The report highlighted that TEPCO had been aware since 2006 of the risk of a station blackout and loss of cooling capabilities in the event of major flooding from a tsunami. Despite this knowledge, the regulator NISA did not mandate preparations for such scenarios and even advised against planning for station blackouts for cost-saving (World Nuclear Association, 2024). This lack of preparedness became starkly evident during the disaster, with inadequate emergency plans and training that failed to effectively manage severe conditions. Emergency procedures like venting and the manual operation of cooling systems were poorly executed, worsening the situation.

The NAIIC Chairman described the disaster as a ‘Made in Japan’ catastrophe, highlighting that it was rooted in cultural norms such as reflexive obedience and a reluctance to question authority (World Nuclear Association, 2024). These cultural traits hindered the ability to learn from past nuclear accidents like Three Mile Island and Chernobyl, ultimately contributing to the Fukushima tragedy.

The report fueled public outrage. Amidst significant public pressure, changes were made: the then Prime Minister Naoto Kan resigned, the government replaced NISA with the more independent NRA, and TEPCO was nationalized in 2012. Despite these reforms, the deep-seated cultural inclination towards non-questioning remained pervasive. This cultural norm leads authorities to prefer maintaining the status quo, and avoiding risks that could lead to failure and blame. This tendency is evident in subsequent recovery efforts, where decision-makers often hesitated to adopt proactive measures.

Since the melting of the nuclear debris, TEPCO relied on using rain and seawater to cool the reactor cores—a necessary but unsustainable solution. This makeshift solution, while temporarily stabilizing the reactor temperatures, did not address the critical need for a long-term strategy to manage the accumulating radioactive water and debris. As the crisis persisted, the lack of a sustainable plan became increasingly evident.

In response to the growing crisis, the government and TEPCO rolled out an action plan to local fishing communities in 2012, aiming to preemptively extract groundwater before it seeped into the reactor and subsequently discharge it into the sea. Initially, the plan received the support of the fishing communities. However, the execution was significantly delayed until 2014 after 300 tons of radioactive water leaked from the plant into the sea, igniting outrage among the fishermen and further damaging the credibility of the authorities involved (Jozuka et al., 2023).

The government's response to challenges like this has often been reactive rather than proactive. Each time an accident occurred, it triggered a strong public backlash, prompting the authorities to sidestep or delay addressing the core issues to avoid political fallout. This pattern of deferral not only undermined public trust but also stalled the development of effective, long-term solutions for water management and debris control at Fukushima.

The already strained situation was exacerbated by emerging issues with the transparency of the decision-making processes. The NRA requires that nuclear energy equipment and facilities undergo a rigorous approval process, including reviews of installation standards, construction plans, and security measures, followed by pre-use testing to verify technical compliance. Yet, it was later revealed that two of the three ALPS units, designed to minimize the water's radionuclide content, had been operating for years without the final approval from Japan's NRA (Takao, 2021).

Due to the inadequate ALPS systems used in the first purification process, 70 percent of the storage tanks contained levels of radioactive substances above legal limits (Brown, 2023). This alarming disclosure surfaced just months after TEPCO released a radiological environmental impact assessment that was meant to justify its decision to discharge treated wastewater into the ocean in 2018. During a period soliciting public feedback, experts, including Dalnoki-Veress, highlighted critical omissions and sluggish responsiveness from TEPCO: "We requested data on what is in the tanks, and it took them 54 days to respond... The data provided required extensive sorting and careful review for consistency," he explained (Lee, 2023). This was a fatal blow to public trust in authorities. According to a survey conducted by Asahi Shimbun, one of the largest newspapers in Japan, less than 32% of the Japanese public supported the release of the wastewater, highlighting deep-seated mistrust and skepticism towards the management of the crisis (Buchholz, 2021).

Missed Opportunities in the Deep Blue

Scientists have proposed several alternative long-term solutions. One such method is bioremediation, which involves pumping wastewater through tanks containing oyster species that feed on plankton (Abukins, 2023). These oysters could absorb radionuclides into their shells, significantly reducing the need for long-term water storage. This method not only accelerates the processing of contaminated water but also minimizes ecological impacts. Another proposed solution is the utilization of treated wastewater in the construction of roads or bridges (Abukins, 2023). Mixing the radioactive water into concrete offers multiple benefits—it expedites the removal of water from storage, poses no risk to the fishing industry, and effectively isolate it from the environment.

Alternatively, Japan could simply wait. Tritium has a 12.3-year half-life, meaning that in about 40 to 60 years more than 90 percent of it will have decayed (Abukins, 2023). This approach

requires patience and considerable storage capacity but could ultimately avoid the risks associated with releasing or utilizing the water in other ways.

Japan rejected all the proposed ideas. Instead, the government chose to discharge the treated wastewater into the ocean, a plan that also coincides with being the least expensive option available.

This series of events paints a troubling picture of a government seemingly reluctant to assume full political responsibility for the impacts of the wastewater discharge into the Pacific Ocean. This is seen through a lack of urgent action to mitigate harm, loose monitoring of key operations, riding channels of transparency, and reluctance to consider other more sustainable solutions. As Takahashi Kazuyasu, a 42-year-old fisherman in Soma City, puts it “the government shelved the issue for a decade, and didn’t even call for a national discussion,” he says (Akihito, 2021). “Does anyone really believe the pledge to counter fearmongering?”

The ongoing management of the Daiichi nuclear waste release present a complex dilemma for Japan. The stakes are manifold: environmental sustainability, public health, economic vitality, and national security. Economically, the fishing industry in Fukushima and the broader region faces a precarious future and a daunting recovery. Socially, the fabric of local communities remains strained and fragmented due to fears of contamination and the stigma associated with the disaster. Politically, the trust deficit between the public and the government threatens the effectiveness of governance and the public’s willingness to accept necessary but difficult policy decisions in the future. The decisions made today about nuclear waste management will have long-lasting impacts, echoing through generations and extending far beyond the immediate environmental and health impacts.

Governance on the Ground

In situations involving nuclear policy, the stakes are exceedingly high, and the potential consequences of mismanagement are catastrophic. Therefore, the public’s need for facts, transparency, and a demonstrably responsible government is paramount. Transparency is not just a matter of ethical governance but a practical necessity in nuclear crisis management. The public needs access to factual, detailed information about the risks involved and the steps being taken to mitigate these risks. They need to see a government that acts responsibly and decisively, one that can lead the nation through recovery and beyond, not one that obfuscates in the face of critical challenges.

Transparency is the cornerstone of rebuilding trust. Governments must commit to open communication about the risks associated with nuclear energy, as well as the steps being taken to mitigate these risks. While opening up these processes to public scrutiny through such measures might expose previous shortcomings, this honesty will not undermine the government’s

credibility. Instead, it enhances it by showing a commitment to accountability and continuous improvement. By implementing these steps, the government can facilitate a more informed public discourse, making future policies concerning nuclear energy more acceptable and supported by the public.

However, the role of transparency is complex in the age of the internet, where access to an abundance of information can paradoxically lead to increased polarization. While transparency helps in clarifying actions and intentions, the sheer volume of information—and misinformation—available online can deepen divisions, as individuals may cling more strongly to pre-existing biases, complicating the public's reception of factual data. This situation underscores the need for governments to engage more deeply with the public, addressing diverse perspectives and combating misinformation effectively.

Unfortunately, the typical governmental approach to managing public unrest, characterized by attempts to limit media coverage on contentious topics or downplay issues, are grossly inadequate. Such strategies only exacerbate public fears and fuel rumors, as seen in the aftermath of Fukushima. These strategies not only fail to quell public unrest but also prevent the establishment of a trust-based relationship necessary for effective governance in crisis situations.

Restoring public trust after a nuclear crisis like Fukushima is a daunting task for any government. It requires more than just promoting transparency; meaningful engagement with stakeholders, particularly local communities close to nuclear sites, is crucial. The residents in these areas are the most directly impacted by nuclear operations and often harbor the greatest reservations about the safety and environmental implications of such facilities. Consequently, their inclusion in the decision-making process is not just beneficial but essential for addressing their concerns and fears effectively.

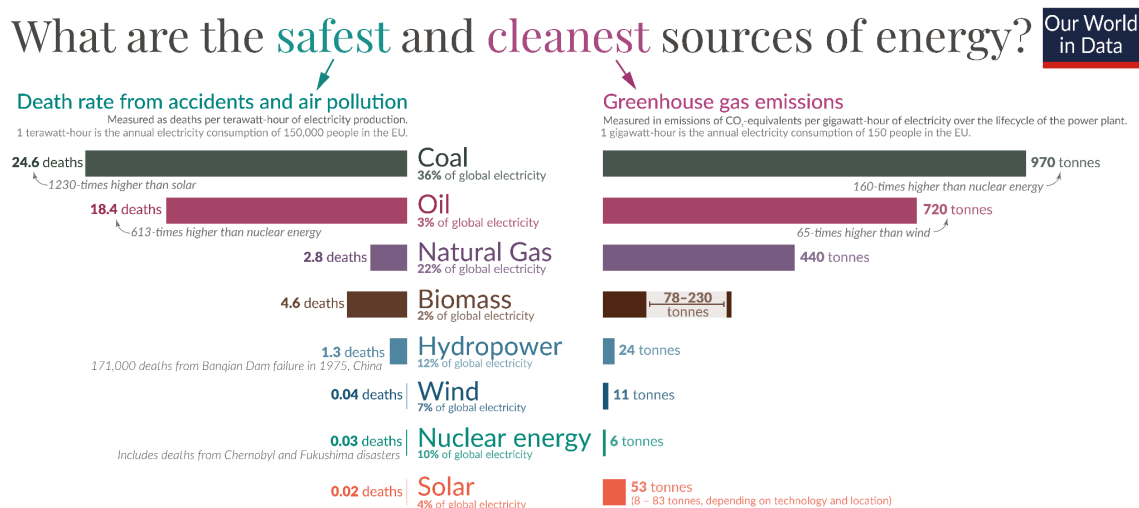
While there is a legitimate concern that involving a broad array of stakeholders could slow down the decision-making process, potentially impeding recovery efforts, the alternative could be far worse. Excluding these critical voices risks creating greater delays and complications in the long run. When stakeholder input is ignored, it can sow deep-seated distrust and lead to public conflicts, such as protests. These disruptions not only impede operational processes but can also attract negative media coverage and public backlash, exacerbating the challenges of recovery and undermining public confidence in the authorities.

Incorporating diverse stakeholder perspectives might seem time-consuming initially, but it ultimately creates a more robust, inclusive, and transparent decision-making process. This approach helps to ensure that all potential impacts and concerns are considered, leading to solutions that are more broadly acceptable and less likely to be contested.

Therefore, engaging in transparent communications and involving stakeholders in the decision-making process are two areas that the Japanese government needs pressing change. However, simply addressing these issues, while essential, constitutes only a partial solution to restoring public trust. To fully rebuild this trust, there is also an imperative need to enhance public knowledge of nuclear energy.

Public perception of nuclear energy should not be influenced solely by perceptions of risks. Nuclear energy, paradoxically, is scientifically among the safest forms of energy. It is produced through nuclear fission—the splitting of heavy atomic nuclei like uranium or plutonium into smaller, lighter nuclei. This reaction releases a significant amount of energy as well as nuclear radiation. The impact of this radiation on human cells and tissues depends on the dose received, the type of radiation, and the frequency of exposure.

Low-level background radiation, which is routinely encountered in daily life, typically causes minimal harm; human cells are well-equipped to repair any damage it might induce. Medium radiation doses can alter cellular structures by modifying DNA, leading to increases in cancer risks. In contrast, high doses—like those from Chernobyl or nuclear bomb detonations—can immediately destroy cells and tissues, causing acute radiation sickness with severe, often fatal, symptoms.



Death rates from fossil fuels and biomass are based on state-of-the-art plants with pollution controls in Europe, and are based on older models of the impacts of air pollution on health. This means these death rates are likely to be very conservative. For further discussion, see our article: [OurWorldinData.org/safest-sources-of-energy](https://ourworldindata.org/safest-sources-of-energy). Electricity shares are given for 2021. Data sources: Markandya & Wilkinson (2007); UNSCEAR (2008; 2018); Sovacool et al. (2016); IPCC AR5 (2014); UNECE (2022); Ember Energy (2021). OurWorldinData.org – Research and data to make progress against the world's largest problems. Licensed under CC-BY by the authors Hannah Ritchie and Max Roser.

“What are the safest and cleanest sources of energy?” via Our World in Data

Despite its relative safety and lower emissions compared to fossil fuels, nuclear energy’s reputation suffers from the shadows cast by high-profile disasters like Chernobyl and Fukushima. This fear is not limited to Japan; it is a global phenomenon, transcending borders and political systems. For instance, in the United Kingdom, a study by Bickerstaff reveals that

citizens trust independent scientists over the government or the energy industry regarding nuclear issues. This mistrust is mirrored in Belarus, where citizens believe their government downplayed the severity of Chernobyl to support its nuclear ambitions. Nearly half of the Belarusian population opposes nuclear power, often linking their skepticism directly to the health impacts of past nuclear disasters. Similarly, in France, support for nuclear power has steadily declined since Chernobyl, underscoring a global pattern of eroding trust in governmental handling of nuclear energy (Sengupta, 2024). This profound discrepancy between nuclear power's safety record and public perceptions underscores the urgent need to rebuild trust. Trust, fundamentally, is about fostering positive expectations about how others will function in potentially risky situations. Therefore, the path to mending the rift between public trust and nuclear energy lies in diminishing the perception of risk while enhancing the perception of benefits.

Attempts to ban or suppress negative news coverage of nuclear energy do not alleviate fears; instead, a “censorship” would likely induce more fear among the public evidenced in Fukushima where local citizens were pressured to buy local products. Media coverage is not a cause, but rather a phenomenon of public distrust. For example, in the US, where over 70 percent of newspaper headlines about nuclear energy were depicted negatively following the 2011 Fukushima disaster, public support for nuclear energy only dropped by a small amount after the 2012 Fukushima accident, and it quickly reverted to its baseline level (Hacquin et al., 2021). Since news media are strongly demand-driven, it is more likely that the media might be an effect rather than a cause of public opinion.

Thus, in addition to addressing the need for transparency and engaging in stakeholders, governments must also demystify nuclear technology through public education and actively engaging the public in nuclear policy discourse. This means going beyond mere investment in safety and technology to include rebuilding trust through transparent and inclusive practices. Governments need to establish platforms for open dialogue where public fears and misconceptions can be addressed, educating the populace about the realities of nuclear energy—the inherent risks, the robust safety protocols in place, and its critical role in addressing climate change.

Tools for Rebuilding Trust

To address the Fukushima Case, the government can implement the following strategies to take meaningful steps towards restoring public trust:

Firstly, the Kishida administration could significantly enhance transparency by launching an online platform that provides real-time data on radiation levels and water quality before, during, and after the release of wastewater. This platform should be made accessible not only to the general public but also to independent researchers, fostering an environment of openness and continuous scientific verification. In addition, involving respected independent parties such as

the International Atomic Energy Agency (IAEA) or the Pacific Islands Forum (PIF) to conduct regular audits and publish their findings would further ensure that the processes surrounding the wastewater treatment and release are transparent and adhere to international standards.

Secondly, hosting regular public forums could serve as a cornerstone for ongoing dialogue, crucial for maintaining community trust. Unlike the past where announcements were made primarily before and after the final release decisions, these forums should facilitate a genuine two-way conversation, where residents can voice concerns, ask questions, and propose suggestions. The structure of these meetings should encourage open discussions and include presentations that respond directly to community feedback, demonstrating a real consideration of stakeholder concerns. This approach not only informs the community but also involves them in the decision-making process, reflecting a commitment to addressing the issues that affect them directly.

Lastly, a comprehensive educational campaign is essential to demystify nuclear energy and its associated risks. Tailored workshops that range from explaining the basics of nuclear energy to detailing the specific health effects of radiation could address the community's concerns. Moreover, addressing psychological reactions to nuclear energy is crucial. As noted by Paul Rozin, people often intuitively equate radiation with pathogens—both invisible yet harmful—triggering a behavioral immune response (Hacquin et al., 2021). By tackling these misconceptions head-on, the government can help alleviate fears and clarify the scientific realities of nuclear safety.

However, as illustrated earlier, it appears that both the Japanese government and TEPCO knew what was demanded of them. They were well aware of the need to involve local stakeholders and to provide clear, transparent communication with the public and independent third parties like PIF scientists, including Dalnoki-Veress; and they have repeatedly said so in front of cameras. Yet, their actions—or lack thereof—suggest a deliberate choice to avoid these crucial responsibilities.

Indeed, there were initial attempts to address these issues, such as the 2012 initiative to preemptively extract groundwater before it seeped into the reactor. This project demonstrated an understanding of what was required to mitigate environmental impacts proactively. However, this promise was ultimately unfulfilled, leaving local fishing communities, Japanese citizens, and international observers disillusioned. This failure stemmed largely from a fear of political backlash and a reluctance to assume responsibility for any potential setbacks. Such hesitations highlight a deeper issue within the governmental approach, where short-term political calculations seem to override long-term safety and environmental considerations.

The consequences of these decisions—or indecisions—are significant. Questions about safety, recovery, and accountability have been overshadowed, not by substantive action or transparent policy, but rather by superficial gestures, like the Fukushima fish served, alone with cameras, to the prime minister. These symbolic acts cannot substitute for genuine accountability and action.

As long as the Japanese government and TEPCO continue to prioritize political convenience over rigorous, responsible governance, no technical solution or policy recommendation can fully address the underlying issue of trust. The path to genuine recovery and safety in the aftermath of Fukushima lies not just in technical solutions but in a fundamental shift in how responsibilities are approached and executed. Until such a shift occurs, the real questions of safety, recovery, and environmental protection will inevitably resurface.

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