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Beyond Fukushima
A Joint Agenda for U.S.-Japanese Disaster Management

POLICY BRIEF

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The catastrophes that struck Japan on March 11, 2011, created opportunities to improve the capabilities of both the United States and Japan to manage the consequences of future disasters as well as to strengthen the Japanese-American relationship. This paper describes those opportunities and offers a path to realizing them. Our aim is to illuminate how Japan and the United States can learn from each other's experiences coping with past disasters and suggest how they might cooperate to respond more capably when unpredicted disasters strike in the future.

We begin with a short account of efforts to cope with the consequences of the Japanese disaster in 2012, emphasizing challenges and successes in Japan-U.S. cooperation during the first two weeks. We then identify problems that government officials had in dealing with the Fukushima Dai-ichi nuclear disaster and note the similarity with those that occurred during the 2005 response to Hurricane Katrina and other natural and terrorist disasters that have struck both countries. We conclude by recommending an "all-hazards" approach to consequence management that aims to maximize disaster preparedness. While it is not possible to predict the next disaster, many such events share common features, which allows for integrated planning.

The Fukushima Experience

On March 11, 2011, Japan was hit by two disasters, an earthquake and a tsunami, which were unexpected in timing but for which Japan had experience and preparation. Unfortunately, the magnitude of these events dramatically exceeded expectations. At 9.0 on the Richter scale, the earthquake was the fourth-largest in the 111 years for which accurate records are available.[1] The resulting tsunami was not only concomitantly large; it originated only several dozen kilometers off the eastern coast of Japan. Immediately after the quake, forecasters warned that the tsunami height might reach "three meters or more."[2] The tsunami, however, exceeded 15 meters, with maximum heights reaching more than 23 meters in some areas.[3] Together the quake and tsunami killed some 20,000 people.

These disasters triggered a third, little-anticipated disaster: severe damage to three nuclear reactors and four spent fuel pools at the Fukushima Dai-ichi nuclear power station. Disconnected power lines and flooded generators prevented the backup systems from providing cooling to the reactor cores and

spent fuel pools, causing contaminated releases and compelling the Japanese responders to take drastic measures to prevent complete nuclear meltdowns.

Naoto Kan, who was prime minister at the time, endured withering criticism for his handling of the crisis but directed some improved responses. He quickly nationalized crisis response decisions by establishing a joint headquarters with Tokyo Electric Power Co. (TEPCO) and, albeit belatedly, appointed his deputy, Goshi Hosono, to serve in effect as crisis manager. Kan appointed outside technical advisers to broaden the evaluation of options.[4] Unlike in 1995, when Prime Minister Tomiichi Murayama delayed sending the Self-Defense Forces (SDF) to quake-affected areas in Kobe, in 2011 Kan immediately authorized SDF deployment (initially 20,000 and eventually 106,000 troops).[5] Similarly, response times to offers of international assistance, something Japan drew criticism for in 1995, were dramatically shortened in 2011.[6]

Common Problems

The traumas of Fukushima Dai-ichi and Hurricane Katrina were fraternal twins not only in their size and complexity, but also to the extent they were not accurately anticipated. The possibility of a hurricane hitting New Orleans was long considered, but as in Japan, the extent of the damage from Hurricane Katrina was beyond expectation. Most significantly, the initial natural disaster, as with Fukushima, also led to a second disaster when it collided with a man-made system: a breach of levees that protected the city from the Mississippi River.[7] This section focuses on the overlapping lessons from these two disasters.

Both the United States and Japan had learned from prior disasters. After the 1995 Hanshin-Awaji (Kobe) Earthquake, for example, Japan instituted new seismic standards,[8] retrofitted buildings, implemented early warning systems, revamped its disaster preparedness education system for citizens and strengthened the Cabinet Office's disaster response coordination.[9] Also relevant were responses to the 1995 Aum Shinrikyo sarin attack on the Tokyo subway system and other traumatic Japanese experiences, as well as analogous American ones such as the Three Mile Island (Pennsylvania) nuclear accident, the *Exxon Valdez* and BP Deepwater Horizon oil spills, the 9/11 and anthrax terrorist attacks and hurricane responses in Florida, Mississippi and other U.S. states.[10]

Of course, Japan and the United States have significantly different political systems, planning practices and national cultures. We do not think, however, that this diminishes the value of a cross-cultural assessment. To the contrary, these differences make the appearance of common problems all the more suggestive of issues likely to arise in a great range of situations. A cross-national study also can highlight opportunities for better international cooperation.

Among the painful common experiences, six issues particularly demand attention:[11]

Situational awareness was grossly inadequate. Authorities did not fully comprehend these disasters in their first hours and did not completely understand them even, for example, 100 hours after the catastrophes began. Both events obliterated much of the existing information collection equipment, emergency response centers and processes on which disaster management systems depended.[12]

Required assistance was poorly defined and uncoordinated. Requests for assistance were conveyed through whatever channels came to hand and, in the first days, were not effectively prioritized either among local officials or between local and national authorities.[13] Supply rather than demand drove aid decisions. Resources – some useful, some irrelevant and some even burdensome – were forced into a constricted system with little ability to match aid to need.[14] Many anticipated rescue resources were within the disaster zone and therefore unavailable.[15]

Relationships between national and local authorities and between government and private entities were not well delineated in some cases, and were overly rigid in others.[16] Distrust, contention and competition proliferated.[17] Ad hoc "workarounds" were invented, and these undermined response[18] until some trusted personalities could be designated and procedures were idiosyncratically constructed.[19]

Evacuation plans and procedures were hotly debated, flawed in their implementation and later severely criticized. The two situations imposed quite different evacuation requirements: Katrina's evacuation was conducted largely in advance of the approaching hurricane, and Fukushima's with short warning and for the most part after the tsunami and radiation release. In both instances, however, evacuation procedures were unsatisfactory. Evacuation efforts in Louisiana were later described as characterized "by a lack of coordination, by governmental complacency, and at times by utter dereliction of duty" resulting in "incomprehensible and unnecessary suffering, deprivation and even loss of life."[20] The Diet report on the Fukushima accident is similarly searing in its conclusion about evacuation: "The Commission concludes that the government effectively abandoned their responsibility for public safety."[21]

Public distrust and alienation from government were widespread. Lack of timely disclosure and contradictory statements during the first days of the crisis fed confusion and the consequent perception that officials did not have, or withheld, information required to advise the public accurately.[22] As a result, self-assessment of risks (for example, in Japan with personal Geiger counters) and unwise choices by members of the public proliferated.[23] In New Orleans, tension was particularly strong between residents and evacuees, on the one hand, and law enforcement authorities on the other.[24] Lack of communication before the crisis about risk preparedness and mitigation exacerbated public distrust. Risk communications and interaction with the public before the incidents could have helped both the government and the public to communicate more effectively after the events.

Longer-term issues of environmental restoration and health rehabilitation (including mental health rehabilitation) were as consequential as short-term issues of damage mitigation in these disasters but were not well-considered. The governments in both cases did not readily recognize, prioritize or plan for these issues, instead focusing planning on immediate issues.[25]

Joint Corrective Action

To help ameliorate the preceding commonalities in disaster response, we recommend the following seven steps:

1. The United States and Japan should prioritize an all-hazards approach in their national planning. The natural tendency after an event is to focus narrowly on "lessons" that will be applicable if a similar event occurs in the near future. This is necessary and valuable, as when Japan moves to create a stronger and separate nuclear regulatory agency[26] and both public and private groups in the United States advance recommendations for strengthening U.S. nuclear facilities in light of the Fukushima experience.[27] However, alongside these efforts are broader lessons, applicable to a wide range of accidents.

An all-hazards approach would begin by emphasizing that each catastrophe presents opportunities to learn by inference about traumas the United States has not yet experienced, even when these traumas may be of a very different kind.[28] The United States does not, for example, have experience responding to a terrorist's aerosol biological attack that might affect a wide area. Extrapolation from experiences in Fukushima, Katrina and elsewhere can give the United States great insight into the problems that

situation would pose. These include comprehending what damage and contamination may have occurred, how evacuation decisions can be managed and mismanaged, how communications with the public may be facilitated or hobbled and what the challenges of restoration will be.

Moreover, Fukushima is a reminder that catastrophes often do not come in neat categories. Separate response systems designed for earthquakes, tsunamis and nuclear incidents are confused, and in some respects crippled, when they are forced together in the wake of catastrophe. Good planning needs to consider several together as well as each alone.[29]

Beyond this, we note that disasters, which at first may appear to be of one variety, often turn out to be something quite different than was initially imagined. For example, the anthrax used in the 2001 attacks was initially thought to be naturally occurring but later understood to be the result of bioterrorism. An all-hazards approach improves performance when a transition must be made between one theory of an event and another one, as it aims to optimize planning irrespective of the specific nature of the disaster.[30]

Finally, we observe that systems built to respond to narrowly defined risks tend to fall into disrepair when those risks do not materialize. An all-hazards system can perform better because it performs more often. Men and women within it have more experience working together. These systems attract and sustain more funding and more talent.

2. Japan and America should together plan a more internationally integrated and flexible response to natural and terrorist catastrophes. U.S.-Japanese military planning has evolved during the half century of the two countries' joint defense treaty. The Fukushima experience shows both the value of that effort and the limitations of centering that planning exclusively on military contingencies. The two countries' militaries became the most competent of the cooperative agencies, but this posed problems integrating this competence with civilian agencies and applying it to problems different from planned-for military contingencies. For example, as in Katrina, some senior military officers resisted civilian direction and some civilian leaders were wary of introducing military action, resulting in less-effective responses. As another example, military planners focused before Fukushima on crises that could lead to an evacuation to Japan (presumably as a result of a Korean contingency), not evacuations from Japan or within it due to crises that occurred on Japanese territory. Due, in part, to inadequate planning, the separate Japanese and American military systems confronted unexpected issues of evacuation within Japan or possibly from Japan. As one Japanese review concluded, "… the mechanism for bilateral cooperation between the United States and Japan remained highly inadequate… building a new and comprehensive mechanism for such cooperation was an urgent issue."[31] Joint efforts require greater systems integration and interoperability, both among Japanese agencies and between Japan and the United States. Joint planning can also yield benefits, as outsiders can sometimes make statements and press issues that insiders cannot, giving operators in both systems the benefit of seeing problems and possibilities through fresh eyes.[32]

3. A U.S.-Japanese team should study common problems and responses in Fukushima and Katrina. Both countries have done admirable work assessing these catastrophes.[33] But the analytic studies drawing general lessons from each of them need to be reviewed in contexts that consider both disasters together. This effort should be the first step in the joint all-hazards approach recommended above.

4. It is critical to study, and in some instances resolve, inconsistencies in Japanese and American approaches to disaster avoidance and consequence

management. It is inevitable and appropriate that there will be inconsistencies in national approaches to disaster response. However, these inconsistencies merit more reflection. When two sophisticated governments arrive at two different ways of doing things, each should ask whether the other has taken an approach that offers improvements. Though American systems tend to be hermetic, the United States can learn a lot by looking abroad.

For example, Japan emphasizes citizen training and citizen response more than the United States.[34] Japanese children regularly participate in emergency drills at school and practice what to do in the event of an earthquake or evacuation. In addition, Japanese adults and children are more disposed to wear masks in public when they have a cold or other contagious illness. Due to the high levels of training in cardiopulmonary resuscitation (CPR) among the citizens of Osaka, Japan, victims of cardiac arrest there are many more times likely to survive than are victims in New York City, where such training is less prevalent.[35] On the other hand, the United States enacted a system of response to oil spills in the Oil Pollution Act of 1990 that defines the relationships between private firms and public authorities.[36] No such legislation exists in Japan, but it might be considered in the wake of difficulties between the Tokyo Electric Power Co. – the operator of the Fukushima nuclear plant – and Japanese national authorities.

Beyond this, it is important to recognize that inconsistencies between Japanese and U.S. approaches will create gaps that reduce the effectiveness of consequence management. For example, Japan scrutinizes the backgrounds of its nuclear contractors less than the United States does.[37] Both nations have a responsibility under Security Council Resolution 1540 to "take and enforce effective measures to establish domestic controls to prevent the proliferation of nuclear, chemical, or biological weapons and their means of delivery."[38] If a terrorist attack on a nuclear reactor emanated from a Japanese contractor and had global consequences, how would Japan defend its lesser standards? Or as another example, what is the sense of the United States considering restrictions on publication of biological information if the same information is freely publishable in Japan?

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Inconsistencies in the U.S. and Japanese approaches to disaster response also impede cooperation. For this reason, they should be avoided or at least recognized in advance. The problems of evacuation after Fukushima provide an example of the tensions that can arise. The Japanese evacuation zone was defined as the area 20 to 30 kilometers from the nuclear plant, while American officials set the zone at 80 kilometers.[39] Since large numbers of American citizens lived alongside Japanese citizens, the different standards created consternation: Could one constituency be told one thing and the other another?

5. The United States and Japan should improve the sharing of standby stockpiles of drugs, vaccines and other emergency supplies. Each nation must have an incentive to do its own investing and each should recognize that if both face a common emergency (for example, a highly contagious disease) they may not be able to share. But many emergencies are likely to be local. And in some situations the interests of both nations may best be served by concentrating resources in one, as, for example, when a contagious outbreak might be contained at its source.

Efforts were made to supply American stocks of potassium iodide pills to those possibly exposed to radiation from Fukushima. However, when speed was of the essence, American suppliers did not share pills because they demanded indemnification against risk and Japanese officials determined that this would require legislation. After the event, Japanese officials stated that they had built potassium iodide stockpiles to the point that legislation was no longer needed.[40] This approach, however, represents a failure of forethought, attributable to the absence of all-hazards thinking. Though the particular need for potassium iodide may not recur, other requirements will arise – such as the need for other types of medication – and the legislative need will recur. Joint stockpile planning should identify and diminish, if not remove, legal and logistical impediments.

More ambitiously, joint planning may also illuminate opportunities for economies from joint purchasing or enhanced effectiveness by concentrating stockpiling of some supplies in one or the other country but with understandings about use in both. Smallpox vaccine is, for example, a low priority in Japan, but Japan could gain greater protection through an understanding with the United States about distribution of some of its attenuated vaccine in the event of an outbreak.

6. Governmental agencies from both countries should collaborate to improve their tools for predicting contamination dispersal and make them more usable for policymakers and laymen. Several U.S. and Japanese agencies have refined their "fate and transport" models, which estimate the movement of radioactive particles and therefore affect evacuation planning. However, uncertainties about the validity of data entered in the models as well as the multiplicity of models compound decisionmakers' difficulties. Under conditions of considerable stress, policymakers must assess uncertainties and strike a difficult balance between waiting for more data and offering public predictions of contamination dispersal.[41]

After the Fukushima release, Japanese residents in the radiation-affected area did not receive accurate information about the projected path of the contamination, despite data existing precisely for that purpose.[42] As a result, evacuees in some cases based decisions on local knowledge of prevailing seasonal winds, instead of on scientific modeling. Improved communications plans and better information technology solutions, such as mobile phone applications and visualization tools, can help both citizens and policymakers better understand and make better use of model projections, thereby reducing, for example, the chance of avoidable injury during an evacuation from an environmental contaminant.[43]

7. The United States and Japan should expand joint disaster-preparedness exercises. The United States regularly holds exercises with allies and partners to practice responding to a range of threat-based scenarios, in order to help identify weaknesses in joint planning, response and capability. For example, the Able Response 2012 exercises between the United States and the Republic of Korea offered the opportunity for the two countries to test their responses to biological outbreaks, whether natural or man-made.[44] Though the United States and Japan already hold numerous exercises as part of the U.S.-Japan security alliance, they should expand their exercises to include scenarios relating to nuclear, chemical and biological accidents and acts of terror.[45] Exercises employing an all-hazards approach would further strengthen the responses of the involved agencies and help build trust.

Conclusion

The United States and Japan should enhance their cooperation on disaster response. Such coordination would lead to more effective planning, more adequate capabilities, more efficient response in the event of a crisis and, ultimately, improved safety

and security for the people of both nations. In so doing, the two countries should employ an all-hazards approach, drawing lessons from past responses that can apply across a range of crises.

It is possible to find opportunities even in disasters. Indeed, we owe it to those who suffered from Fukushima and Katrina to learn how to improve on past experiences. We owe it to those who may similarly suffer in the future to do everything we can to learn from the past.

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ENDNOTES

1. United States Geological Survey, *USGS Updates Magnitude of Japan's 2011 Tohoku Earthquake to 9.0*, (March 14, 2011), http://www.usgs.gov/newsroom/article.asp?ID=2727&from=rss_home#.T84J1NVrPbY.

2. Japan Meteorological Agency, *Tsunami Information (Tsunami Observation)* (March 13, 2011), http://www.jma.go.jp/en/tsunami/observation_04_20110313180559.html.

3. "Executive Summary of Urgent Field Survey of Earthquake and Tsunami Disasters" (Port and Airport Research Institute, March 25, 2011), http://www.pari.go.jp/en/eq2011/20110325.html.

4. Yoichi Funabashi and Kay Kitazawa, "Fukushima in Review: A Complex Disaster, a Disastrous Response," *Bulletin of the Atomic Scientists*, March 5, 2012, http://bos.sagepub.com/content/early/2012/02/29/0096340212440359.abstract?rss=1.

5. Yoichi Funabashi and Heizo Takenaka, eds., *Lessons from the Disaster: Risk Management and the Compound Crisis Presented by the Great East Japan Earthquake*, (Tokyo: *The Japan Times*, 2011), 138.

6. Niigata Prefecture, which has suffered severe earthquakes and landslides in the past decade, has established more than 4,000 community disaster prevention organizations across the region, each covering approximately 100 families in 30 cities and villages. Jiang Xueqing, "Japan learns lessons from disasters," *China Daily*, November 1, 2011, http://www.chinadaily.com.cn/cndy/2011-11/01/content_14012527.htm.

7. Charles Foti, quoted in Douglas Brinkley's book *The Great Deluge*, stated: "They knew that FEMA could cope with a hurricane. Okay. Maybe but the Bush Administration refused to come to grips with the flood." Douglas Brinkley, *The Great Deluge: Hurricane Katrina, New Orleans and the Mississippi Gulf Coast* (New York City: William Morrow, 2006), 271.

8. Interview with Japanese expert, Washington, September 2012. Many of our observations were developed in interviews conducted throughout the year in the United States and Japan with American and Japanese government officials and experts. Because we wanted to surface rather than resolve issues in these interviews, we conducted them on a non-attribution basis. See also Hideo Tokuyama, "Learning from Japan's Ordeal," *Public Roads*, 75 no. 6 (May/June 2012), http://www.fhwa.dot.gov/publications/publicroads/12mayjune/04.cfm. Tokuyama describes agreements between the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and local construction contractors in Tohoku, pre-dating March 11, 2011, which were put into place to facilitate quick response and recovery after a disaster. Furthermore, regulations that slowed ministry officials' ability to direct immediate road rebuilding in Kobe and to expedite the delivery of needed medical supplies were revamped in the aftermath of that catastrophe. As a result, after the 2011 tsunami, roads in Tohoku were reconstructed and a new medical perimeter was established much more efficiently and quickly than could have been achieved previously.

9. Funabashi and Takenaka, *Lessons from the Disaster: Risk Management and the Compound Crisis Presented by the Great East Japan Earthquake*.

10. These incidents, occurring between 1979 and 2010, represent the broad spectrum of natural and man-made disasters where study could inform future preparedness, They include the partial meltdown of one of the reactors at the Three Mile Island nuclear plant outside of Harrisburg, PA, in 1979; the 1989 *Exxon Valdez* oil spill, caused by a tanker running aground off the coast of Alaska; the 2001 anthrax attacks, which killed five and sickened 17 using anthrax spores sent through the mail; the Matsumoto sarin attack in 1994, in which Aum Shinrikyo cult members released the gas in a residential neighborhood; successive damaging hurricanes Katrina and Rita, which hit the U.S. Gulf Coast in August and September 2005, respectively; and the Deepwater Horizon oil spill in 2010, which killed 11 workers and leaked approximately 5 million barrels of oil into the Gulf of Mexico.

11. There were also some differences. For example, law and order, a large problem after Katrina, was not a significant problem after Fukushima. Yoichi Funabashi observes: ". . . not a single incident of rioting occurred in the wake of the catastrophe." Funabashi and Takenaka, *Lessons from the Disaster: Risk Management and the Compound Crisis Presented by the Great East Japan Earthquake*, 129. Variations like this, perhaps attributable to cultural differences, are worthy of study. We focus here, however, on the commonalities.

12. For example: "Fukushima Prefecture also was unable to conduct emergency monitoring. Only one of the 24 fixed monitoring posts was still working; the others were either washed away or were no longer connected. Mobile monitoring posts were unusable until March 15 due to problems with the mobile telephone network. There was one vehicle equipped with monitoring equipment, but this was also out of action due to a lack of fuel." The Fukushima Nuclear Accident Independent Investigation Commission (NAIIC), *Official Report – Executive Summary* (August 3, 2012), 36, http://naiic.go.jp/en/report/. During Hurricane Katrina, not only were local and state officials – who were responsible for damage assessments during a disaster, according to the National Response Plan (NRP) – overwhelmed, but also, the NRP "did not specify the proactive means necessary for the federal government to gain situational awareness when state and local officials are overwhelmed." Government Accountability Office, *Hurricane Katrina: Better Plans and Exercises Need to Guide the Military's Response to Catastrophic Natural Disasters*, GAO-06-808T (May 25, 2006), 7.

13. Interviews with Japanese experts, Tokyo, April 2012, and Washington, September 2012.

14. As Hurricane Katrina destroyed state and local response capabilities in many cases, federal officials acting in their stead "struggled to perform responsibilities . . . such as the rescue of citizens stranded by the rising floodwaters, provision of law enforcement and evacuation of the remaining population of New Orleans, all without the benefit of prior planning or a functioning State/local incident command structure to guide their efforts." The White House, *The Federal Response to Hurricane Katrina: Lessons Learned* (February 2006), 52, http://georgewbush-whitehouse.archives.gov/reports/katrina-lessons-learned/. Similar difficulties are described in Brinkley, *The Great Deluge: Hurricane Katrina, New Orleans and the Mississippi Gulf Coast*, 266.

15. The Investigation Committee on the Accident at Fukushima Nuclear Power Stations of Tokyo Electric Power Company's Final Report points out that four of the six hospitals in Fukushima that were equipped to provide radiation emergency medical care in response to accidents like Fukushima Dai-ichi were inside the designated evacuation zone, rendering them ineffective. Investigation Committee on the Accident at Fukushima Nuclear Power Stations of Tokyo Electric Power Company, *Executive Summary of the Final Report* (July 23, 2012), 16, http://icanps.go.jp/eng/ExecutiveSummaryOfTheFinalReport.pdf.

16. "There was also no clear guidance about the responsibilities of the related parties in the case of an emergency." The Fukushima Nuclear Accident Independent Investigation Commission, *Official Report — Executive Summary*, 20. In regards to Katrina, see Brinkley, including his recitation of a newspaper comment: "'My biggest regret,' Brown later said, was not getting the governor [of Louisiana] and the mayor of New Orleans to sit down and iron out their differences" and his comment "I am having a horrible time . . . I can't get a unified command established." Brinkley, *The Great Deluge: Hurricane Katrina, New Orleans and the Mississippi Gulf Coast*, 267, 269.

17. The Investigation Committee on the Accident at Fukushima Nuclear Power Stations of Tokyo Electric Power Company's Final Report recounts how at midnight on March 14, 2011, the town officials of Miharu (18,000 inhabitants located 48 kilometers due west of Fukushima Dai-ichi) decided to distribute and issue orders to take iodine tablets to its residents. When Fukushima Prefecture officials learned of the order they issued their own order to suspend the action and recall the pills, citing the fact that the central government had not instructed Miharu to distribute iodine tablets. Miharu refused to comply. The Investigation Committee on the Accident at Fukushima Nuclear Power Stations of Tokyo Electric Power Company, *Executive Summary of the Final Report*, 13-14.

18. See Funabashi, on six "special advisors appointed by the Prime Minister," including two "from his old school." Also see Funabashi on the creation of an "Integrated Response Office," which "had neither responsibility nor authority from a legal standpoint . . . " Funabashi and Takenaka, *Lessons from the Disaster: Risk Management and the Compound Crisis Presented by the Great East Japan Earthquake*, 228, 232. The NAIIC observes that "[s]tarting with the Prime Minister's visit to the Fukushima Daiichi plant, a new route was established to communicate information between the Kantei and Fukushima Daiichi and the head office of TEPCO. This new route was contrary to the official information flow from Fukushima Daiichi to the head office of TEPCO and on to NISA [Nuclear and Industrial Safety Agency] and the Kantei (the Prime Minister's Nuclear Emergency Response Headquarters). The new route required TEPCO to communicate its information not only to NISA but also to the Kantei, contributing to the disruption of TEPCO's response and disorder in the plant." The Fukushima Nuclear Accident Independent Investigation Commission, *Official Report – Executive Summary*, 35.

19. Interviews with Japanese experts, Tokyo, April 2012. In one example from the Katrina response, units that could have reacted faster waited more than a day to respond because their authorizations had not gone through the proper processes and chains of command. As a result of lessons learned, U.S. Northern Command is now designated as a "dual-status" command structure for disasters, allowing a single commander to direct both federal and state forces, improving coordination when responding to crises. Darron Salzer, "Guard, NORTHCOM leadership concept will improve disaster responses," Northcom.mil, March 7, 2011, http://www.northcom.mil/News/2011/030711a.html.

20. Susan Collins, U.S. Senator, statement to the Committee on Homeland Security and Governmental Affairs, U.S. Senate, January 31, 2006.

21. "A total of 146,520 residents were evacuated as a result of the government's evacuation orders. However, many residents in the plant's vicinity evacuated without accurate information. Unaware of the severity of the accident, they planned to be away only for a few days and evacuated with only the barest necessities. Evacuation orders were repeatedly revised as the evacuation zones expanded from the original 3-kilometer radius to 10 kilometers and later, 20 kilometers, all in one day. Each time the evacuation zone expanded, the residents were required to relocate. Some evacuees were unaware that they had been relocated to sites with high levels of radiation. Hospitals and nursing homes in the 20-kilometer zone struggled to secure evacuation transportation and find accommodations; 60 patients died in March from complications related to the evacuation. Frustration among the residents increased." The Fukushima Nuclear Accident Independent Investigation Commission, *Official Report – Executive Summary*, 40.

22. The distrust has had a profound impact on Japan's national energy policy planning, as all but two nuclear plants remain idle, and while the current government has since abandoned its recently announced plan to phase out nuclear power entirely by 2040, widespread opposition to nuclear power remains among the population.

23. Pavel Alpeyev, "Japan Geiger Counter Demand After Fukushima Earthquake Means Buyer Beware," *Bloomberg News*, July 14, 2011, http://www.bloomberg.com/news/2011-07-15/geiger-counters-sell-out-in-post-fukushima-japan.html. Distrust and uncertainty spawned a "Measurement Movement," an initiative by citizen groups to self-measure radiation levels around schools and public facilities. See John M. Glionna, "A year after tsunami, a cloud of distrust hangs over Japan," *Los Angeles Times*, March 11, 2012, http://articles.latimes.com/2012/mar/11/world/la-fg-japan-quake-trust-20120311; and John M. Glionna, "Post-disaster, Japanese are less trusting of authority," *Los Angeles Times*, December 18, 2011, http://articles.latimes.com/2011/dec/18/world/la-fg-japan-distrust-20111218.

24. David Eggers provides an illuminating nonfiction narrative account of the experiences, and alienation, of one New Orleans family. See Dave Eggers, *Zeitoun* (San Francisco: McSweeney's, 2009). Furthermore, according to a Pew Research Center poll conducted in Hurricane Katrina's aftermath, the number of Americans who viewed government as "almost always wasteful and inefficient" grew from 47 percent in December 2004 to 56 percent in September 2005 and "just 27 percent of independents and 24 percent of Democrats said the federal government had done an excellent or good job in responding to Katrina," a significant drop from just a few days earlier. "Katrina Has Only Modest Impact on Basic Public Values," Pew Research Center, September 22, 2005, http://www.people-press.org/2005/09/22/katrina-has-only-modest-impact-on-basic-public-values/.

25. "Of all the issues from the accident, the Commission considers the problem of environmental pollution to be the least addressed." The Fukushima Nuclear Accident Independent Investigation Commission, *Official Report — Executive Summary*, 40. See also the report's conclusion that "[t]he government must establish a detailed and transparent program of decontamination and relocation, as well as provide information so that all residents will be knowledgeable about their compensation options." The Fukushima Nuclear Accident Independent Investigation Commission, *Official Report – Executive Summary*, 22. "The Commission recognizes that the residents also have different decontamination agendas depending on the region, and consideration needs to be given to their demands. Some want to remain in their homeland and actively support decontamination; others want to move away and are requesting compensation to support their relocation. Many residents have a choice and, in these cases, the government must help them make informed decisions. It is time to begin monitoring decontamination cost effectiveness and its effect on the environment, as well as the methods used in the decontamination process. Without in-depth analysis, the major concerns of the residents will remain unanswered: Can they return home? If yes, when? If they return, will they be able to support themselves?" The Fukushima Nuclear Accident Independent Investigation Commission, *Official Report — Executive Summary*, 41. Furthermore, health professionals in the Tohoku region point out that suicide rates are rising among evacuees living in temporary housing facilities due to a sense of hopelessness and separation from their communities. Makiko Segawa, "After The Media Has Gone: Fukushima, Suicide and the Legacy of 3.11," *The Asia-Pacific Journal,* 10 no. 2 (May 7, 2012). Similarly, we note that after Katrina, by December 2006, the Environmental Protection Agency "had spent an estimated $416 million on its hurricane response and, at its peak, employed about 1,600 staff and contractors on response activities," including responding to chemical and oil spills at industrial facilities and "cleanup of a million-gallon oil spill at a facility in St. Bernard Parish, Louisiana, that affected neighboring homes." Government Accountability Office, *Hurricane Katrina: EPA's Current and Future Environmental Protection Efforts Could Be Enhanced by Addressing Issues and Challenges Faced on the Gulf Coast*, GAO-07-651 (June 2007), 4, http://www.gao.gov/new.items/d07651.pdf. Health issues abounded from the disaster as well, as "34 percent of children living in FEMA-subsidized community settings have at least one diagnosed chronic medical condition, a rate one-third higher than that of the general pediatric population in the United States," according to a Columbia University study. David Abramson and Richard Garfield, "On the Edge: Children and Families Displaced by Hurricanes Katrina and Rita Face a Looming Medical and Mental Health Crisis" (Columbia University Mailman School of Public Health National Center for Disaster Preparedness, April 17, 2006), 1, http://www.ncdp.mailman.columbia.edu/files/On%20the%20Edge%20L-CAFH%20Final%20Report_Columbia%20University.pdf. More broadly, Hurricane Katrina "severely strained – the capacity of local health systems and public health departments to manage major population shifts and provider losses and still deliver preventive, chronic and acute care services." Ibid., 4.

26. Prime Minister of Japan and His Cabinet, "Address by H.E. Mr. Yoshihiko Noda, Prime Minister of Japan, at Seoul Nuclear Security Summit March 27, 2012," http://www.kantei.go.jp/foreign/noda/diplomatic/201203/27address_e.html.

27. See Joseph Fitzgerald, Samuel Wollner, et al., "After Fukushima: Managing the Consequences of a Radiological Release" (Center for Biosecurity of UPMC, March 2012), http://www.upmc-biosecurity.org/website/resources/publications/2012/2012-03-07-after_fukushima.html; and Nuclear Regulatory Commission, *Recommendations for Enhancing Reactor Safety in the 21st Century: The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident* (July 12, 2011), http://pbadupws.nrc.gov/docs/ML1118/ML111861807.pdf.

28. Senate and House bills to reauthorize the Pandemic and All-Hazards Preparedness Act passed their respective chambers, but no unified version of the legislation has garnered agreement yet.

29. Not doing so can lead to dangerous technology gaps as well. For example, Japan prided itself on its robotics capabilities, but the robots were not designed to deal with the combination of water, rubble and radiation at the site. This rendered Japan's robot fleet incapable of dealing with many of the most important tasks after the disaster. Sakai Yasuyuki, "Japan's Decline as a Robotics Superpower: Lessons From Fukushima," *The Asia-Pacific Journal*, 9 no. 2 (June 2011), http://japanfocus.org/-Sakai-Yasuyuki/3546. See also Funabashi and Takenaka, *Lessons from the Disaster — Risk Management and the Compound Crisis Presented by the Great East Japan Earthquake*, 245. Fortunately, discussions are now under way between the Japanese and American governments to undertake joint work on development of robotic capabilities for responding to disaster.

30. We note the Diet Commission observation that "[I]f preventive measures against terrorist attacks had been implemented, the accident might have been handled and developed in a different way." The Fukushima Nuclear Accident Independent Investigation Commission, *Official Report – Executive Summary*, 30.

31. Funabashi and Takenaka, *Lessons from the Disaster – Risk Management and the Compound Crisis Presented by the Great East Japan Earthquake*, 251.

32. The Diet Commission concluded that "[t]he Japanese nuclear industry has fallen behind the global standard of earthquake and tsunami preparedness, and failed to reduce the risk of severe accidents by adhering to the five layers of the defense-in-depth strategy." The Fukushima Nuclear Accident Independent Investigation Commission, *Official Report – Executive Summary*, 43.

33. Four major Japanese reviews have assessed the crisis, but little work has analyzed the Japanese failures and successes in the context of similar crises elsewhere. The Japanese government, the Japanese Diet, the Tokyo Electric Power Co. and the Rebuild Japan Initiative Foundation, an independent organization, conducted the studies. See: Investigation Committee on the Accident at Fukushima Nuclear Power Stations of Tokyo Electric Power Company, *Executive Summary of the Final Report*; The Fukushima Nuclear Accident Independent Investigation Commission, *Official Report – Executive Summary*; and Tokyo Electric Power Co., *Fukushima Nuclear Accidents Investigation Report* (June 20, 2012), http://www.tepco.co.jp/en/press/corp-com/release/2012/1205638_1870.html. Though the fourth report, by the independent Rebuild Japan Initiative Foundation's Independent Investigation Commission on the Fukushima Dai-ichi Nuclear Accident, has not been fully translated into English, the organization released an English-language article summarizing the analysis of the full report. Funabashi and Kitazawa, "Fukushima in Review: A Complex Disaster, a Disastrous Response." On the response to Hurricane Katrina, please refer to the following reports: The White House, *The Federal Response to Hurricane Katrina: Lessons Learned*; Government Accountability Office, *Hurricane Katrina: Better Plans and Exercises Need to Guide the Military's Response to Catastrophic Natural Disasters*; and Keith Bea, *Federal Emergency Management Policy Changes After Hurricane Katrina: A Summary of Statutory Provisions,* RL33729 (Congressional Research Service as of March 6, 2007).

34. Bill Stafford, "What Seattle needs to learn from Japan's quake," Crosscut.com, March 14, 2011, http://crosscut.com/2011/03/14/seattle/20716/What-Seattle-needs-learn-from-Japans-quake/.

35. See Towson University-St. Joseph Medical Center Wellness Center, "Cardiopulmonary Resuscitation (CPR) Statistics," http://www.towson.edu/wellness/documents/CardiopulmonaryResuscitationStatistics.pdf; and Taku Iwami et al., "Continuous Improvements in 'Chain of Survival' Increased Survival After Out-of-Hospital Cardiac Arrests," *Circulation*, 119 (January 2009), 728-734, http://circ.ahajournals.org/content/119/5/728.full.

36. 33 U.S.C. § 2701 "Oil Pollution Act of 1990," http://epw.senate.gov/opa90.pdf.

37. Japan is debating whether mandatory background checks should be required for nuclear plant personnel and whether the government should have a role in analyzing the information collected during those checks. A Cabinet Office nuclear security subcommittee proposed both of these steps in February 2012 in response to criticism from the International Atomic Energy Agency (IAEA). "National oversight of background checks for nuclear plant personnel proposed by Cabinet Office Nuclear Energy Committee," *Sankei Shimbun*, February 11, 2012, 24. Recent media reports have suggested that Japanese power companies may not have adequately screened nuclear plant contractors for connections to organized crime. "Yakuza labor structure formed base of nuclear industry," *The Asahi Shimbun*, February 2, 2012, http://ajw.asahi.com/article/behind_news/social_affairs/AJ201202020055.

38. United Nations, *Security Resolution 1540* (April 28, 2004), http://www.state.gov/t/isn/73519.htm.

39. Jeffrey A. Bader, "Inside the White House During Fukushima," *Foreign Affairs* (March 8, 2012), http://www.foreignaffairs.com/articles/137320/jeffrey-a-bader/inside-the-white-house-during-fukushima#.

40. Conversation among Richard Danzig, Andrew Saidel and senior Japanese government officials, Tokyo, April 26, 2012.

41. These difficulties are compounded by considerable uncertainty about tolerable radiation dosage levels and variance in these levels for different elements of the population (including pregnant women, children and the elderly). "After the accident, the government unilaterally announced a benchmark on dosage without giving the specific information that residents needed, including answers to questions like: What is a tolerable level of exposure in light of long-term health effects? How do health implications differ for individuals? How can people protect themselves from radioactive substances? The government has not seriously undertaken programs to help people understand the situation well enough to make their own behavioral judgments. They failed to explain, for example, the risks of radiation exposure to different segments of the population, such as infants and youths, expecting mothers, or people particularly susceptible to the effects of radiation." The Fukushima Nuclear Accident Independent Investigation Commission, *Official Report – Executive Summary*, 19-20.

42. Data from the System for Prediction of Environmental Emergency Dose Information (SPEEDI) was not released to the public until March 23, 2011. "Japan Failed to Release Radiation Threat Data," Global

Security Newswire, August 9, 2011, http://www.nti.org/gsn/article/japan-failed-to-release-radiation-threat-data/.

43. Social media and information technology are dramatically increasing the amount of information that citizens can communicate with each other after disasters. For a discussion of how this took place on and after March 11, 2011, in Japan, see Miyadai Shinji, *IT Jidai no Shinsai to Kaku Higai, (Earthquake Disaster and Nuclear Damage in the IT Age)* (Tokyo: Inpuresu Japan, 2011).

44. "South Korea Announces Biodefense Exercise," Global Security Newswire, May 11, 2012, http://www.nti.org/gsn/article/south-korea-announces-biodefense-exercise-us/.

45. "In order to guarantee public safety, it is necessary for these agencies not only to respond flexibly in times of crisis, but to raise their crisis management capability through a continuous training regimen." The Fukushima Nuclear Accident Independent Investigation Commission, *Official Report – Executive Summary*, 36.

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Members of the Japan Ground Self-Defense Force and U.S. Army survey schools before the school year began April 21, 2011. Operation Tomodachi was a multinational effort coordinated with Japan to respond to the March 11, 2011 disaster.

(CPL. PATRICIA D. LOCKHART/
U.S. Marine Corps)