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The Fukushima Nuclear Disaster and the Democratic Party of Japan

Leadership, Structures, and Information Challenges During the Crisis

Abstract: The Fukushima nuclear disaster was a critical juncture in the world's relationship with nuclear energy, as well as Japan's postwar political economy, society, and national psyche. The Democratic Party of Japan (DPJ), and particularly Prime Minister Kan, were later widely criticized for mismanaging the disaster, contributing to the party's loss of power. This article closely examines the crisis as it unfolded, assessing the degree to which the government's chaotic response can be attributed to the DPJ's political leadership. It finds that the DPJ inherited a difficult hand when coming to power in 2009, with deep structural problems developed under the long Liberal Democratic Party rule. Existing procedures and organizations were drastically inadequate, information and communications problems plagued decision making and coordination. Kan's leadership was, on balance, beneficial, taking control where the locus of responsibility and decision-making was ambiguous and solving several information and communication problems. This article is one of

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the first readily accessible English-language analyses examining this critical juncture, and it includes a broadly readable account of primary government decision makers as the disaster unfolded.

The Fukushima nuclear disaster that began on March 11, 2011, was a critical juncture in the world's relationship to nuclear power.¹ The melt-downs and hydrogen explosions that occurred in three of the six nuclear reactors at the Fukushima Dai-Ichi plant profoundly affected Japan's economy, society, national psyche, and the long-reaching effects on Japan's political economy are still unfolding.

The Democratic Party of Japan (DPJ), in power from 2009 to 2012, faced the challenge of governing Japan as the nuclear disaster unfolded at the same time that it dealt with the Great Tohoku earthquake disaster and devastating tsunami. The government's earthquake and tsunami response was a great improvement over its 1995 response to the Great Hanshin Earthquake, with the swift mobilization of Japan's Self-Defense Forces (SDF) and a joint operation with the U.S. military (Samuels 2013). Concerning the nuclear crisis, however, the DPJ leadership, and in particular Prime Minister Kan Naoto, were severely criticized from various quarters, ranging from much of the media to government and independent accident investigation reports. At the time, he had seemed to exercise leadership by becoming personally involved, but this was later criticized as counterproductive, and even as having precipitated part of the disaster. In the media confusion surrounding the nuclear accident, and subsequent politicized debates over the Tohoku disaster recovery, the general public was left largely confused. The DPJ, however, was significantly discredited and its popular support eroded considerably, contributing to its landslide electoral loss in 2012 (Kushida and Lipsky 2013).

While technical causes of the Fukushima nuclear disaster have been examined extensively, a systematic analysis of the DPJ's political response has yet to be undertaken. The primary critiques of the DPJ's response in government reports, independent commission findings, and the media, focus on five points: (1) a delay in announcing a nuclear emergency and commencing evacuations around the Fukushima Dai-Ichi nuclear power plant; (2) chaotic early press conferences and communications with the public; (3) Kan's personal involvement and micromanagement of the nuclear disaster; (4) the government's slow response to hydrogen explosions at the plant; and (5) the evacuation process that did not take into account government-owned radiation diffusion prediction maps.

This article assesses the degree to which the Japanese government's chaotic response to the Fukushima nuclear disaster can be attributed to the DPJ's political leadership. To what degree were the DPJ and Prime Minister Kan responsible for the inadequacies in dealing the Fukushima nuclear accident for which they were criticized? Conversely, to what degree were they victims of preexisting organizational structures, processes, and actors—elements that developed under the Liberal Democratic Party's (LDP) almost continuous rule from 1955 until 2009?

These questions are not simply empirical, but are of theoretical interest for numerous areas of inquiry. For scholars of Japanese politics, unpacking the decision-making process as politicians, bureaucrats, and one of Japan's most powerful corporations interacted during the crisis is informative for longstanding questions of power and leadership. For example, did the DPJ in fact suffer from the very success of its platform to undermine the power of elite bureaucracies? Did the DPJ's lack of governance experience hinder effective government–business or central–local government coordination? For those interested in nuclear governance more broadly, Fukushima is, unfortunately, now the third major paradigmatic nuclear power accident the world has experienced from which nuclear policy and technological experts glean useful lessons, joining the ranks of the 1979 Three Mile Island critical incident in Pennsylvania, and the 1986 reactor explosion at Chernobyl. A detailed analysis of the Fukushima accident also contributes to scholarship concerned with political and bureaucratic processes of crisis management, such as bureaucratic–political interactions and analytical frameworks including concepts such as cognition, communication, coordination, and control.² Finally, for a more general readership, this article provides one of the first broadly accessible English-language narratives of the critical juncture as the nuclear disaster unfolded, based on extensive technical reports, other Japanese-language sources, and interviews with some of their authors.

The DPJ's platform and early experience in power created plausible expectations that the DPJ was primarily to blame for the government's chaotic response. Its core political platform of seizing power from the bureaucracies might have hindered the coordination of expertise when most necessary, and its intense focus on cutting government budgets might have slashed resources for response to the nuclear disaster. The DPJ's inexperience in governing the country was clearly manifested in policy paralysis during its early days in power, suggesting that the party might not have had the capacity to deal with Japan's largest postwar natural

disaster and nuclear accident. On the other hand, the DPJ inherited most of the government's nuclear power governance organization structures, and emergency preparedness measures from the time of LDP reign. Moreover, Japan's electric utilities industry developed with close ties to the LDP to become among the most powerful Japanese corporations; the DPJ may simply have been dealt an impossible hand.

If the government's chaotic response was primarily the DPJ's fault we would expect to find evidence including: effective structures or procedures in place but not followed; previous structures or procedures that were removed or defunded; evidence that political interventions catastrophically slowed the rescue effort; evidence that appropriate expert advice was not heeded by the political leadership in decision making; and leadership decisions that worsened the crisis from a technical or procedural standpoint. On the other hand, if the chaotic response was due primarily to organizational structural factors rather than the DPJ's response, we would expect findings such as: a lack of appropriate procedures and structures to deal with the nature of the crisis at hand; DPJ leadership decisions lacking appropriate information input and/or lacking follow-through by other actors; and DPJ decisions that were in fact helpful mitigating the crisis from a technical or procedural vantage.

To carefully analyze the Fukushima nuclear disaster as it unfolded, this study draws upon several extensive accident reports compiled by a government commission (ICANPS 2012), an independent committee commissioned by the National Diet (NAIIC 2012), a private sector independent accident investigation commission (IIC 2012), Tokyo Electric Power Company's own report (TEPCO 2012), reports from international organizations such as the International Atomic Energy Agency (IAEA) and the U.S. Nuclear Regulatory Commission (IAEA 2011), numerous credible accounts by investigative journalists, academics, and independent nuclear experts (Asahi 2012; Funabashi 2012a, 2012b; Kadota 2012; Oshika 2012), and accounts by some of the political leaders themselves (Hosono and Torigoe 2012; Kan 2012). Most reports and accounts draw from extensive interviews, many of which were on public record, and the author interviewed several experts involved in writing the independent reports.

Findings in Brief

This article contends that the DPJ's initial chaotic response was primarily the result of unexpected physical information and communications prob-

lems from the ground level up, problematic government organizational structures and procedural deficiencies that were ill-suited to dealing with the crisis. Specifically, existing procedures and organizations were drastically inadequate for planning and executing an evacuation, and the government suffered shortcomings in information gathering, expertise, and on-the-ground response during the crisis.

Prime Minister Kan's leadership was, on balance, beneficial in that he took control of a situation in which the locus of responsibility became ambiguous during the crisis, and he solved several serious information and coordination problems. Moreover, his micromanagement was in the technically appropriate direction. He did not measurably worsen the crisis, although his relatively abrasive leadership style (for Japanese norms or expectations, at least) alienated many with whom he worked. Much of the blame-game after the crisis stabilized was an outgrowth of the LDP's becoming a more effective opposition party, using the accident and broader Tohoku recovery issue as a means to successfully undermine the credibility of the DPJ.

The Fukushima Nuclear Accident: An Overview

The magnitude 9.0 earthquake that struck northeastern Japan on March 11, 2011, was the world's fourth largest earthquake in modern recorded history, jolting the island of Honshu 2.4 meters to the east. A massive tsunami followed shortly, reaching an estimated height of over 30 meters in some places. Five hundred kilometers of Japan's northeastern coast were devastated, with a death toll of over 15,000 people. Damage from the earthquake and tsunami led to one of the world's most serious nuclear disasters at the Fukushima Dai-Ichi (number one) Nuclear Power Station, owned and operated by the Tokyo Electric Power Company.

The Fukushima Dai-Ichi plant had six nuclear reactors, three of which were operating on March 11, and the rest were undergoing routine maintenance. As the earthquake hit, the active reactors immediately succeeded in emergency shutdowns. All power lines leading to the plant were severed, but onsite backup generators, installed for such contingencies, kicked in seamlessly.

Forty minutes later, the tsunami of over 12 meters hit, well exceeding the maximum design limit of 5.7 meters, and obliterating the 10 meter high seawall. Critically, the tsunami irreparably damaged virtually all onsite backup power sources, including emergency diesel generators

and batteries, along with most electricity circuit switchboards within the plant.

Despite successfully shutting down, the fuel rods within Fukushima Dai-Ichi Reactors 1, 2, and 3, combined, still required approximately *70 tons of water per hour, for ten days* to avoid fuel core meltdowns (Saito 2011). However, the tsunami damaged most of the primary cooling pumps. Emergency cooling systems required electricity, but all backup power had been lost.

In the critical first two days, efforts to cool the reactors failed. All three reactors experienced fuel core meltdowns, and hydrogen explosions blew off the roofs and walls of three reactor buildings. While there were no immediate deaths from direct radiation exposure, the accident emitted at least 168 times the amount of radioactive cesium 137 compared to the Hiroshima atomic bomb. Mandatory evacuation zones of a radius of 10 kilometers were imposed on March 11, and expanded to 20 kilometers the following day, affecting more than 80,000 residents. The disaster was eventually declared level 7 on the International Nuclear Event Score (INES)—the maximum.³ In Fukushima, seawater pumped into the reactors and used fuel storage pools contaminated more than 100,000 tons water, about a tenth of which was released into the ocean by mid-2011 (IIC 2012).

Causes of the Accident: Technical and Political Economy Factors

The first question following the disaster was why such a severe disaster occurred in a country famous for its technologically advanced infrastructure; the *shinkansen* high speed rail, for example, measures average annual delays (barring severe weather) in minutes. In the eighteen months following the disaster, government investigation committees, independent groups, scholars, and international organizations immediately identified many of the technical failures and design flaws at the Fukushima Dai-Ichi plant.

The proximate causes were quite clear. When external power was lost—a possibility for any nuclear power plant—onsite backup power sources required minimal risk of failure. However, given the height of the tsunami, Fukushima Dai-Ichi's low seawall height and plant elevation left it vulnerable to massive tsunami damage. Backup diesel generators were located underground, directly behind the seawall, rather than on higher ground behind the reactor buildings. Cooling pumps and electric circuit

Table 1

Comparison of Tsunami and Earthquake Damage at Nuclear Power Plants

		External power? (EQ damage)	Backup power? (Tsunami damage)	INES level	Disaster outcome
Fukushima Dai-Ichi	Reactors 1–4	X	X	7	Core meltdown (1–3) hydrogen explosion
	Reactors 5, 6	X	Δ		Cold shutdown
Fukushima Dai-Ni	Reactors 1–4	Δ	Δ	3	Cold shutdown
Onagawa	Reactors 1–3	Δ	O	1	Cold shutdown
Tōkai Dai-Ni	Reactor	X	O	0	Cold shutdown

Notes: X = complete failure, Δ = partial failure with at least one functional, O = majority intact.

board facilities were insufficiently watertight, incurring catastrophic damage when inundated. The complete loss of both external and onsite power, along with most of the cooling pumps and electric switching facilities almost guaranteed disaster.

Much of the damage stemmed from flaws in design and siting of the plant itself. Comparison with the three other nuclear power plants stricken by the same March 11 earthquake and tsunami is revealing. At the Fukushima Dai-Ni plant, also operated by TEPCO, approximately 12 kilometers south of Dai-Ichi, the tsunami was lower. Although the plant was partially flooded, most backup generators and one external power line were spared. While the plant did narrowly avert a meltdown, availability of some external and backup power made all the difference. At the Onagawa plant, operated by the Tohoku Electric Power Company 116 kilometers north of Dai-Ichi, the tsunami height was also 12 meters. Onagawa, however, was built on higher ground, escaping largely unscathed. The Tōkai Daini plant, 112 kilometers to the south, operated by the Japan Atomic Power Company, lost all external power in the earthquake. Fortunately, however, the tsunami crested at lower height, and despite some flooding from a hole in the seawall under repair, most backup power generators and therefore the plant were spared (See Table 1).⁴

Deeper policy and institutional questions about why the Fukushima Dai-Ichi plant had been allowed to continue operating without significant upgrades (such as repositioning backup generators onto higher ground, raising seawalls substantially, or waterproofing), and what political economic, and governance structures were responsible, are more complex. Various analyses offer several contributing factors, many of which overlap and reinforce one another. One is regulatory capture. As Japan's postwar electric power industry developed, with a priority on ensuring stable electricity supplies for industrial development, the electricity market was divided into regional monopolies, and the Electricity Operators Law allowed prices to be set at cost-plus bases to ensure sufficient revenue for capital investments. The largest operators, particularly TEPCO and Kansai Power Electric Company (KEPCO), became some of Japan's largest firms. Major Japanese companies, ranging from construction and steel, to nuclear facility builders such as Toshiba, Hitachi, and Mitsubishi Heavy Industries, were major suppliers. Electric power companies therefore enjoyed vast financial resources and steadfast support from Japan's most powerful industries—a recipe anywhere for regulatory capture by a powerful concentrated interest group. The nuclear industry also channeled its vast financial resources to capture much of Japan's expertise in industry and academia creating the so-called nuclear village. Few independent scholars were therefore capable of critiquing the nuclear industry. Another set of factors surrounded structural problems of government oversight. The government organization responsible for promoting the nuclear industry, the Ministry of Economy, Trade and Industry (METI), also housed the agency responsible for regulating nuclear safety, the Nuclear Industry and Safety Agency (NISA). Incentives to rigorously regulate safety conflicted with organizational pressure to promote the rapid expansion of nuclear power.⁵ Finally, norms of the “myth of nuclear safety” arguably trapped all parties involved. In order to convince localities to accept nuclear plants, nearby operators gave assurances that the plants were completely safe. Since plants were deemed completely safe, contingency planning was limited to nonsevere accidents, since severe accidents were allegedly impossible. Operators were also hindered from performing major safety upgrades, since this would be admitting that plants had not been completely safe. Over time, operators themselves bought into their own safety myth, ignoring particular risk assessments and avoiding severe accident contingency planning (IIC 2012).

Empirical studies have also shown that Japanese plants on the whole

seem to have a higher risk of tsunami inundation, given historical tsunami data, although numerous plants elsewhere are also at risk (Lipsy, Kushida, and Incerti 2013). Others contend that the organizational structure of Japan's nuclear governance, which functioned efficiently under normal conditions, was ill-suited to cope with large unexpected shocks (Aoki and Rothwell 2013).

The DPJ's Chaotic Response: Fuel for Controversy

As the Fukushima nuclear disaster rapidly unfolded, the immediate government response was chaotic. This confusion, projecting the sense that the government was either withholding crucial information, or worse yet, incapable of understanding or dealing with the situation, fueled a barrage of critiques of the DPJ administration. The criticisms were concentrated around five main issues.

First, Prime Minister Kan's administration was criticized for delay in informing the nation that a nuclear emergency was developing, and in ordering an evacuation. At 3:00 p.m. on March 11, Fukushima Dai-Ichi plant manager Yoshida Masao faxed TEPCO headquarters and NISA officially declaring that a nuclear emergency was likely to occur. At 4:30 p.m., he declared "nuclear emergency in progress," a status that automatically triggers an evacuation order.⁶ Both were unprecedented. Yoshida reported that they were unable to cool the reactors or even monitor the water levels of Reactors 1 and 2. The implications were serious, since exposed fuel rods would melt together—the phenomenon commonly known as a "meltdown"—and potentially melt through all containment facilities while releasing intense radiation.

At 4:54 p.m., Prime Minister Kan issued a two-minute statement, but did not acknowledge the "nuclear emergency in progress" declaration. Instead, he reported that the nuclear reactors had successfully shut down active operations, with no observed radiation leakage. While not false, by not acknowledging the emergency declaration, Kan was later widely criticized as having downplayed the severity of the situation.

It took until 7:00 p.m. for Kan to declare a nuclear emergency to the nation. Statutorily, this should have triggered an evacuation order. However, such a directive was not made immediately. At 7:45 p.m., Chief Cabinet Secretary Edano Yukio advised the public not to panic and flee, but to stay indoors and wait (NAIIC 2012).

At 8:50 p.m., four and a half hours after the "nuclear emergency in

progress” report, the Fukushima prefectural government took matters into its own hands, declaring a 2 kilometer evacuation radius around Dai-Ichi.

Half an hour later, at 9:23 p.m., the Prime Minister’s Office finally announced an evacuation zone, but with a 3 kilometer radius. Later estimates revealed that by around 5:00 p.m., four hours earlier, Reactor 1’s core was already exposed, and by 5:50 p.m., radiation monitors had begun showing elevated radiation levels (see Table 2 for a timeline) (NAIIC 2012).

Second, in addition to delays, the government’s early press conferences did little to allay the public’s fear and suspicion. Although the entire government seemed to have immediately donned neat, matching work uniforms, many initial officials and spokesmen were clearly not nuclear specialists. They were often unable to respond to journalists’ questions, giving the public the strong impression that the government was either unaware of exactly what was happening, or hiding critical information. As if to confirm the public’s fears, an early NISA spokesman who used the word “meltdown” was immediately replaced. Successors used alternate phrases such as “damage to the outer casings of the fuel rods,” raising suspicion that either the government or political leadership was clumsily downplaying the disaster.⁷

Third, Prime Minister Kan’s personal involvement with disaster mitigation efforts, in particular his personal visit to the stricken Fukushima Dai-Ichi plant on the morning of March 12, later drew heavy criticism. News reports at the time were confusing—the nation was reeling from the tsunami disaster, and information about the developing nuclear disaster was unclear. Some saw Kan’s personal involvement as reassuring, in that the government was responsive, and that perhaps the Dai-Ichi situation was not critical if the prime minister was willing to visit.

However, soon after the hydrogen explosions occurred and finger-pointing began, Kan’s detractors began accusing him of precipitating, or at least accelerating the disaster by sidetracking recovery efforts with his interventions and visit. This image of Kan as an unnecessarily meddling figure persisted in the media and among many opinion leaders (Samuels 2013).

Fourth, compounding other issues, the government was slow in responding to the hydrogen explosion at the stricken plant, when at 3:36 p.m. on March 12, the roof of Reactor 1’s building blew off. After an hour, national television stations began rebroadcasting a long-range

Table 2

Simplified Timeline of Events in the Fukushima Nuclear Accident

March 11	
2:46 p.m.	Magnitude 9.0 Earthquake All power lines severed to Fukushima Dai-Ichi Plant Emergency shutdown of reactors Backup power starts Plant Manager Yoshida declares “nuclear emergency likely to occur”
3:00 p.m.	
3:37 p.m.	12m tsunami strikes plants Loss of all backup power
4:30 p.m.	Yoshida declares “nuclear emergency in progress”
4:45 p.m.	Kan’s press statement that reactors shut down successfully
5:00 p.m.	Reactor 1 core exposed (estimated) Meltdown begins (estimated)
5:50 p.m.	Increased radiation levels detected
7:03 p.m.	Nuclear emergency declared by cabinet
7:45 p.m.	Cabinet advises public in vicinity to stay indoors
8:50 p.m.	Fukushima government announces 2 km evacuation radius
9:23 p.m.	Cabinet announces 3 km evacuation radius
March 12	
7:10 a.m.	Prime Minister Kan visits Fukushima Dai-Ichi Plant
3:36 p.m.	Hydrogen Explosion at Reactor 1
6:25 p.m.	Cabinet expands evacuation radius to 20 km

shot captured by the local Fukushima broadcaster. Television reporters and hastily gathered nuclear experts were visibly shaken, since the nature of the explosion was far from obvious. To the general public, the video seemed to depict a worst-case scenario—a Chernobyl-style, full-blown reactor explosion. Fears of radiation, terrifyingly invisible, spread widely.

The government took some time even to acknowledge the explosion. Edano stated that a large shock sound had been reported, and that they were confirming details—even as footage of the actual explosion was running on all channels. He refused to acknowledge that a meltdown had occurred, despite the near certainty that such a hydrogen explosion could be caused only by a meltdown. The government’s seemingly excessive

caution about inciting panic actually undermined its credibility. Only at 6:25 p.m., three hours after the explosion, did Kan order expansion of the evacuation radius to 20 kilometers.

Finally, the government's orchestration of evacuations later came under intense media criticism when it turned out that the government had possessed, but not utilized, radiation prediction maps. After the two other hydrogen explosions on March 14 and 15, the government expanded the evacuation radius to 30 kilometers—concentric circles around Dai-Ichi. However, given wind conditions and topological features, the radioactive material did not fall evenly. In the northwest and southwestern directions, the fallout exceeded the evacuation radius, while there was very little directly west. As a result, some evacuees fled from areas with almost no fallout directly into areas with relatively heavy fallout.

The government actually possessed a radiation diffusion prediction system that had accurately predicted the fallout, known as SPEEDI (System for Prediction of Environmental Emergency). The (in retrospect) ironically named system was under the jurisdiction of the Ministry of Education, Science and Technology (MEXT), and between March 11 and March 16, no less than forty-five simulations were conducted. However, the government had not publicized the results (IIC 2012).

Moreover, six months after the disaster it emerged that U.S. aircraft equipped with radiation sensors had conducted numerous high altitude flyovers of the area, collecting and sending accurate information about the radiation spread to the Japanese government (*Nihon keizai shimbun* 2012; *Yomiuri shimbun* 2012). These were neither made public nor utilized in the evacuation.

Thus, the government, and in particular the DPJ, was heavily criticized for its chaotic response to the nuclear crisis: the delay in declaring an emergency and ordering evacuations; a perceived expertise vacuum and incompetence in government officials explaining the situation; Prime Minister Kan's personal visit to the plant, the delayed response to the hydrogen explosion; and the evacuation hazard map fiasco.

Explaining the DPJ's Chaotic Response: How the Disaster Unfolded

Why was the government's initial response so chaotic, and how much was the DPJ, the Kan administration, or Kan himself to blame? The DPJ, after all, was much criticized for difficulty with policy coordination after

it took power, and Kan came under fire for his personal involvement in the details of rescuing the stricken plant.

A close examination of the nuclear crisis as it unfolded reveals that the DPJ leadership was operating under conditions of extreme information uncertainty and communication difficulties, exacerbated by shortcomings in preexisting governmental organization and contingency. It is not obvious that fault lay with the DPJ leadership itself; the LDP or any other party in power would have faced similar problems. The accusation that the prime minister's excessive meddling in the rescue effort seriously hindered recovery seems an exaggeration. His actions also need to be placed into the context of his personality, background, and previous experience rather than attributed to inherent flaws in the DPJ. While it is unlikely that his predecessors or successors would have become as personally involved in the rescue effort, some of Kan's involvement did aid the rescue efforts by solving blockages of information flows. Given the timeline of events, even had Kan not intervened, the disaster would not likely have been averted.

Information and Communication Problems at All Levels

As the nuclear crisis unfolded rapidly, information and communications at all levels—from within the plant to the Prime Minister's Office—were severely compromised due to earthquake damage and inadequate emergency planning procedures. Much of the initial delay in informing the public and orchestrating evacuations was simply due to the fact that information was not reaching the top leadership, and existing organizations and procedures were entirely inadequate to deal with the situation.

At the Fukushima Dai-Ichi plant, the earthquake severely damaged most operations centers. Plant manager Yoshida and his core team rushed to the seismically reinforced emergency operations center. The center, on high ground, was largely intact. In fact, *it had been completed just eight months before the earthquake*—without this structure there would have been no viable onsite command center to rescue the plant.⁸

Subsequently, the tsunami destroyed virtually all the backup power generators, plunging the operations centers into darkness. To operators' horror, the control panel indicators went dark. The nearby cellular communications tower had been damaged in the earthquake, rendering cell phones useless (Kadota 2012).

With massive damage on the ground, no electricity, no control panel indicators, and no mobile communications, Yoshida had very limited

information. He sent staff into the damaged reactor buildings to take readings. Traversing the plant was hazardous, particularly after nightfall with open manholes and other debris. Small crews were staked out at each reactor building's operations room, with only one telephone line connecting them to the emergency operations center. They used car batteries to plug into each instrument, one at a time, to take readings. Some instruments were damaged, providing inaccurate readings, and later misleading Yoshida to initially prioritize Reactor 2, although Reactor 1 was actually in far worse condition (IIC 2012). After 11 p.m. on March 11, as radiation levels began rising rapidly in Reactor 1, Yoshida prohibited entry into the reactor building.

Virtually the only link to the outside world was a video conference system and a spotty satellite telephone link to TEPCO headquarters. The government had no direct communications with the plant, and Yoshida himself had great difficulty assessing the condition of the reactors (NAIIC 2012).

Information and communications problems at the Prime Minister's Office also plagued emergency operations, and Kan's official advisors were rendered largely useless.

After the earthquake, Kan immediately proceeded to the Emergency Operations Center in the Prime Minister's Office basement, his designated base of operations during a national disaster or crisis. However, the room did not receive cellular signals, only having emergency fax and telephone lines. The area was designed for military threats, assuming that the prime minister would remain there and take command—but this was not a military attack, and Kan and political leaders needed to use their cell phones. Moreover, some political colleagues were not preregistered in the biometric security system and could not get in (Funabashi 2012a). Kan, in particular, wanted to contact trusted friends and acquaintances, since he was quickly disillusioned with the designated nuclear advisory organizations, and was suspicious of those with deep ties to the power industry. For this, he needed cellular reception (Oshika 2012).

By the following day, Kan was working from his own office on the fifth floor. However, while the room received cellular signals, official emergency communications were still routed to the basement operations headquarters. As strong aftershocks kept shaking the capital, elevators remained stopped, so aides and younger DPJ politicians hand-delivered faxes and communications by running up and down the stairs. Later, more than one investigation commission noted that SPEEDI radiation diffusion

prediction maps arrived via fax to the basement, but never reached the fifth floor. SPEEDI terminals were located in NISA, the Nuclear Safety Commission (NSC), MEXT, and the Fukushima prefectural government, but not in the Prime Minister's Office. Yet the Prime Minister's Office was ultimately responsible for evacuation orders. Procedures on how to incorporate SPEEDI data were not codified, and subsequent interviews suggest that none of the government agencies wanted responsibility for reporting simulation results (Oshika 2012: 74–75). Kan and the political leadership were apparently unaware of the system's existence (*ibid.*; IIC 2012; Kan 2012; NAIIC 2012). Regardless, the need to run time-sensitive documents up six floors from a fax machine to the prime minister's operations headquarters certainly contributed to the information chaos among top leadership.

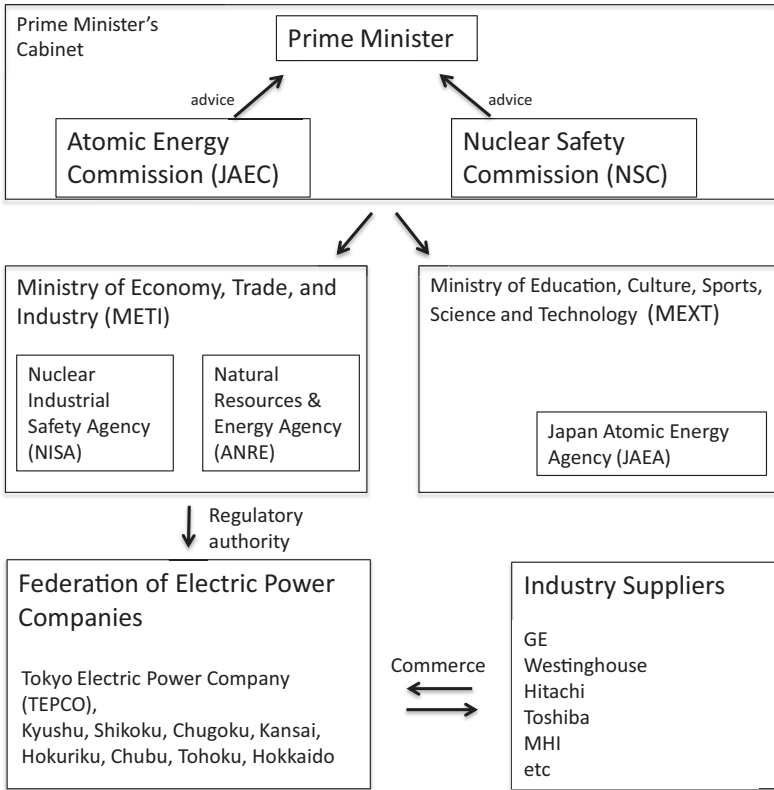
The U.S. military's radiation diffusion predication reportedly arrived as e-mails to NISA and the Ministry of Foreign Affairs. However, there were no protocols or procedures on how to handle this information. Rather than willful suppression at the top (*Yomiuri shimbun* 2012), the e-mails likely fell victim to ambiguous responsibility and information chaos.

Physical and organizational information and communications problems in the Prime Minister's Office also rendered ineffective the advisers stipulated by Japan's formal nuclear governance structure, shown in Figure 1. The Nuclear Safety Commission and the Atomic Energy Commission (JAEC), within the cabinet, advise the prime minister with the NSC responsible during emergencies (JAEC). NISA directly oversaw the electric power companies, and the Japan Atomic Energy Agency (JAEA), under MEXT focuses on technical research.

During the emergency, Kan quickly discovered that NSC and NISA could not provide live information. Statutorily, the declaration of a nuclear incident triggered the establishment of the Nuclear Emergency Headquarters (NEH). However, the NEH had no predetermined physical location. It was therefore established in a small room in a mezzanine along the staircase leading down to the basement emergency headquarters for easy access. Unfortunately, the space had only two phone lines, no fax, and no cellular reception (Kimura 2012). NSC, NISA, and TEPCO representatives had difficulty receiving updates from their own organizations in advising Kan.

When NSC chairman Madarame arrived at NEH, he was amazed to find no diagrams of the Fukushima Dai-Ichi plant. NISA, rather than NSC, possessed the diagrams, and they had not arrived at the NEH.

Figure 1. **Japan’s Nuclear Governance Organization** (as of March 2011)



Given the variety of Japan’s fifty-four nuclear reactors, Madarame had to rely on his recollection of the Dai-Ichi plant—which had six different reactors made by three different companies—to advise the prime minister (Kimura 2012).

To emphasize the point, *the nation’s nuclear emergency headquarters was an ad hoc office, initially with minimal communications infrastructure and almost no information about the stricken plant, set up in a small room along a staircase mezzanine.* This was not simply a DPJ response issue, but a deeper inadequacy in government contingency planning. The amount and reliability of information and expertise available to top leadership was therefore limited.

More fundamental organizational weaknesses resulted in not only a lack of expertise, but a lack of procedural and logistical resources to

carry out evacuations. Prime Minister Kan's personal judgment and the DPJ's competence were only a small part of numerous factors delaying the evacuation order.

Organizationally, NISA had limited nuclear expertise. METI bureaucrats, who tended to be economics or law majors from elite universities, rotated through every few years. METI had actually acquired NISA functions during a government reorganization in the late 1990s. The Science & Technology Agency, which had been the primary nuclear regulator, was taken apart at that time, with some parts going to the Ministry of Education, forming MEXT. The Science & Technology Agency was dissolved partly because it was held responsible for a 1999 criticality incident at a uranium reprocessing plant at Tōkaimura, Ibaraki Prefecture, that killed two workers and spread radiation to the community.

Kan, unusually for a prime minister, had studied applied physics at the Tokyo Institute of Technology. His sophisticated understanding of nuclear reactors led him to have little patience for nonspecialist NISA officials lacking operational knowledge. He asked the head of NISA, Terasaka Nobuaki, whether he knew where the emergency diesel generators were located in Dai-Ichi; Terasaka did not. METI ended up procuring someone from outside NISA with a suitable nuclear engineering background to advise Kan.

Kan was also frustrated that NISA had no live information, relying instead on secondhand reports from TEPCO, which gave them no advantage over the Prime Minister's Office (Kimura 2012). In fact, as radiation at Dai-Ichi rose on March 12, NISA officials stationed onsite left the plant. METI Minister Kaieda Banri, a DPJ politician, ordered them back (Funabashi 2012a).

Returning to March 11, the question remains about what happened between Yoshida's 4:30 p.m. "nuclear emergency in progress" declaration, Kan's 7:00 p.m. nuclear emergency declaration, and his 9:23 p.m. evacuation orders.

Immediately after Yoshida's emergency declaration, Kan met with his aides, the head of NISA, and former TEPCO vice president, Takekuro Ichiro. He began asking why the nuclear emergency had developed—for example, where were the backup diesel generators, and why were they not working? Frustrated by their lack of answers, Kan reportedly demanded to see the TEPCO president or somebody with live information. When METI Minister Kaieda rushed to the Prime Minister's Office around 5:45 p.m., Kan reiterated the seriousness of the "Article 15" emergency declared at

Dai-Ichi; it meant the plant had completely lost all primary and backup power and all primary and emergency cooling systems, leaving no way to cool the reactors (Funabashi 2012a: 73–76). Kaieda later testified that the incredulous Kan had taken some time to accept that an Article 15 emergency was in progress (NAIIC 2012).

While Kan might have declared an emergency sooner, his background in nuclear engineering allowed him to understand the full magnitude of the crisis. He immediately grasped that the reactor was essentially out of control and that without heroic measures to restore cooling, the fuel would overheat, breach the reactor and containment vessel, and spill out into the reactor building, which would become far too radioactive to approach. All five adjacent reactors would follow; Dai-Ichi was among the most tightly packed plants worldwide. Complete disaster at Dai-Ichi would trigger cascading disasters at the nearby Dai-Ni plant, then Tōkai, followed by Onagawa. With Tōkai only 110 kilometers from Tokyo, the nation could easily lose its capital city.

As Kan reeled from this possibility, the government was simultaneously coping with Japan's worst natural disaster since the 1923 Great Kanto Earthquake. The Self-Defense Forces faced their greatest challenge ever, and the prime minister as commander in chief immediately commanded the 20,000 available personnel to begin disaster relief. At around 6:30 p.m., Kan rushed to meet with the opposition parties to seek cooperation in the earthquake and tsunami recovery; the DPJ did not have a majority in the Upper House. Only after Kan returned from this meeting did he finalize the emergency declaration just after 7:00 p.m. (ICANPS 2012).⁹

A serious procedural problem, stemming from insufficient disaster preparation plans, also contributed to Kan's delayed evacuation order. The immediate problem was that the Prime Minister's Office lacked the know-how to proceed with an evacuation order (Oshika 2012). This does not automatically suggest DPJ incompetence, since it is not obvious that the LDP would have had such evacuation procedural know-how. The bureaucracy would have been the natural repository for such procedural knowledge, but NISA staff also lacked operational evacuation expertise.

A major legal structural flaw hindered coordination as well. The Special Law for Emergency Preparedness for Nuclear Disasters, formulated after the 1999 Tokaimura accident, governed the situation. The law called for the Nuclear Safety Commission (NSC) to gather and establish

an emergency technical advisory group to advise the prime minister. However, with trains stopped, roads in gridlock, and communications lines mostly inoperable, the advisory group could not physically gather or communicate with each other (IIC 2012). Put simply, *the law governing nuclear disasters did not take into account the possibility that a nuclear disaster could be caused by, and therefore occur simultaneously with, an earthquake/tsunami disaster* (NAIIC 2012).

When Kan did finally declare a nuclear emergency, this should have triggered an evacuation order. However, the Prime Minister's Office lacked information about conditions on the ground, such as which roads were usable and the scope of damage in the tsunami-ravaged areas (Os-hika 2012). This was not simply lack of experience or resourcefulness on the part of Kan's staff or the DPJ, but was instead a catastrophic failure of the "offsite center" legally designated to be the locus of information flows on the ground.

The Fukushima "offsite" emergency operations center was 5 kilometers from Dai-Ichi. However, earthquake damage rendered it useless; there was no power from the grid, emergency backup generators were damaged, water had stopped, and the cellular network was down. The sole means of communication was a single phone line that doubled as a fax line. Moreover, there was no radiation filter. The adjacent Fukushima Nuclear Power Center building had backup power, but no telephone lines and no computers (Funabashi 2012a: 33, 57).¹⁰ Even at midnight, when a METI vice minister DPJ politician arrived via helicopter from Tokyo, (after physically extricating himself from liquefied ground in a landfill area of Tokyo and enlisting Self-Defense Forces to extract him from complete gridlock) the offsite center was still dark and unusable (Kadota 2012). Yet, this was the designated information clearinghouse for managing information flows between the plant, the government, TEPCO, and local municipalities—including orchestrating evacuations.

Information gaps between the Prime Minister's Office and local governments added to the chaos. Initially, the two towns of Okuma and Futaba could not be contacted; the offsite center was not functioning, and the phone lines to Futaba were down. The political leadership asked the Police Agency to coordinate with the localities. Then, when the Fukushima prefectural government issued a 2 kilometer evacuation radius at 8:50 p.m., it neglected to inform the central government (Funabashi 2012a: 182). This led to the government's 3 kilometer evacuation radius announcement at 9:23 p.m., contributing to local confusion.

TEPCO's Leadership Vacuum Hindering Government-Business Coordination

As the crisis developed, with NISA and political leaders clearly lacking live information, the question was how TEPCO handled the situation, including coordination with the government. It turned out that during the critical first day, TEPCO had a serious leadership vacuum. Neither its president nor chairman could return to headquarters until the morning of March 12, more than twenty hours since the crisis had begun. According to the legal framework, TEPCO was responsible for handling the nuclear crisis, while the government was to focus on evacuations. However, the perceived lack of decisive leadership at TEPCO and its slow reporting to the Prime Minister's Office led Kan to feel the need to personally assume responsibility for the nuclear disaster as well.

The political leadership was initially unaware that TEPCO's top management was absent, fueling their distrust of the company. Throughout the critical first day, they were left dealing with Vice President Takekuro and lower-level employees who had no information or decision-making authority. Kan and his inner circle were frustrated that TEPCO's top management did not appear publicly, or even to them (Funabashi 2012a: 73).

The difficulty that TEPCO's chairman, Katsumata Tsunehisa, and president, Shimizu Masataka experienced in returning to Tokyo illustrates the lack of preparation by TEPCO and lack of preplanned government-business coordination for earthquake-triggered nuclear emergencies.

On March 11, Chairman Katsumata was in China on tour with Japanese press and labor leaders. Since the Tokyo airports of Narita and Haneda, rail, and freeway routes were all closed, Katsumata had to return to Tokyo on a chartered flight the following morning. In the meantime, given the communications disruptions in Japan, it is not clear that Katsumata, the company's true power wielder, could communicate effectively with headquarters (Oshika 2012).

President Shimizu's attempts to return would border on comedy had the situation not been so dire. On March 11, he was vacationing in Nara, his whereabouts unknown to many of his staff. With rail and road transportation to Tokyo halted, Shimizu traveled to Nagoya, hoping to use a TEPCO-affiliated company's helicopter. However, upon reaching the heliport, officials discovered the company had neither the equipment nor permits to fly at night. Shimizu and his staff contacted the government, which dispatched a Self-Defense Forces aircraft. The aircraft, with

Shimizu as the sole passenger, took off for Tokyo at 11:30 p.m., eight hours after the disaster. Yet, due to a combination of unfortunate judgment by the minister of defense and communications failures within the SDF, the plane made a U-turn at 11:45 p.m., returning to Aichi Prefecture (Oshika 2012).¹¹

Shimizu had to wait until the next morning to take the helicopter, landing at the Tokyo municipal heliport. From there, he became stuck in the colossal post-disaster traffic gridlock, taking two hours to cover the short distance to TEPCO headquarters. He finally arrived around 10:00 a.m.—almost twenty hours after the earthquake (Oshika 2012). By then, the Dai-Ichi plant was deep into the crisis, with Reactor 1 already experiencing a meltdown and the hydrogen explosion imminent. The Prime Minister's Office and TEPCO had been working through the night, and Kan had already visited Dai-Ichi himself.

Kan's Personal Involvement in the Recovery Effort: Battery Trucks

During the first night of the crisis, Kan became personally involved in dispatching battery trucks to the Fukushima Dai-Ichi plant, and he visited the plant on the morning of the March 12. While he was criticized by the media and some reports, his involvement reflects in part the remarkable lack of leadership and unclear locus of decision making within TEPCO, leadership that Kan believed essential to the very survival of the nation. Kan was acutely aware of the critical need to supply the reactors with water. To supply water, pumps needed electricity, and Dai-Ichi called urgently for battery trucks. TEPCO vice president Takekuro at the Prime Minister's Office also urged Kan to orchestrate sending battery trucks (Funabashi 2012b).

While numerous battery trucks were dispatched from various sources, including the Self-Defense Forces, traffic gridlock surrounding Tokyo and earthquake-destroyed roads closer to Fukushima slowed progress. Kan ended up personally making phone calls to dispatch SDF power trucks, a whiteboard in his office constantly updated with maps of trucks' progress and route availability (IIC 2012).

With land routes uncertain and slow, Kan explored other options. Attempting to airlift battery trucks, Kan at one point phoned the SDF to inquire about the weights and dimensions of the trucks. Finding the weight prohibitive for SDF helicopters, Kan also inquired of the U.S.

military—but the trucks were simply too heavy. All told, Kan’s office dispatched forty to sixty-nine power trucks (IIC 2012; Oshika 2012).

After 9:00 p.m., a Tohoku Electric Power Company battery truck finally reached the unused Fukushima offsite center. More arrived over the next few hours, but they incurred delays such as those caused by drivers who did not know how far the offsite center was from Dai-Ichi, and by security at Dai-Ichi not allowing unregistered trucks through. Kan’s impatience with TEPCO mounted. Then, to everyone’s dismay, the trucks turned out to be unusable. The voltage was incorrect, and the plug sockets were incompatible. Kan and his aides were furious, interpreting this as TEPCO’s incompetence (Funabashi 2012a).

On the ground, plant manager Yoshida’s attempts to use electricity converters within the Reactor 2 building were unsuccessful. A 200-meter-long cable was needed, and it took some time to locate such a long cable, since much of this knowledge was held by contract workers who had left. As reports flowed into the Prime Minister’s Office (“Truck arrived”; “Doesn’t fit!” “Needs longer cable”; “Don’t have cable”; “Identified cable location”; “Can’t open door”), Kan’s mistrust of TEPCO grew (IIC 2012; Oshika 2012a).

Once the cable was located, transporting it was a challenge, since it weighed over a ton and most heavy equipment was damaged. A crane-equipped four-ton truck hauled the cable out of storage, and about forty men began pulling it into place. Phones did not work, it was pitch dark, debris was scattered all over, strong aftershocks kept occurring, and missing manhole lids made work highly treacherous—and, critically, time-consuming (Funabashi 2012a; Oshika 2012).

In fact, tsunami damage was the reason that Dai-Ichi required specific cables, voltages, and plugs. Most of the plant’s electricity circuit boards and voltage converters were catastrophically damaged (Ohmae 2012). Therefore, battery trucks had to be physically plugged into each piece of equipment and motor individually; each required specific voltages and plugs, and motors were not designed to be individually accessible to external power sources (Funabashi 2012a: 89–91). However, nobody explained this to Kan or his aides.

At 11:50 p.m., with the power truck yet to be connected, plant manager Yoshida faxed another report to NISA: radiation levels within the reactor building were rising.

Reactor 1 was clearly experiencing a meltdown. Although instruments recorded sufficient water levels, clearly they were not, and the exposed

fuel core had damaged the containment vessel, leading to radiation leakage (Oshika 2012).

Kan's personal involvement in sending battery trucks that ended up not being immediately useful was later criticized as wasted energy and attention. Yet, at the nearby Fukushima Dai-Ni plant, in which three of the four plants headed into crisis, the immediate response of plant manager Masuda Naohiro was to obtain 20 battery trucks. Since the circuit boards were not as severely damaged vis-a-vis Dai-Ichi, they were effective. Masuda even had to deny Dai-Ichi's request for battery trucks since survival of Dai-Ni depended upon them (Funabashi 2012b: 453). Kan's attention was focused in the technically appropriate direction, although he might have delegated more effectively—yet he understood the situation far better than his political aides, and he found TEPCO unresponsive.¹²

Kan's background gave him strong reason to distrust TEPCO, and long-standing industry–bureaucracy ties in general. Kan began his career as a civil society activist, an outsider to hereditary or money politics. As minister of health and welfare in 1994, Kan exposed a devastating scandal in which untreated, HIV-tainted blood was provided to hospitals, infecting numerous patients. The offending companies hired retired bureaucrats and the ministry had ignored internal warnings. The scandal represented government–business collusion at its worst, and Kan became a household name. The electric power industry was also infamous for its close ties to bureaucrats and for keeping academics on its payroll.

Kan's much-criticized visit to the Dai-Ichi plant, against aides' cautions, seems rational given the pervasive informational, procedural, leadership, and coordination problems between the government and TEPCO. As Dai-Ichi fell deeper into crisis on the night of March 11, Kan began harboring doubts about TEPCO's very willingness to undertake the next step of disaster aversion—a process known as venting.

Heat from the fuel cores increased pressure within the reaction chamber. Unless reduced, the containment vessel itself could explode. Venting would reduce pressure, but since Dai-Ichi (and Japanese plants in general) lacked filters, some radiation would be released. It was therefore not a decision to be made lightly.

Around 11:50 p.m. on March 11, plant manager Yoshida discovered that Reactor 1's internal pressure had reached 600 kilopascals (kPa), far exceeding its 427 kPa maximum design. He decided to vent the reactor.

However, venting was difficult in the damaged plant. Without electricity, the vents had to be opened manually. Yet, nobody knew the exact

design or location of the hatches because this was beyond any drills or commonly used manuals. Staff with flashlights searched the destroyed operations rooms for design schematics (Kadota 2012; Oshika 2012).

At the Prime Minister's Office, Kan, Kaieda, Edano, two other DPJ members—Kan's inner circle—NISA head Terasaka, and TEPCO vice president Takekuro debated the venting procedure. By 1:00 a.m. on March 12, they decided it was necessary, asking Yoshida to commence venting after a 3:00 a.m. announcement. At 3:12 am, Edano held a press conference announcing that venting would commence shortly (Funabashi 2012a; Oshika 2012).

The political leadership expected imminent news of venting—but it never came. As Kan waited, he suspected that TEPCO was incapable of making, or unwilling to make, the difficult choices necessary to sustain irreparable reputational damage by releasing radioactive material into the atmosphere. Yet, not venting would produce a worse catastrophe. During the night, Kan decided to visit the Fukushima Dai-Ichi plant himself the following morning. METI minister Kaieda had actually thought he should visit also, but aides convinced him to stay behind (IIC 2012).

Overnight, numerous strong aftershocks exceeding magnitude 6, centered below the Tohoku area, shook Eastern Japan and Tokyo. Clearly, venting at Dai-Ichi needed to happen as soon as possible before it sustained further damage.

By 5:00 a.m., venting had yet to occur. TEPCO vice president Takekuro was asked why, but had no answer. Political leaders were shocked to learn that he had been simply relaying messages via TEPCO headquarters without live information from Dai-Ichi (Funabashi 2012a: 111; Oshika 2012). Kan became concerned that if not vented, the reactor's containment vessel might explode, releasing far greater radiation than would venting. The NSC chairman agreed that this was a possibility, leading Kan to widen the evacuation radius from 3 kilometers to 10 kilometers at 5:44 a.m. (Funabashi 2012a: 113–14).

Just then, the situation worsened. Fukushima Dai-Ni reported that cooling systems had failed, and temperatures in three of its four reactors were rising. This news was not relayed to Kan yet.

In the meantime, Kan had instructed Kaieda to issue an unprecedented formal order to TEPCO through METI to commence venting, which was issued at 6:50 a.m. The political leadership no longer considered TEPCO capable of deciding or executing the venting procedure on its own (Funabashi 2012a: 116; Oshika 2012).

Kan visited the emergency operations building at the Fukushima Dai-Ichi plant for just under an hour, meeting Yoshida and seeing the ground-level workers packed into the building. Exhausted and isolated, many of them with families in tsunami-ravaged areas whose fates they did not know, workers were crammed along the hallway, dazed or sleeping. Few realized that the nation's prime minister was nudging his way through. Kan met with Yoshida, and was considerably reassured by Yoshida's competence and strong leadership. He described this meeting as the first time somebody answered his questions properly (Kan 2012).

Kan's insistence in meeting Yoshida was not unjustified; in hindsight, given the lack of contingency planning and leadership from TEPCO headquarters, along with the information chaos, TEPCO's initial strategy during the crisis was essentially to "leave it to Yoshida." A U.S. Nuclear Regulatory Commission member was reportedly later astonished by the extent of Yoshida's responsibilities, and Yoshida repeatedly expressed to the political leadership his frustration at TEPCO headquarters' lack of support (Funabashi 2012b).

At 6:30 a.m., Kan left the Prime Minister's Office by helicopter. As Kan was leaving, he signed off on a second nuclear emergency decree, ordering a 3 kilometer evacuation radius around Dai-Ni.

Kan left Dai-Ichi just after 8:00 a.m. At 9:04 a.m., two-man teams began entering the reactor building to manually open the vent. However, high radiation levels delayed the process, and Reactor 1 was not vented until 2:00 p.m.—almost fourteen hours after Yoshida's decision, and eight hours after Kan's legal order. The reactor pressure, designed for a maximum of 427 kPa, had at one point risen to more than 840 kPa (Oshika 2012).

By then, the fuel core of Reactor 1 had already melted through. At 3:36 p.m., the hydrogen explosion blew off its roof and upper walls.

Despite the accusations of TEPCO and a significant portion of the media that Kan had delayed recovery efforts at the plant, the hour he met with Yoshida, and the hour or so in preparation, were unlikely to have changed the outcome. By the time Kan visited, Reactor 1 had long since melted down, and it took six hours after his departure to execute the venting.¹³

The Hydrogen Explosions: Chaos from the Ground Upward

The government's delay in acknowledging the hydrogen explosion and expanding the evacuation radius was largely due to organizational and

physical information flow problems on the ground rather than the political leadership's incompetence or information suppression.

Chaos and panic ensued at the plant after the explosions hit. With the instruments unreliable and operations centers lacking windows, the initial question was exactly what had exploded. If it was the reactor vessel itself, radiation levels were likely fatal. With chaos on the ground, TEPCO headquarters lacked immediate information to relay to the Prime Minister's Office.

The prime minister and NSC chairman Madarame were meeting when an aide rushed in to turn on the television. Kan's first reaction was to demand of Madarame what had exploded, and to state that Madarame had asserted an explosion would not occur. Kan had actually raised the possibility during his helicopter ride to Dai-Ichi, inquiring whether hydrogen released from the fuel rods' zirconium casing having heated up could ignite and explode the containment vessel; clearly, Kan's grasp of nuclear reactors was sophisticated. Seeing the explosion, Madarame sat holding his head in his hands. He later explained that he had meant, but not explicitly stated, that the containment vessel itself would not explode since it contained no oxygen. However, in this case the hydrogen had escaped to the inside of the reactor building, which did contain oxygen, fueling the explosion. In Kan's mind the NSC, along with NISA, was now thoroughly discredited.

Although it had been an hour after the event that Kan saw the national television broadcast, he strongly insisted that they not speculate and incite panic until confirming what had happened. However, although Kan was yelling for reports from TEPCO, the company never reported to him about the explosion until much later. Edano was therefore forced to use the tortured phrase, "an explosion-like phenomenon was observed." The first information came from the Policy Agency rather than TEPCO or NISA (Funabashi 2012b).

At the plant, the Reactor 1 explosion seriously set back the recovery effort of Reactor 2. Yoshida expected casualties, but remarkably some workers only sustained injuries. However, a battery truck and its cable preparing to start the water injection system in Reactor 2 was catastrophically damaged. Radiation levels spiked, but fell again, indicating that the containment vessel was still mostly intact.

The delay in expanding the evacuation radius to 20 kilometers was largely due to the lack of information at the Prime Minister's Office about the explosion, and the lack of plans for an evacuation of this magnitude.

The political leadership debated the merits of widening the evacuation radius to 10 kilometers, 20 kilometers, or 30 kilometers; if venting failed, a containment vessel explosion would disseminate far greater radiation. Yet, there were no local evacuations plans for beyond 10 kilometers. The offsite center at Okuma-cho, for example, even lacked maps indicating a 20 kilometers radius. Since evacuations require identifying the localities affected, finding suitable places to accommodate evacuees, and arranging and orchestrating transportation, an expanded evacuation radius entails major logistical challenges—particularly if unplanned. Cold temperatures elevated risks of hypothermia and illness, and gridlock could endanger the nuclear plant recovery effort itself. Gravely ill patients in hospitals risked becoming casualties during transportation.¹⁴ Expanding evacuation radii beyond existing plans entailed serious hazards, but they went ahead after deliberation.

Seawater Injections: Manufactured Controversy

Seawater injections to save the Dai-Ichi plant later became the focal point of significant controversy, contributing to the delegitimization of Kan and the DPJ's handling of the crisis.

As soon as Dai-Ichi lost all power, Yoshida considered the possibility of using fire trucks to pump seawater directly into the reactor. This would ruin the reactor and contaminate vast amounts of seawater, but after the hydrogen explosion, seawater injections seemed the only way to prevent the reactors from spiraling out of control. Yoshida began seawater injections on the afternoon of March 12.

The Prime Minister's Office was unaware of this, and around 6:00 p.m., Kan strongly advocated commencing seawater injections. He was concerned about the salt reigniting a chain reaction, but saw no other options. However, TEPCO's Takekuro made a controversial judgment call. Upon learning that Yoshida had already started seawater injections, Takekuro feared the potential wrath of Kan if he confessed that TEPCO had begun the process before Kan's decision and order. Takekuro therefore commanded Yoshida to halt seawater injections until further notice. Yoshida, incredulous, disobeyed the order, going so far as to pretend to give an order to his subordinate on the video feed to headquarters. Thus, when Kaieda ordered TEPCO to inject seawater at 8:05 p.m., the political leadership was unaware that seawater injections were well under way, while TEPCO headquarters was unaware that it had continued.

Later, on May 21, *Yomiuri shimbun*, Japan's largest daily newspaper, ran a front-page story about how Kan had personally ordered the halting of seawater injections. It reported that TEPCO had complied, substantially worsening the disaster (*Yomiuri shimbun* 2011). This ignited a media firestorm, shaping a dominant narrative that Kan's irrational interference severely set back the recovery, possibly accelerating the subsequent explosions (Samuels 2013). Tanigaki Sadakazu, head of the LDP, went so far as to falsely accuse the DPJ leadership of causing the meltdowns by delaying seawater injections. (They had already melted down; Funabashi 2012a). Kan's approval rates dropped precipitously.

Almost a week later, plant manager Yoshida revealed that he had disobeyed TEPCO's orders to stop seawater injections.¹⁵ Only then was it discovered that Takekuro rather than Kan had ordered the halt. Yet, Kan's approval rates did not recover, and politicians within and outside the DPJ intensified calls for his resignation. Journalists investigating the source of this false accusation against Kan conclude that the *Yomiuri* article and subsequent television news reports originated in an e-mail newsletter by the LDP's former and subsequent Prime Minister Abe Shinzo. Abe, who appeared in numerous interviews accusing Kan of grossly mismanaging the crisis, simply stated that he had heard from multiple people what had occurred. The original *Yomiuri* article had quoted Abe, despite Abe's being neither the head of the LDP, a nuclear expert, nor prominent a figure in nuclear regulations (Funabashi 2012a; Oshika 2012).

TEPCO's Abandonment Request Controversy, Establishment of Joint Headquarters

When the explosion at Reactor 3 occurred on March 14, the political leadership again first learned of it through television. The larger, black plume led many to initially fear that the reactor itself had exploded. On the ground, the seismically reinforced operations headquarters was damaged and no longer airtight—radiation levels near windows began rising. The vents in Reactor 2 to lower the pressure for water injections also slammed shut. Self-Defense Forces members and workers preparing for the operation were injured and pulled from the site. Reactor 2 was entering the most severe stage of crisis yet.

As the nuclear crisis entered its third night on March 14, pressure in Reactor 2 kept building, water levels were dropping, and water injections were failing. Yoshida's team estimated hours until a catastrophic

containment vessel breach, and Yoshida began planning to evacuate all crew other than key operators—people who would die with him defending the plant (Funabashi 2012a: 279–80, 95–302; Kadota 2012).

Later that night, TEPCO president Shimizu began telephoning Kaieda, then Edano numerous times requesting to see the prime minister. In events that became the focal point of intense scrutiny in subsequent investigations, the political leadership understood Shimizu to inquire whether TEPCO could abandon Dai-Ichi. Reading this as intent to put the responsibility on them, they stopped picking up his calls. Shimizu and TEPCO executives later insisted that they had said “retreat,” rather than “abandon,” implying that key personnel would stay behind to continue seawater injection operations. Kaieda and Edano dispute this view, contending that nothing was ever said about core personnel remaining. They argued that a simple “retreat” would not require Shimizu’s attempts to contact the prime minister (NAIIC 2012).

Kan was awakened from a nap in his fifth floor office around 3:00 a.m. on March 15 by aides and political leaders informing him of TEPCO’s abandonment request. Kan forcefully asserted that this could not happen, summoning Shimizu around 4:00 a.m. Shimizu arrived in twenty minutes (Asahi 2012; IIC 2012). He began talking about the rolling blackouts TEPCO had to impose, given the electricity shortage from the disaster, without bringing up anything about the explosions.

Kan finally interrupted Shimizu, asking why TEPCO had not reported personally after the explosions. Then, in response to Kan’s forcefully demanding whether TEPCO intended to abandon the plant, participants were dumbfounded by Shimizu’s meek reply in the negative. This seemed to undermine the purpose of his countless requests to see the prime minister and long list of missed calls to Edano and Kaieda. However, critically, his denial ensured that Shimizu left no record of explicitly requesting abandonment, and politicians rather than TEPCO were forced to decide whether TEPCO employees should risk their lives at Dai-Ichi (IIC 2012; Oshika 2012).¹⁶ Kan’s aid, DPJ member Hosono Goshi, had actually personally called Yoshida at the plant before waking Kan. Yoshida assured him that he had no intent to abandon the plant. Kan followed up with Yoshida, who repeated his resolve. The political leadership had felt for some time that TEPCO headquarters and the plant were not in sync (Funabashi 2012a).

At this point, Kan took the unprecedented step of ordering a joint government–TEPCO headquarters within TEPCO. He recalls having

thought about solving the information coordination problems by this means since the previous day (Kan 2012). He told Shimizu to prepare a desk for Hosono within half an hour, and that he, Kan, would visit TEPCO headquarters within the hour (IIC 2012).

It only took Kan approximately five minutes to reach TEPCO headquarters—they were that nearby—arriving at 5:35 a.m. He announced to the 300 or so employees on the main floor that TEPCO would not be allowed to abandon Dai-Ichi. He told them that they, TEPCO, were responsible, and if they fled, the company would not survive. This visit increased antagonism between TEPCO and the political leadership. However, communications flowed far more effectively with the Prime Minister's Office. Kan's establishment of joint headquarters was later considered highly beneficial in coordinating subsequent reactor stabilization water injection operations, involving the Self-Defense Forces, Tokyo Fire Department, and TEPCO (IIC 2012).

During Kan's visit, just after 6:30 a.m., Reactor 4's building roof and upper walls blew off in a hydrogen explosion, likely from a pipe shared with Reactor 3. Kan remained at TEPCO headquarters until 8:45 a.m. (Asahi 2012; Oshika 2012).

The Reactor 4 building explosion created a new, highly dangerous situation. It housed more than 1,500 spent fuel rods in open pools for temporary storage during maintenance. These pools were located tenuously at the top of the building, now severely compromised, without any concrete encasing like that of the reactor. If the water leaked or evaporated, or if the pools collapsed, spent fuel rods would fall down inside the building. The entire Dai-Ichi plant would then become too radioactive to approach, and completely uncontrollable. Cascading disasters at Dai-Ni and then others could cause the worst-case scenario of losing the capital city and Eastern Japan.

The water levels in the spent fuel pools were initially unknown. Designed for temporary storage, they lacked water level indicators (Funabashi 2012b). At 11:00 a.m., Kan expanded the evacuation radius to 30 kilometers. The U.S. Nuclear Safety Commission feared that the fuel was already exposed, leading the U.S. government to issue a 50 mile (88 kilometer) evacuation radius for U.S. citizens, clearly demonstrating that it found the Japanese government's radius inadequate. The stock market plunged.

As the recovery efforts for Reactor 2 stalled, Yoshida, fearing the endgame was near, sent most of the 650 remaining staff at Dai-Ichi to the Dai-Ni plant. He remained with around 70 critical operations staff.¹⁷

In Kan's worst-case scenario calculated by his trusted expert, an evacuation of the greater Tokyo metropolitan area—population 35 million plus—would be required. Fearing mass panic, Kan did not publicize this scenario. Later, however, he stated on numerous occasions that he considered the nation's very survival at stake (Kan 2012). His concerns were not unfounded.

Emergency Mobilization to Cool Used Fuel Pools

The situation at Fukushima Dai-Ichi finally began to stabilize after March 18, a week after the earthquake and tsunami. On March 16, an SDF helicopter visually confirmed that Reactor 4's spent fuel rods were still immersed in water. This was largely luck, since there happened to be water filling Reactor 4 during maintenance, which cascaded down into the spent fuel pool, possibly due to the hydrogen explosion. However, visual confirmation of water was necessary to continue rescue efforts.

In another element of luck, the pressure that had been building up in Reactor 2, unchecked in the pressure vessel, suddenly dissipated, probably due to the Reactor 4 building explosion. Although this released the most radiation of anytime during the disaster, the looming catastrophic reactor explosion that might have led to a worst-case scenario was averted.

The following day, another SDF helicopter dumped water onto Reactor 3, and a number of SDF fire trucks began dousing Reactor 3 with water from the ground. This was accomplished by coordination between the SDF, the Tokyo Fire Department, and the National Policy Agency, representing the government's success in bringing them together (IIC 2012). The political leadership was also directly responsible for mobilizing some key pieces of equipment. Most important, a German concrete-pouring pump with a 58 meter tall arm was headed for Vietnam and happened to be docked in Japan. The government worked with the Japanese headquarters of the manufacturer, Putzmeister, orchestrating its transportation to Fukushima, and training operators (Funabashi 2012b: 203–11).

Since Japan has no martial law, coordination had to be orchestrated by the political leadership. Even efforts such as transporting the 80 ton, ten-axle pump truck on freeways required coordination with the Policy Agency and Ministry of Land, Transport and Infrastructure. To mobilize the Tokyo Fire Department's large fire truck, Kan needed permission from Tokyo governor Ishihara Shintaro.

On March 18, Kan left the Prime Minister's Office for the prime min-

ister's residence for the first time since the disaster had begun. He had spent the whole week catching naps on the sofa in his office. On March 20, power from the electricity grid to the Fukushima Dai-Ichi plant was finally restored. However, the pumps were damaged and did not start. Hosing with concrete-pouring trucks and fire engines continued until the pumps came online a few days later. By the end of the month, water injection procedures were stabilized, and work began on reinforcing the damaged reactor buildings and spent fuel pools. Collecting contaminated water and other issues continued to occupy the plant workers full-time.

On April 1, Kan changed back into a suit. Eight months later, Yoshida, who had worked almost continuously at the plant, was diagnosed with esophageal cancer—not directly attributed to radiation. He then suffered a stroke in July 2012. A year later, he passed away. The complete decommissioning of the reactors is estimated to take twenty to thirty years.

Conclusion

The Fukushima nuclear disaster was a critical juncture in Japan's postwar history, and in the world's relationship to nuclear power. By closely examining events as they unfolded, this article has focused on the DPJ's role and response to the disaster.

On balance, the DPJ and Kan were dealt a very difficult hand, and cannot be accused simply of crucially mismanaging the crisis. It was not a case of potentially effective structures or procedures not being followed and organizations defunded, political interventions catastrophically slowing or worsening the recovery, unnecessary political hindering of effective bureaucratic management and government–business cooperation, or sound expert advice gone unheeded.

Instead, the disaster revealed severe shortcomings in legal and bureaucratic organizational structures, contingency plans, information flows, and bureaucratic expertise. The political leadership did not unnecessarily intervene or hinder the rescue operations, and in fact played a critically beneficial role in coordinating various actors and facilitating information flows.

The relationship between the political leadership and TEPCO was plagued with deep mistrust, but on balance TEPCO gave credible reason for the leadership to harbor doubts about its intentions and actions. Of all postwar prime ministers, Kan's background in applied physics, civic activism, and his previous uncovering of the government–pharmaceutical

industry scandal made him arguably the least likely to trust TEPCO. (Since the offending pharmaceutical firm went bankrupt, Kan was skeptical of the argument that rational corporations would not do things to harm their long-run self-interest or very existence.) While this might have damaged TEPCO–government coordination to a degree, Kan’s establishment of joint headquarters with TEPCO and facilitation of interagency cooperation were valuable in stabilizing the reactors.

While the DPJ perhaps could have strengthened some of the contingency planning and organizational inadequacies, having come to power in September 2009, they had little time to do so. Ostensibly the biggest government response failure was the evacuation that lacked input from SPEEDI or the U.S. military. However, this failure can be seen as a systemic problem deeper than the DPJ’s policy execution, since procedures and operations for a major evacuation itself had never been planned.

Kan and DPJ leaders’ relationships with elite bureaucracies could have been better. However, they had good reason to be disillusioned with NISA—later removed from METI and re-formed as the relatively independent Nuclear Regulatory Agency under the Ministry of the Environment—which lacked the expertise and on-the-ground personnel to gather information.

Moreover, there is no evidence that defunding of organizations exacerbated the response. There were no disaster relief agencies starved of funding or nuclear disaster response crews lacking equipment and personnel; such organizations did not exist in the first place, and the SDF had no response units for civilian nuclear power plants. In fact, such organizations could have been highly valuable.

Japan is often criticized for lacking strong leaders, but during this crisis, Kan’s strong, though abrasive, leadership did appropriately focus the government’s attention on the most critical threat to the nation’s survival. From a technical standpoint, the risk was serious, and Kan understood that risk. Even relatively objective and comprehensive investigation commissions criticize his personal micromanagement of the crisis at the expense of focus on the broad picture. However, Kan’s view, shared by this article upon close examination of events as they occurred, aided by hindsight, was that the nuclear crisis response *was* the broad picture; given the ambiguity in the locus of decision making, a worst-case scenario was quite possible.

Legally, the operator bore primary responsibility for managing the accident at the plant. However, the lack of preestablished procedures

for government–TEPCO coordination in times of severe nuclear crises, combined with TEPCO’s failure to display leadership and the obvious need to coordinate resources beyond TEPCO’s capabilities prompted Kan to assume a central role. Japan does not have martial law, so coordinating the SDF, police, fire departments, and TEPCO was critical in orchestrating the resources and securing operators for the equipment. This article agrees with the contention that Kan played a critical role in shifting the government’s nuclear response into “emergency mode,” culminating in the coordination that allowed sustained water injections.

Moreover, some of Kan’s leadership resulted from TEPCO’s seeming to delegate to the political leadership tough choices such as venting, injecting seawater, and keeping employees in potentially life-threatening situations. Aides contend that TEPCO was off-shouldering responsibility, but the issue is deeper, and exposes a basic dilemma facing nuclear governance for public companies operating nuclear plants. Can private firms command their employees to risk their lives? Is potential liability infinite if operators release radioactive material to vent, or contaminate seawater to prevent a greater disaster? If their expected liability is infinite, threatening survival of the firm, quick decisions may be impossible—exactly what Kan feared.

The exact role of TEPCO’s top management—who subsequently settled in high-paying postretirement jobs in affiliated companies and continue to refuse candid interviews—remains unclear.

Japan did have a statute in the Nuclear Damage Compensation that limited operator liability in the case of war or a natural disaster exceeding three times that of the Great Kanto Earthquake of 1923. Expecting this law to be applied, and under the assumption that TEPCO was too big to fail, major banks immediately extended a staggering ¥2 trillion of credit. However, the Kan administration argued that the statute did not apply, eventually *de facto* nationalizing TEPCO to prevent its insolvency. If nuclear operators are too big to fail—since nuclear problems tend to get worse with time if not properly managed—they may not undertake sufficient safety measures. This is ultimately a governance structure problem, which developed under the LDP.

What were the warnings that TEPCO and Japan’s nuclear governance structure did not heed? In 2003, an NSC working group raised the possibility of a complete power loss. However, the final report omitted the issue (Oshika 2012). In 2007, NSC chair Madarame, then still a Tokyo University professor, was asked in court as a witness what would happen if backup diesel generators failed. He answered that such an event was

beyond their assumption of possible outcomes. In 2010, a Japan Communist Party Diet member asked NISA point-blank about the possibility of complete station power loss during a METI committee Diet hearing. NISA head Terasaka answered that plants' design safety made such an occurrence almost impossible.¹⁸

In 2008, an internal TEPCO simulation showed that a 15.7 meter tsunami would critically devastate the Dai-Ichi plant. The simulation followed historical research showing that a magnitude 8.4 earthquake occurred in the area in 869, triggering a major tsunami that was still 3 meters high at 3 kilometers inland. Documents from that time estimated more than 1,000 casualties in a population of 7 million—roughly the same proportion as the March 2011 tsunami with 20,000 casualties out of 127 million residents. TEPCO's maximum earthquake parameter was 7.9, one-sixth the strength of the 869 quake (Kimura 2012; Oshika 2012). Recent geophysical research also indicated the Tohoku region had experienced more than six earthquakes greater than magnitude 8.0 that triggered tsunamis over the past 6,000 years (Aoki and Rothwell 2013).

There were important lessons that the United States and, to some degree, Europe implemented that Japan had not. Filters were an obvious step. Other security measures known as B.5.b, were implemented in the United States following the September 11, 2001, terrorist attacks, including significant waterproofing of facilities and reduction of vulnerability to plane crashes.

That being said, the government's nuclear accident response did improve after previous accidents. The Nuclear Emergency Preparedness Law, though it turned out to be inadequate, was prepared after the 1999 Tōkai-mura nuclear accident, in which the utility and government were accused of deliberately suppressing information and delaying public notification. In Fukushima, information chaos rather than suppression caused a delay. In 2000, an investigation of TEPCO set off by a whistleblower from General Electric involved in maintenance of a reactor at Dai-Ichi revealed that TEPCO had concealed twenty-nine accidents and incidents, leading to mass resignations of the company's leadership. In 2007, a control rod malfunction at the Kashiwazaki Kariwa plant following a large offshore earthquake near Niigata led to the construction of Dai-Ichi's seismically reinforced operations center, without which the disaster would likely have been far worse.

In terms of general disaster response, in the 1996 Hanshin Awaji Great Disaster that hit Kobe and the surrounding area, then-Prime Minister

Murayama learned of the disaster at home on television, and did not alter his preplanned schedule for the day. Rescue operations were riddled with problems and delays, with a lack of procedures for setting up a disaster response headquarters, and with bureaucratic jurisdictional conflict and central–local coordination problems, combined with rejections of external (domestic and foreign) help. As parts of Kobe and Awajishima burned, rescue crews were nowhere to be seen. New laws and regulations enacted after the 1996 earthquake greatly facilitated bureaucratic coordination and emergency response after the March 11, 2011, disaster, including the immediate mobilization of tens of thousands of SDF forces (Samuels 2013). As the Fukushima disaster revealed, however, the linkage between disaster response and nuclear crisis had not been made.

How uniquely Japanese was the disaster and its aftermath? The magnitude of the earthquake and nuclear disaster was unprecedented in peacetime, advanced industrialized countries. From a nuclear governance standpoint, the fusion of Japan’s nuclear regulatory and promotion agencies under the same bureaucratic roof was unusual for advanced industrialized countries, particularly after the U.S. Three Mile Island accident in 1979. Yet, developing countries ranging from China to Brazil, Indonesia, Saudi Arabia, and Vietnam have either massive build-outs under way, or plan to build new plants, raising significant concerns. Japan’s new Nuclear Regulatory Authority, formed in September 2012 well behind schedule, immediately began to take stricter measures. The early indications of stricter governance are encouraging.

From the perspective of natural disaster and crisis response, a comparison with advanced industrialized countries’ government responses to acute unexpected crises, ranging from Hurricane Katrina in the United States to financial crises in the United States and Europe, suggests that initial chaos followed by partisan politics is quite common. In the medium-term politics that ultimately led to Kan’s stepping down in September 2011, just as the Japanese were astonished and disappointed that political strife seemingly prevailed, holding the reconstruction budget hostage—missing the opportunity to set aside differences and address the human toll—citizens worldwide are often disappointed by their government’s responses. There are often electoral consequences. Ironically, as Japan becomes more “normal” by experiencing alternations of the party in power, it is likely to face partisan political strife and “blame games” when political cooperation may be most needed.

In terms of institutional and interest group politics, Japan’s power

companies were among the strongest industrial actors, providing vast amounts of business for Japan's major blue-chip companies and enjoying a strong voice within Japan's major business association, Keidanren. As such, they successfully resisted previous efforts at reform and strengthened oversight. With the LDP's return, their political support has grown, but some industry reform is more likely to occur than before the disaster, weakening the industry's political power. Since METI lost the nuclear governance functions it gained in the 1990s, it is therefore in search of new causes to champion, a search that may well play out with new drives for industrial policy.

Finally, and soberingly, this is not likely to be the last major natural disaster to hit Japan or any other country that has nuclear power. The five meters that Northeastern Japan moved toward the United States in the 2011 earthquake puts stress on the intersection of that tectonic plate and the two others beneath Tokyo. All other magnitude 9 or above earthquakes in the past 100 years have been accompanied by volcanic activity—except in Japan, so far. Climate change also increases the possibility that super-storms will exceed recent historical records, and melting ice caps can also potentially threaten low-lying American and European nuclear plants, as the 2012 Hurricane Sandy and 1999 flooding of a French nuclear plant portend. Lessons from Fukushima—not only technical, but organizational and political—should not go to waste.

Notes

1. For example, Germany immediately moved to eliminate its dependence on nuclear power.

2. For examples of this thrust of scholarship, see Rosenthal and Kouzmin (1991), Farazmand (2001), and Comfort (2007).

3. Chernobyl was the only other level 7 nuclear accident, although it released approximately six times more radioactive material than Fukushima, since Chernobyl was an explosion of an active reactor with no concrete containment vessel.

4. For a detailed and systematic comparison of the four plants, see Ohmae (2012). See also Lipsy, Kushida, and Incerti (2013).

5. In fact, METI's plan for nuclear power just before March 11 called for increasing Japan's 54 reactors in 2010 by more than 14 by 2030.

6. This was an "Article 15" event, as stipulated in the Nuclear Emergency Preparedness Act.

7. For many of these accounts, see Samuels (2013).

8. Yoshida later stated that without that operations center, they would have "had their hands up." Senior NISA officials also stated that without it, all six reactors might have been lost (Funabashi 2012a: 29).

9. Kaieda later testified to a Diet investigation commission that it took time to get Kan's understanding and agreement to declare the emergency.

10. The Ministry of Internal Affairs and Communications had actually recommended to NISA that the offsite center have a radiation filter, but NISA did not implement this recommendation (Funabashi 2012a: 57–58).

11. Minister of Defense Kitazawa Toshimi was criticized by Kan's aides in the Prime Minister's Office for his judgment that the president of a single private company should not tie up the much-needed resources for the Tohoku recovery (Funabashi 2012a: 395).

12. In his memoir, Kan writes that he was frustrated that to every question he would ask of TEPCO, the reply was they would check with headquarters. Then, in response to the answer, he would ask a follow-up question, to which the employee would say they had to check with headquarters. In the first day of the crisis, Kan reports not getting any clear answers as to who was in charge (Kan 2012).

13. Kan reportedly expressed some concern about the trip, noting that many were opposed. He also expressed concern that his trip not detract from the rescue effort from the tsunami, pointing out that he would be riding a small but fast helicopter that would not interfere with major logistics operations (Funabashi 2012a: 119).

14. As context, at one point approximately 8,000 people evacuated into Tsushima, a town with 1,400 residents (Funabashi 2012a: 226).

15. Yoshida had worked almost continuously at the plant, only returning home for two nights more than a month after the disaster.

16. DPJ member and Kan's aide, Hosono Goshi, however, had been in touch with plant manager Yoshida directly via cell phone a number of times. Yoshida said that there was still work they could do and they would remain. The political leadership got the strong impression that TEPCO headquarters was not in tune with what was happening on the ground (Funabashi 2012a: 307).

17. According to an interview with Yoshida before his stroke, this was when he took some time to contemplate which of his longtime colleagues he would ask to join him and stay until the very end and perish along with the plant (Kadota 2012).

18. Quotes based on Diet deliberation minutes (Kadota 2012: 47–48).

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