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One Year Later: Lessons from Recovery After the Great Eastern Japan Earthquake

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Executive Summary

To assess the Japanese experience, The Heritage Foundation reassembled a team of experts to evaluate Japan's long-term efforts to recover from the Great Eastern Japan Earthquake and to prepare for future catastrophes. Based on extensive literature and interviews with Japanese officials and experts, the team identified four critical areas that affect response to a catastrophe: recovery and resiliency of critical infrastructure, environmental remediation, compensation and disaster assistance, and population resiliency. In each area, the team made key observations, determined findings, and developed recommendations for learning from Japan's experience.

The following key lessons learned are essential for the United States in expanding its capacity to respond to catastrophes.

Recovery and Resiliency of Infrastructure

- *Implement the right transportation investment policy.* A nation's ability to restore critical infrastructure, particularly transportation, largely determines the pace of response to catastrophic disaster and is one of the most critical factors in addressing the needs of the most vulnerable populations in a disaster, affecting both evacuation and delivery of critical goods and services. In the United States, promoting deeper and more efficient investment in transportation infrastructure will require restructuring how the federal government partners with the states, including increasing flexibility in determining requirements and encouraging more private-sector investment and non-tax sources of revenue.

- *Invest in power generation, transmission, and distribution.* Federal and state governments need to adopt measures to ensure the resilience of the U.S.–Canadian electrical grid, especially increasing the capacity and robustness of power generation and transmission to meet projected increases in demand. While electrical power generation has received substantial attention, transmission and distribution are just as important. Developing an adequate transmission infrastructure that provides reserve margins and operating capacity is vital. Government should not pick winners and losers, especially not in power generation. Every type of power plant—natural gas, coal, nuclear, and renewable sources—has a role to play. Government policies should rely on market forces and the private sector's research and development capabilities to provide Americans with affordable and reliable power.

Environmental Remediation

- *Realize that all remediation is local.* Developing a remediation framework before an event occurs would clearly help to mitigate the challenges by moderating expectations, establishing requirements for survey and monitoring, and establishing ways and means to mitigate the effects of hazardous materials. Therefore, learning from events in other countries in which different techniques and technology were used is essential, with the understanding that "what works in one country under certain conditions does not automatically work well in another country under the same or different conditions." Successful remediation requires deciding what to clean up, how and when to clean

it, and who will do the cleaning. A clear strategy is needed.

- *Closely study the Japanese experience and apply appropriate "lessons learned."* The federal government should review its nuclear remediation plan to ensure a clear chain of command and list of responsibilities for each applicable agency and locality. While the U.S. should closely study the results of the Japanese experience, it should regularly review and update its plans to incorporate changes in best practices and to ensure a clear chain of command to prevent redundant or counterproductive actions during remediation.

Disaster Assistance and Compensation

- *Do not become dependent on Washington.* Compensation models and procedures for implementing them under the conditions imposed by a mass catastrophe will be greatly influenced by numerous post-event factors, including the nature of the disaster, perceptions of liability, cultural and economic factors, and the extent of losses. In the wake of a disaster, enormous political pressure will likely be applied to script procedures to meet the perceived needs at the time. The best way to deal with the challenges and heart-wrenching losses of large-scale disaster is to put in place a framework before the event. In other words, the best strategy is to have a robust system for disaster compensation in place that places a maximum premium on individual responsibility.
The first step in addressing this issue is to ensure that unique compensation programs are limited to truly unique and catastrophic events and do not set a precedent for handling "normal" disasters. This is a particular concern in the United States, where the increasing frequency of federal disaster declarations is creating a new entitlement mentality that the federal government must play a larger role in recovery from any disaster.

Population Resiliency

- *The American people are the best responders.* After a disaster, fear, anxiety, and mistrust can undermine the resiliency of the population more than physical destruction. There will likely never be enough mental health professionals to address the wide range of needs that appear after a catastrophic disaster. Thus, implementing measures to enhance the resiliency of the population beforehand and identifying means for self-help during and after a crisis are vital. Building strong, caring communities and establishing means for people to take care of themselves after a disaster are the best ways to mitigate the demand for mental health assistance after a catastrophe.

Before Disaster Strikes

In addition to these recommendations, this report makes several other important proposals on how to best prepare the American people to cope with catastrophic disasters. In most cases they involve government doing less, not more, and placing the responsibility for caring for communities where it belongs—on the communities themselves. The proposals reserve to the national government the responsibilities that only the national government can fulfill, focusing its activities on the most efficacious activities, rather than the most politically expedient acts.

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Abstract

The lessons from the Great Eastern Japan Earthquake are much the same as those the United States should have already learned from responding to its own large-scale disasters, including the aftermath of Hurricane Katrina, the Gulf oil spill, and the events of 9/11. A team of experts assembled by The Heritage Foundation has identified four areas that are critical to responding to a catastrophe: recovery and resiliency of critical infrastructure, environmental remediation, compensation and disaster assistance, and population resiliency. Many of the team's recommendations in these areas involve government doing less, not more, and placing the responsibility for caring for communities back on the communities themselves and reserving for the federal government the responsibilities that only the national government can fulfill.

On March 11, 2011, an earthquake rocked the coast of Japan. The quake also generated the largest recorded tsunami in modern Japanese history. The tsunami swept across the northeast coast of Japan causing massive loss of life and destruction, including severely damaging the Fukushima Daiichi nuclear power station, causing a release of radiation into the environment.

In the wake of the disaster, The Heritage Foundation organized a special task force consisting of The Heritage Foundation's homeland security research team and a working group of outside experts. The task force published its report, "The Great Eastern Japan Earthquake: Assessing Disaster Response and Lessons for the U.S,"[1] in May 2011. This report made key observations on critical activities involved in responding to the immediate aftermath of a catastrophe, including preparedness and response, communicating risks, international assistance, and restoring critical infrastructure. In each area the task force made recommendations for preparing for catastrophic events as well as routine disasters in the United States.

One year later, the Japanese effort to recover from the destruction wrought by the Great Eastern Japan Earthquake continues to yield important lessons. Further, the Japanese have dedicated renewed attention to preparing for future disasters. Using recent seismographic data, a research team at the University of Tokyo has concluded that the March 2011 seismic event has increased the risk of a major earthquake in the country's most densely populated metropolitan area. The team calculated a 70 percent probability of a devastating earthquake in Tokyo over the next four years. Such an earthquake would directly and immediately affect 5 million people. Planning for such catastrophic disasters is a daunting challenge. How Japan has chosen to respond is affecting not only the nation's capacity to deal with future disaster, but also the character of its society and its political economy.

Assessing the response to catastrophic disaster of such an advanced economy as Japan is valuable to the United States. Developed nations have superior capacity to prepare for, mitigate, and respond to disasters. As a 2010 study notes, high-income nations respond better to catastrophic disasters than low-income or middle-income countries. Wealthy countries also recover more quickly.[2] That said, there is little cause for complacency. Citizens have high expectations that governments will respond quickly and effectively after a disaster, expectations that could be difficult to satisfy in the wake of a major catastrophe. Affluent societies can best deal with catastrophes by building strong, self-reliant, and resilient communities and by

exploiting the innovative and adaptive capacity of free economies.

To assess the Japanese experience, The Heritage Foundation reassembled a team of experts to evaluate Japan's long-term efforts to recover from the Great Eastern Japan Earthquake and to prepare for future catastrophes. Based on extensive literature and interviews with Japanese officials and experts, the team identified four critical areas that affect the aftermath of catastrophic response:

- Recovery and resiliency of critical infrastructure,
- Environmental remediation,
- Compensation and disaster assistance, and
- Population resiliency.

In each area, the team made key observations, determined findings, and developed recommendations for learning from Japan's experience.

I. Recovery and Resiliency of Critical Infrastructure

A nation's physical assets are the foundation of effective governance, economic vitality, and a resilient civil society. Agriculture, food, water, public health, emergency services, government, the industrial base, information and telecommunications, energy, transportation, banking and finance, and other key assets—such as nuclear power plants, dams, government buildings, and commercial facilities—are vital to everyday life in a modern society. With the massive destruction caused by the earthquake and tsunami, Japan faced daunting challenges in reconstituting critical infrastructure.

Observation #1: The Japanese organized a massive response to re-establish critical infrastructure, particularly essential transportation systems.

The Japanese cabinet office reported that the overall infrastructure damage on March 11, 2011, totaled $44 billion, including damage to railways, roadways, and other transportation hubs, which could not be operated safely or were closed for repairs. In particular, about 76 percent of the highways in the area were closed due to damage. Additionally, approximately 600 miles of Japan's high-speed rail network suspended operation.[3]

Because the destruction was largely limited to northeast Japan, it was possible to deploy resources from other parts of the country to aid in the rebuilding and recovery. If the disaster had been more widespread, the result would have been calamitous.

Immediately after the disaster, the government established an emergency response team headed by the prime minister. Within one day, the Ministry of Defense dispatched assistance, including 110,000 active and reserve troops and 28,000 police. This was followed by an aggressive clearing and reconstruction effort. As a result, almost 100 percent of the affected highways were functional within two weeks. Railways were running after 40 days.[4]

Despite the pace of recovery, vulnerable populations—small children, the aged, chronically ill, the poor, and pets, who are less resilient in the wake of disasters—suffered disproportionately. Difficulty in reaching and evacuating vulnerable populations due to impassable roads was a major challenge.

Finding: A nation's ability to restore critical infrastructure, particularly transportation, largely determines the pace of response to catastrophic disaster and is one of the most critical factors in addressing the needs of the most vulnerable populations in a disaster, affecting both evacuation and delivery of critical goods and services.

After the disaster, there is no substitute for an organized national effort to restore infrastructure in the affected region.[5] However, before the disaster, much can be done to ensure that modern societies can cope with catastrophes. A well-maintained infrastructure with sufficient capacity to meet the nation's needs and a robust commercial construction sector that can surge in response to regional disaster offer the best strategy for mitigation and recovery.

The United States has underinvested in the most important components of the national transportation system, such as infrastructure (e.g., bridges and roads). Some estimates indicate that bringing America's highways up to an acceptable standard would cost an additional $78 billion per year and just sustaining the current level of quality would cost $27 billion per year.[6] More investment in road networks that connect to rail terminals, seaports, and airports is essential to providing the capacity, redundancy, and flexibility required for the free flow of trade and travel. Both intercoastal waterways and the expansion of

1. James Jay Carafano, "The Great Eastern Japan Earthquake: Assessing Disaster Response and Lessons for the U.S.," Heritage Foundation *Special Report* No. 94, May 25, 2011, http://www.heritage.org/research/reports/2011/05/the-great-eastern-japan-earthquake-assessing-disaster-response-and-lessons-for-the-us.
2. United Nations and World Bank, *Natural Hazards, UnNatural Disasters: The Economics of Effective Prevention* (Washington, DC: World Bank, 2010).
3. Ichiro Fujisaki, "Japan's Recovery Six Months After the Earthquake, Tsunami and Nuclear Crisis," lecture at the Brookings Institution, September 9, 2011, http://www.brookings.edu/events/2011/0909_japan_recovery.aspx (accessed March 28, 2012).
4. Ibid.
5. The United States organized just such an effort after the devastating 1964 Easter Earthquake in Alaska. See Dwight A. Ink, "After Disaster: Recovering from the 1964 Alaskan Earthquake," in Richard Weitz, ed., *Project on National Security Reform: Case Studies*, Vol. 1, 2000, pp. 482–521, http://www.pnsr.org/data/files/pnsr%20case%20studies%20vol.%201.pdf (accessed March 28, 2012).
6. American Association of State Highway and Transportation Officials, "Rough Roads Ahead: Fix Them Now or Pay for It Later," 2009, p. 14, http://roughroads.transportation.org/RoughRoads_FullReport.pdf (accessed March 28, 2012).

commercial rail freight offer additional opportunities for expanding the resiliency of U.S. transportation networks.[7]

The management of U.S. transportation infrastructure is highly decentralized. The federal government with its misplaced priorities and pervasive inequities is poorly organized to play a supporting role. For example, Congress spends more than 20 percent of highway trust fund spending (and motorist fuel taxes) on transit systems, which serve only 5 percent of the nation's passengers. The formulas used to redistribute federal fuel tax revenues back to the states are biased in favor of slow-growing states in the New England and Mid-Atlantic regions, which receive larger shares from the trust fund than they contribute. By contrast, states in the Southeast and West, which are growing much faster than the nation as a whole, receive less than they contribute.

Recommendation: In the United States, promoting deeper and more efficient investments in transportation infrastructure requires significantly restructuring how the federal government partners with the states, including increasing flexibility in determining requirements and encouraging more private-sector investment and non-tax sources of revenue.

The U.S. federal highway program should be modified to allow states maximum flexibility in spending their share of federal money allocated to them from the highway trust fund. States should be permitted to spend these funds according to their own transportation priorities, rather than the one-size-fits-all, lobbyist-driven mandates entrenched in federal law. To the extent that the federal government maintains overall goals, they should be limited to congestion mitigation, enhanced mobility, and safety.

States should also be allowed to opt out of the federal highway program in return for a commitment to meet certain obligations. In return for the right to retain all of the federal fuel tax revenues raised within the state, the state would agree to maintain the interstate highway system to a certain standard of quality, meet a series of existing federal safety standards, and forgo the receipt of any federal transportation spending derived from general revenues.

States should be allowed the maximum flexibility in using other fees (e.g., tolls and congestion taxes), public–private partnerships, privatization, competitive markets, and private participation in transit service provision.

Observation #2: The massive reduction in electrical power production affected both the effectiveness of the Japanese response and the entire nation.

In addition to the physical destruction, the loss of electrical power limited Japan's capacity to recover. The shutdown of the Fukushima power station was a huge blow to the recovery effort because it provided a significant portion of the area's power. Further complicating recovery, the Japanese government shut down 43 of Japan's 54 nuclear reactors, which accounted for more than one-quarter of the nation's electricity.[8] In response to a myriad of problems, the Japanese government imposed mandatory cuts of 15 percent on major electricity users.

Japan's dual electrical system exacerbated the challenge of compensating for lost generating power. Rather than a single national grid, for historical reasons Japan has two different power grids, which use different frequencies for transporting electricity. One system was imported from Germany and is in use in eastern Japan, while American technology was installed in western Japan. These two technologies are not compatible with each other and transferring power from one grid to the other is difficult.[9]

Finding: Widespread losses of electrical power are not unprecedented in modern societies.

For example, in the United States the August 2003 Northeast blackout affected Ohio, New York, Maryland, Pennsylvania, Michigan, and parts of Canada. Overall, the blackout cost $7 billion to $10 billion in food spoilage, lost production, overtime wages, and

7. For example, the Federal Highway Administration has concluded that total freight movements across all modes will increase 61 percent from 2010 to 2040. See Edward R. Hamberger, statement before the Subcommittee on Railroads, Pipelines and Hazardous Materials, Committee on Transportation and Infrastructure, U.S. House of Representatives, April 7, 2011, http://www.aar.org/KeyIssues/~/media/aar/Testimony/2011/2011-04-Testimony-SAFETEA-LU.ashx (accessed March 28, 2012).

8. Fujisaki, "Japan's Recovery Six Months After the Earthquake, Tsunami and Nuclear Crisis."

9. Masaaki Shirakawa, "Japan's Great Earthquake: Societal Resilience and Determination to Reconstruct," lecture at the Council on Foreign Relations, Washington, DC, April 14, 2011, http://www.cfr.org/japan/japans-great-earthquake-societal-resilience-determination-reconstruct/p24685 (accessed March 28, 2012).

related costs and affected more than one-seventh of the U.S. population.[10] However, the Japanese experience was far from typical. Japan experienced a widespread, extensive, and prolonged loss of electrical power combined with the destruction of physical infrastructure.

The current fixation on "smart grid" technology (digitally enabled systems that gather and distribute information for suppliers and consumers) is controversial.[11] Further, these technologies, even if effective, would have limited application in coping with long-term widespread catastrophic loss of electrical power.

Although the U.S.–Canadian electrical grid operates differently than the Japanese grids, the U.S. could face similar challenges. For example, the U.S. rail network depends directly on electricity. In turn, America depends heavily on rail to transport fuel, food, and unfinished products. Railroad freight traffic totaled 1.8 billion tons in 2003, much of this coal for power plants. Thus, the rail infrastructure is especially critical for continued power generation, and damage to the nation's railroad system would hamper restoration of a damaged electrical grid.[12] In short, electrical power generation is the linchpin of ensuring resilient critical infrastructure.

By some estimates the U.S. is underfunding modernization and expansion of power generation and transmission by as much as one-third, and the required investment in electrical utilities could total nearly $2 trillion by 2030.[13] Furthermore, the difficulty in obtaining permits to build new infrastructure is impeding much needed modernization.

Recommendation: Federal and state governments need to adopt measures to ensure the resilience of the U.S.–Canadian electrical grid, especially increasing the capacity and robustness of power generation and transmission in line with projected increases in demand.

While electrical power generation has received substantial attention, transmission and distribution are just as important. Developing adequate transmission infrastructure that provides reserve margins and operating capacity is vital.

Government should not pick winners and losers, particularly in power generation. Every type of power plant—natural gas, coal, nuclear, and renewable sources—has a role to play. Policies should rely on market forces and the private sector's research and development capabilities to provide Americans with affordable and reliable power. The private sector can deliver traditional supplies and create new supplies more quickly and efficiently than the government can through mandates, regulations, and subsidies. Government should focus on reducing onerous regulations and eliminating subsidies.

Observation# 3: The disaster significantly affected Japanese trade and the global supply chain.

The earthquake and tsunami disrupted many sectors of Japanese manufacturing. Compounding these challenges, the government's evacuation order after the accident at the Fukushima plant caused other businesses to close. With production halted, wholesalers and manufacturers turned to suppliers in different regions of Japan and in other countries. Furthermore, some countries placed restrictions on Japanese imports due to fears of radiation contamination. Consumers worldwide proved reluctant to buy Japanese products because of contamination fears.[14] Some manufacturers expressed concern over whether

10. CNN, "Major Power Outage Hits New York, Other Large Cities," August 14, 2003, http://www.cnn.com/2003/US/08/14/power.outage (accessed April 6, 2012), and Electricity Consumers Resource Council, "The Economic Impacts of the August 2003 Blackout," February 9, 2004, http://www.elcon.org/Documents/EconomicImpactsOfAugust2003Blackout.pdf (accessed November 9, 2010).

11. Peter Behr, "Debate Continues on Smart Grid Benefits Versus Massive Costs," *Scientific American*, May 25, 2011, http://www.scientificamerican.com/article.cfm?id=debate-continues-on-smart-grid-benefits-versus-massive-costs (accessed March 28, 2012).

12. Commission to Assess the Threat to the United States from Electromagnetic Pulse Attack, "Report of the Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack," Vol. 1, "Executive Report," 2004, p. 107, http://www.empcommission.org/docs/empc_exec_rpt.pdf (accessed November 9, 2010).

13. Mark W. Chupka, Robert Earle, Peter Fox-Penner, and Ryan Hledik, "Transforming America's Power Industry: The Investment Challenge 2010-2030," Edison Foundation, November 2008, p. vi, http://www.eei.org/ourissues/finance/Documents/Transforming_Americas_Power_Industry.pdf (accessed March 28, 2012).

14. Shinichi Ishii, Juri Yanagisawa, Kazuyuki Kobayashi, and Michihiro Konagai, "Measures for Dealing with the Effects of the Great East Japan Earthquake on International Transportation Tourism and Logistics," Nomura Research Institute *Paper* No. 168, December 1, 2011, http://www.nri.co.jp/english/opinion/papers/2011/pdf/np2011168.pdf (accessed March 28, 2012).

customers would return to suppliers in the disaster area.[15]

The negative consequences of disruptions extended far beyond Japan. For example, according to one study, "Toyota slowed down some North American production as most parts for Toyota's North American-built vehicles come from about 500 suppliers in Japan."[16]

Finding: Sound risk management, disaster recovery, and business continuity planning remain vital tools for dealing with disasters.

Today's global supply chain depends on quick and reliable delivery of goods. The reputations of manufacturers and service providers depend on ensuring that products arrive safely, securely, and on time. Large-scale disasters in modern nations often affect national economies and the global supply chain in unanticipated ways. The massive, complex, and often nonlinear system of global trade defies hierarchical management and attempts to predict all of the significant consequences of large-scale disasters.

Failure to undertake preparedness measures can dramatically affect businesses in the United States just as Japanese businesses were affected by the earthquake and tsunami. Even smaller-scale incidents can have a dramatic impact. For example, according to a 2005 study, a terrorist attack on the New York City electric system that disrupts the electrical supply for just 20 hours could cause $1.2 billion in business costs and loss of life.[17] No business should risk operating without disaster and business continuity plans.

In the United States, business preparedness is particularly critical for small and medium enterprises. A disaster often has the most significant effect on small businesses. The U.S. Department of Homeland Security quotes an estimate that one-fourth of companies do not reopen after a major disaster, and other estimates are even higher.[18] In the U.S., nearly all independent businesses employ fewer than 500 workers. Together, they account for more than half of the American workforce. These workers and their companies are the backbone of the U.S. economy. On average, they create about two-thirds of all new jobs.

In a disaster, small businesses are also the most vulnerable. They usually have just one location and lack a backup location for operations and the cash reserves to weather long business disruptions. They do not store files, records, or other critical data off-site. They often lack a disaster or contingency plan to ensure continuity of operations if they need to close temporarily, cannot obtain supplies, or cannot be reached by their customers if their customers run out of money to buy from them.

Relying on federal assistance after a disaster, rather than preparing for contingencies, exacerbates the vulnerabilities of the private sector. For example, in the aftermath of 9/11, government agencies issued almost $1 billion in small-business loans. This proved to be a grossly inefficient response. Emergency lending often falls victim to fraud and abuse. Moreover, it is ineffective in a truly catastrophic disaster in which hundreds of thousands of lives are lost and business is severely disrupted over a wide geographic area. Within the United States, government efforts to expand the number of disaster declarations and benefits for victims are providing perverse incentives for Americans to be less prepared.[19]

At the national level, the U.S. is not adequately prepared to deal with complex disruptions on the scale experienced in Japan. In January 2012, the White House released its long-awaited "National Strategy for Global Supply Chain Security."[20]

15. Ibid.
16. Behzad Behdani, "Japanese Catastrophe and the Dark Side of Global Supply Chains," Next Generation Infrastructures, June 2011, http://www.nextgenerationinfrastructures.eu/index.php?pageID=5&itemID=564591 (accessed March 29, 2012).
17. Rae Zimmerman, Jeffrey S. Simonoff, and Lester Lave, "Risk and Economic Costs of a Terrorist Attack on the Electric System," presentation at CREATE (Center for Risk and Economic Analysis of Terrorism Events) Economics of Terrorism Symposium, August 19, 2005, slide 32, http://create.usc.edu/assets/pdf/51818.pdf (accessed March 29, 2012).
18. U.S. Department of Homeland Security, "Ready Business Mentoring Guide: Working with Small Businesses to Prepare for Emergencies," April 25, 2006, p. 6, http://www.ready.gov/business/_downloads/mentor_guide.pdf (accessed March 29, 2012).
19. For example, see David B. Muhlhausen, "Disaster Response: Disaster Loan Fairness Act of 2011," testimony before the Subcommittee on Economic Growth, Tax and Capital Access, Committee on Small Business, U.S. House of Representatives, February 16, 2012, http://www.heritage.org/research/testimony/2012/02/disaster-response-disaster-loan-fairness-act-of-2011, and Matt A. Mayer, "Congress Should Limit the Federal Abuse of FEMA," Heritage Foundation *WebMemo* No. 3466, January 24, 2012, http://www.heritage.org/research/reports/2012/01/congress-should-limit-the-presidential-abuse-of-fema.
20. The White House, "National Strategy for Global Supply Chain Security," January 2012, http://www.whitehouse.gov/sites/default/files/national_strategy_for_global_supply_chain_security.pdf (accessed March 29, 2012).

However, the six-page report does little to lay out a comprehensive strategic plan for supply chain security, instead providing only a basic vision for future planning and implementation. While the basic goals of the strategy may be sound, they are an inadequate foundation for working with international and private-sector partners in taking a risk-based approach to supply chain resilience.

Global dependence on the supply chain will only grow in the coming years as free-market advancement and globalization help to drive the continued opening of markets. In fostering greater security, the U.S. should work with its partners to develop a risk-based approach to supply chain security that respects the complexities of the U.S. supply chain.

Recommendation: Government policies that encourage preparedness, rather than emphasizing national-level planning, are more effective in enhancing business continuity and supply chain resilience.

It is particularly vital that the Department of Homeland Security reach out to small companies and encourage them to prepare before the next disaster strikes. The government should support the Voluntary Private Sector Preparedness Accreditation and Certification Program (PS-Prep), managed by the Federal Emergency Management Agency (FEMA). This program covers both disaster and business continuity. PS-Prep awards private entities an emergency preparedness certification through an accreditation system organized with the private sector.[21]

Furthermore, the best way to encourage the private sector to become more prepared is to insist that it become more self-reliant. The U.S. government should reduce the number of disaster declarations issued. The increase in declarations has left FEMA stretched too thin and, therefore, unprepared for catastrophic disasters. For a state or local government to receive a declaration, the disaster must rise to a level that truly overwhelms state and local capabilities. Raising the bar on declarations (or adhering to current law) would encourage FEMA to focus on preparing for and responding to national catastrophes.

Simply issuing directives from government is the wrong answer to promoting supply chain resiliency at the national level. The complexities of the global supply chain require that the U.S. acknowledge that a whole-of-government approach is clearly inadequate; nor is placing burdensome and misguided mandates and regulations on industry and service providers the answer. Rather, stakeholder engagement is critical. The U.S. national strategy calls repeatedly for the federal government to work with stakeholders throughout the supply chain: state and local governments, the private sector, and the international community. This outreach is essential.

Observation #4: The physical destruction from the earthquake and tsunami significantly disrupted Japanese maritime infrastructure.

Prior to the 1995 earthquake the port of Kobe was one of the busiest ports in East Asia. However, after the earthquake, traffic was diverted to alternate ports and not all traffic has returned because some businesses have also left the area.[22] Yet businesses have begun to recover, and shipping is returning to the area, in part because of repairs to the port.

However, in addition to the physical destruction to port facilities, the tsunami washed away most of the containers stacked at the Sendai–Shiogama port and damaged the contents of others. This has raised disposal questions because the companies that own the containers have filed insurance claims, but it is unclear who is responsible for removing them. The shipping industry has feared such an incident ever since the legal environment became "increasingly demanding with rising claims, disproportionately high clean-up costs and the near impossibility of disposing or recycling of a wreck thanks to the restrictive legal regime now imposed by the 1996 Protocol to the London Dumping Convention and the OSPAR Convention."[23]

21. First implemented in 2010, the standards for PS-Prep drew from guidelines developed both in the United States and overseas. They include the NFPA 1600 (*Standard on Disaster/Emergency Management and Business Continuity Programs*), the British Standards Institution BS 25999:2006-1 (*Code of Practice for Business Continuity Management*), BS 25999: 2007-2 (*Specification for Business Continuity Management*), and the ASIS International SPC.1-2009 (*Organizational Resilience: Security Preparedness and Continuity Management System—Requirements with Guidance for Use*). Participation in the program is voluntary. By law, small businesses receive special consideration. See Mark Sauter and James Jay Carafano, *Homeland Security: A Complete Guide to Understanding, Preventing, and Surviving Terrorism* (New York: McGraw-Hill, 2012), p. 433.

22. Ishii et al., "Measures for Dealing with the Effects of the Great East Japan Earthquake."

23. "Shipping Industry Faces Its 'Deepwater Horizon Moment.'" *The Maritime Executive*, January 12, 2012, http://www.maritime-executive.com/article/shipping-industry-faces-its-deepwater-horizon-moment (accessed March 29, 2012).

The disruptions to the Japanese maritime infrastructure have rippled throughout the global supply chain. An independent shipping association concluded that container shipping was "impacted by lack of exports from the Japanese factories, causing liner companies to leap-frog Japanese ports on their trans-Pacific trading lanes."[24]

Finding: Global trade heavily depends on maritime trade. Significant disruptions will affect the national economy, global commerce, and the pace of long-term recovery. A large-scale incident that damages several maritime nodes is particularly challenging because it limits the capacity to shift the flow of trade from one port to another.

Given that 90 percent of U.S. trade travels by sea, disruptions on the scale of those in Japan could have a similar effect in the United States. The U.S. lacks adequate capacity to respond to a maritime catastrophe. The U.S. Maritime Infrastructure Recovery Plan noted "over 2,100 possible threat scenarios in hundreds of ports," some with severe consequences. A 2006 RAND technical report described an exercise examining the consequences of a nuclear bomb detonation incapacitating the neighboring ports of Long Beach and Los Angeles, which account for nearly one-third of U.S. imports. RAND estimated that such an attack would cost over $1 trillion.[25]

Even smaller-scale disruptions, such as Hurricane Katrina, demonstrate that port disruptions can cause significant losses. Heavy winds and surge waters damaged shipping and port facilities at the Port of New Orleans, curtailing port operations for four months. According to the June 2007 edition of the *Monthly Labor Review*, port operations lost 3,500 jobs and more than $136 million in wages in the 10 months after the disaster. Cargo volumes were affected for two years. The risk to the U.S. economy from natural and man-made maritime catastrophes should not be ignored.

To respond to these kinds of disasters, the U.S. has a dwindling capacity for salvage operations.[26] The U.S. marine salvage industry has long been in decline. Further, tort issues and other regulatory burdens present additional challenges to marine salvage companies. For example, in the aftermath of the *Deepwater Horizon* oil spill, individuals brought "complaint bundles" for injuries, meaning that any organization involved in the spill was named a defendant. As a result, salvage companies that participated in cleanup efforts have been entangled in costly and prolonged litigation.

The Merchant Marine Act of 1920 (the Jones Act) has also contributed to the decline of U.S. commercial salvage. The act provides that any maritime transport of goods between two U.S. points must be performed by vessels that are built and flagged in the U.S. and crewed by Americans. However, maritime salvage is a global industry. Legislation such as the Jones Act limits competitiveness and efficiencies because it makes accessing the globally available industrial base and worldwide services more problematic.

As commercial marine salvage declines, the U.S. sea services are increasingly called upon to fill the capability gap, particularly during emergencies. However, military capabilities are inadequate. The U.S. Navy maintains a small and aging fleet of salvage vessels that need modernization or replacement. The Coast Guard lacks a substantial salvage capability and faces significant challenges in maintaining its current capacity to conduct emergency response. The U.S. Army Corps of Engineers also plays a roll in maritime salvage, but relies primarily on commercial services, particularly commercial dredging equipment.

Federal policies and programs are not optimized for facilitating maritime salvage during responses to large-scale disasters and mass emergencies. For example, according to a post-disaster study by Captain Richard Hooper of the Navy's Supervisor of Salvage and Diving, when Katrina hit, "the U.S. Government had no pre-staged maritime salvage response plans in place for the major agencies concerned."[27] Issues of integrating efforts at the

24. Peter T. Leach, "Japanese Shipping Stopped by Earthquake and Tsunami," *The Journal of Commerce*, March 11, 2011, http://www.joc.com/maritime/japanese-shipping-stopped-earthquake-and-tsunami (accessed March 29, 2012).

25. Charles Meade and Roger C. Molander, "Considering the Effects of a Catastrophic Terrorist Attack," RAND Corporation, 2006, http://www.rand.org/pubs/technical_reports/2006/RAND_TR391.pdf (accessed April 4, 2012).

26. Maritime salvage includes the equipment and activities that help to restore ports and waterways to working order. Among the critical tasks that salvage assets perform are stabilizing vessels, fighting fires, removing debris, and cleaning up hazardous material. Both private companies and government agencies—primarily the Navy's Supervisor of Salvage and Diving, the Coast Guard, and the Army Corps of Engineers—provide maritime salvage assets.

27. Richard Hooper, "The 'Long Pole' in the Tent of Maritime Security," *The Maritime Reporter*, October 2008, p. 34.

federal level are compounded by the requirement that salvage operations comply with state and local regulations.

Furthermore, the U.S. Maritime Infrastructure Recovery Plan acknowledges that the federal government is unable to manage assets effectively. Among the plan's recommendations are to "[e]stablish an inventory of salvage and firefighting assets maintained" by the Navy Supervisor of Salvage and the Coast Guard and "[c]onduct a thorough gap analysis, comparing available assets to those assets needed to respond effectively to a range of potential terrorist activities."[28]

Recommendation: The U.S. government should take steps to make the U.S. maritime salvage and recovery industry more competitive and better organize federal assets and oversight of recovery efforts from catastrophic damage to maritime infrastructure.

Congress should repeal the Jones Act and other "Buy American" provisions. These laws are often trumpeted as a means to "protect" U.S. industries and ensure that the U.S. has secure sources for critical national security needs, but they usually produce the opposite results. The Jones Act was meant to save the merchant marine industry. Yet in the first 76 years following the act, more than 60 U.S. shipyards closed, eliminating 200,000 jobs. Open competition makes the U.S. stronger and is key to the recovery of the marine salvage industry.

The Administration should implement the recommendations of the federal Maritime Infrastructure Recovery Plan. In particular, government should demonstrate its ability to maintain real-time accurate visibility of military and commercial marine salvage.

Congress should identify, assess, and address the legal and regulatory obstacles that limit effective salvage response to maritime catastrophes. Over the past two decades, the National Research Council has periodically sponsored an assessment of the marine salvage posture in the United States and raised the same concerns again and again, but Congress has done little to address these concerns.

Observation #5: Japan's apprehension about nuclear power is understandable, but closing nuclear plants and rejecting future construction is creating substantial and unnecessary economic hardship.

After the earthquake and tsunami caused equipment failures, meltdowns, and release of radiation at the Fukushima nuclear plant in March, there has been much discussion in the Japanese government and the public about whether to continue producing nuclear power. While Naoto Kan, Japan's prime minister at the time the accidents occurred, aggressively pursued a complete withdrawal from nuclear energy, Prime Minister Yoshihiko Noda has acknowledged its enduring role for Japan. He has not, however, endorsed a new policy. Japan's official post-Fukushima energy policy is scheduled for release in summer 2012. Prime Minister Noda has said that existing reactors would be brought back online as quickly as possible, construction on reactors that began before Fukushima could continue, and exporting nuclear technology would remain a priority. However, he has also stated that Japan should reduce its reliance on nuclear energy and has been vague on policies on new reactor construction.

Before the disaster, 54 nuclear reactors provided 30 percent of Japan's electricity. The Japanese government had planned to increase that portion to 50 percent by 2030 with two new reactors under construction, 12 more planned, and a management strategy that recycles nuclear fuel, which was nearly in the final stage of implementation. Today, only two reactors remain in operation, with work halted on other projects. Only one reactor has been restarted since Japan began shutting down nuclear plants for regular maintenance and post-Fukushima inspections. Japan's remaining operating reactors are scheduled to be shut down for regular maintenance by May. Since reactors are generally not restarted after they are shut down, Japan risks losing most or all of its nuclear power by that time.

Finding: Japan's nuclear policies have significantly affected the national economy and the pace of long-term recovery. Because less than 20 percent of its nuclear power production remains online, it has been forced to dramatically increase fossil fuel imports at the cost of billions of dollars. According to the Japanese government, fuel prices could increase by nearly $40 billion within a year, which translates into increases of $312 per person and $770 per household.[29]

Recovering economically from the March earthquake and tsunami

28. Maritime Security Policy Coordinating Committee, "The U.S. Maritime Infrastructure Recovery Plan for the National Strategy for Maritime Security," April 2006, p. 50, http://www.dhs.gov/xlibrary/assets/HSPD_MIRPPlan.pdf (accessed April 6, 2012).

29. Hiroko Tabuchi, "Japan Quake Is Causing Costly Shift to Fossil Fuels," *The New York Times*, August 19, 2011, http://www.nytimes.com/2011/08/20/business/energy-environment/quake-in-japan-is-causing-a-costly-shift-to-fossil-fuels.html (accessed October 31, 2011).

will be challenging just by itself, but adding more barriers to recovery by shutting down a major source of affordable energy makes little sense. According to the Japan Center for Economic Research, shutting down all of Japan's nuclear plants over the next year will cause a 1.2 percent annual loss in GDP, which equates to ¥7.2 trillion ($94 billion) in annual losses.[30] The Japanese government estimates that shutting down all of the nuclear power plants would result in a 10 percent power shortage and a 20 percent increase in electricity costs. Given that Japanese industry accounts for 40 percent of the country's electricity use, such a shortage and price increase would prove extraordinarily harmful not only to industry, but also to consumers who will see the costs passed down to them.[31]

In order not to repeat the mistakes of Japan and undermine confidence in U.S. nuclear power, the U.S. needs to apply the appropriate lessons learned. However, the problems facing the Japanese system of nuclear regulation do not necessarily hold true in the U.S. Although the Nuclear Regulatory Commission is responsible for setting and enforcing safety guidelines in the U.S., plant owners have primary responsibility for operations. Ultimately, plant owners benefit financially from safe operations. This combination of federal and private regulation creates a complementary regulatory system that promotes safety from the macro, federal level down to the individual plant employee.

On the other hand, the United States needs to reform its nuclear waste management policy. By placing the federal government in charge of waste management instead of leaving the responsibility to waste producers, the current system misaligns authorities and responsibilities. Waste producers have little incentive to develop an economically rational and sustainable nuclear waste management plan. Furthermore, the federal government is not the proper entity to manage used nuclear fuel. The government responds to political and bureaucratic signals, not to economic or market signals. This system has led to an unpredictable, incoherent, and failed spent-fuel policy.

Recommendation: In the United States, the federal regulatory authorities have correctly begun reviewing operations at U.S. nuclear plants as an early lessons-learned exercise. They are not only attempting to learn from the Japanese experience, but also rethinking the assumptions underlying current safety standards. While this rethinking is entirely appropriate, in the near term the U.S. should implement only those policy changes that address specific, verified deficiencies that affect U.S. plants.

One key step to ensure the continued robustness of the U.S. nuclear industry is to address the failed waste management policy immediately. Ultimately, the responsibility for waste management needs to be removed from the federal government altogether. Not only has the Department of Energy failed, but it should never have been placed in charge from the beginning. Instead, waste producers should be responsible for managing the waste they create. One benefit of such a system is that it would create a strong incentive for producers to develop simple-to-manage waste streams and economically efficient waste-management techniques. The result would be a comprehensive approach in which fuel production, plant operations, and waste-management elements work together. The federal government's role would be to provide predictable regulations that allow the market to work efficiently while maintaining public health and safety.[32]

30. Japan Center for Economic Research, "Full Nuclear Shutdown Would Cost Economy Y7tln a Year," June 2011, http://www.jcer.or.jp/eng/pdf/m37r_summary.pdf (accessed October 31, 2011).

31. Chikako Mogi, "Analysis: Energy Policy Chaos Threatens Japan's Economy," Reuters, August 4, 2011, http://uk.reuters.com/article/2011/08/04/us-japan-energy-idUKTRE7731GS20110804 (accessed October 31, 2011).

32. Jack Spencer, "Introducing Market Forces into Nuclear Waste Management Policy," testimony before the Reactor and Fuel Cycle Technology Subcommittee, Blue Ribbon Commission on America's Nuclear Future, August 30, 2010, http://www.heritage.org/research/testimony/introducing-market-forces-into-nuclear-waste-management-policy.

II. Environmental Remediation

Every large-scale disaster usually has some type of noteworthy environmental impact. Hazardous threats can take many forms, from the release of contaminents into the air and water to disruptions to the local ecology. In short, nearly every disaster is a hazardous material incident. The release of radioactive material, in particular, raises significant issues and concerns. Therefore, remediation of environmental hazards after a catastrophe will axiomatically be a key issue that affects not only the pace of long-term recovery, but also potentially everything from the national economy to health affairs to cultural and social attitudes.

Observation #6: The Japanese developed a long-term plan to respond to the release of radiation.

On August 26, 2011, the Japanese Diet passed the Act on Special Measures Concerning the Handling of Environment Pollution by Radioactive Materials Discharged by the Nuclear Power Station Accident Associated with the Tohoku District—Off the Pacific Ocean Earthquake That Occurred on March 11, 2011. The act placed the Ministry of the Environment (MOE) in charge of remediation with instructions to work with the appropriate agencies, such as the Ministry of Agriculture, Forestry and Fisheries. It assigned specific roles to each department and established a chain of command. Local governments were to cooperate with the national government and carry out their role in accordance with the natural and social conditions in their particular area to remediate any environmental pollution. The act also called on the owners of the Fukushima plant to deal with the radioactive discharge and cooperate with the measures taken by the national and local governments.

On the same day the Diet adopted the act, the Nuclear Emergency Response Headquarters adopted the "Basic Policy for Emergency Response on Decontamination Work," which outlined the steps of the cleanup program. The steps included conducting a radiation survey, beginning preliminary planning, establishing a remediation plan based on the findings of the radiation survey, applying the remediation measures, and evaluating the effectiveness of remedial measures.[33]

While the government implemented a comprehensive plan, vast challenges remain. In October 2011, the Japanese government estimated that remediation of contaminated areas would cost $13 billion. In addition, a myriad of other challenges still need to be addressed, including dealing with millions of tons of contaminated earth and other materials, mapping the affected areas, and determining the most effective remediation measures. Waste removal and storage or disposal are often the most expensive components of remediation.

Furthermore, widespread fears and confusion remain over the level of acceptable radiation in the environment and the long-term health risks from exposure to low-dose radiation.

Finding: Environmental remediation is a multidimensional and expensive process. A coherent national strategy is essential.

The fact that Japan continues to struggle to implement its polices despite its overarching legislative framework demonstrates the difficulty of dealing with the enormous number of technical, political, and economic issues arising after a major disaster. Clearly, developing a framework for remediation before an event occurs helps to mitigate the challenges by moderating expectations, setting the requirements for survey and monitoring, and establishing the ways and means of mitigating the effects of hazardous materials.

Therefore, it is crucial to learn from previous events in other countries where varying techniques and technology were used, keeping in mind that "what works in one country under certain conditions does not automatically work well in another country under the same or different conditions."[34] Successful remediation requires deciding what to clean up, how and when to clean it, and who will do the cleaning. This requires a clear strategy.

Lessons from previous accidents should be considered, but parallel results are not guaranteed. The remediation process should not be viewed as a series of independent steps that are taken in isolation.

33. International Atomic Energy Agency, "Final Report of the International Mission on Remediation of Large Contaminated Areas Off-Site the Fukushima Dai-ichi NPP," November 15, 2011, http://www.iaea.org/newscenter/focus/fukushima/final_report151111.pdf (accessed March 29, 2012).

34. Ibid., p. 24.

Rather the steps should be thought of as sequential and often complementary, because when formulating a strategy it is paramount to ensure the steps are compatible with one another. Approximately 60 different technologies are available for remediation purposes, and each has different benefits and disadvantages, which are often site specific. It is therefore necessary to test the techniques and technologies before implementing them on a large scale. It is important that they not do more harm than good and that every action be subjected to risk–benefit analysis. This risk–benefit analysis should include the particular action's sociopsychological impact on the local population, not just its technological merits.[35]

In the United States, the Nuclear Regulatory Commission, an independent federal agency, is responsible for the federal government response to a radiation release. The commission's Office of Nuclear Security and Incident Response (NSIR) is charged with coordinating the effort in much the way as the MOE in Japan.

Recommendation: It is vital to closely study the Japanese experience and apply appropriate lessons learned in the United States. The federal government should review its nuclear remediation plan to ensure a clear chain of command and the list of responsibilities for each applicable agency and locality.

While the U.S. should closely follow the results of the Japanese experience, U.S. plans should be reviewed and revised regularly to take advantage of changing best practices and to ensure a clear chain of command that prevents redundant or counterproductive actions during remediation. Such a plan should allow sufficient flexibility to deal with changing ground conditions and include the roles that states and localities are expected to play.

Observation #7: Monitoring and mapping techniques used by the Japanese proved a vital component of the remediation program.

The Japanese conducted extensive radiation mapping before beginning remediation, and it led to the determination of the deliberate evacuation zone northwest of the 20-kilometer exclusion zone. The Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the U.S. Department of Energy jointly mapped the radiation by equipping helicopters with radiation detectors. The helicopters flew at altitudes between 500 feet and 1,000 feet, and their readings were extrapolated to determine the effective radiation dose rate at three feet above the ground. Soil samples were then taken in Fukushima and the five surrounding prefectures. MEXT also began monitoring the oceanic radiation levels in conjunction with the Ministry of Agriculture, Forestry and Fisheries (MAFF) by taking seawater and marine soil samples. Finally, approximately 270 real-time monitoring stations were set up, mostly near schools, to provide constantly updated information. In addition to radiation dose levels, MEXT collected data on the types of radioactive isotopes to best direct the course of remediation. Once data were collected, it was released to the public and continually updated by the real-time monitoring stations as levels changed.[36]

Despite the government's efforts to map risks and convey them to the public, challenges remain. The government's legitimacy in communicating risks came under question early in the crisis. At times, information was understated, inaccurate, and incomplete. Additionally, conflicting information came from other Japanese ministries, the Tokyo Electric Power Company (TEPCO, the utility operating the plant), the International Atomic Energy Agency (IAEA), the U.S. Surgeon General, and the U.S. Nuclear Regulatory Commission.[37] As the crisis demonstrated, confidence in government is difficult to recover once it is lost, no matter how much accurate information is provided in the aftermath of the disaster.

Further complicating the government's credibility were "hot spots." One of the difficulties in mapping radiation is that small hot spots can appear. This is especially true near gutter drainpipes where radioactive material can collect after rain has washed it off a roof.

Finally, even after months of attention and education, concerns over low-dose radiation exposure and the efficacy and appropriateness of remediation measures remain deeply controversial.

Finding: Effective mapping and monitoring must be integrated with an effective risk communication process.

Access to constantly updated, clear, and understandable information is essential. Establishing the means to achieve this is difficult

35. Ibid.

36. Ibid.

37. Carafano, "The Great Eastern Japan Earthquake."

enough in the wake of a catastrophe, but it alone is insufficient to serve the public. Mapping and monitoring must be part of an integrated effort to inform the public. In the wake of disaster, the sooner such a system is in place, the better.

In particular, communicating the risks of low-dose radiation exposure and other technical matters in the aftermath of a disaster is extremely difficult. Communicating technical information during a disaster is especially tricky when the responsibility for communicating information is shared by government and private enterprise. In many respects, the government of Japan and TEPCO experienced troubles reminiscent of similar challenges encountered by the U.S. government and BP during the Gulf oil spill in spring 2011. Government and the private sector can have competing objectives, differing perspectives, different levels of technical knowledge, and contrasting legal obligations to share information during a crisis.[38]

Within the United States, the Environmental Protection Agency runs a radiation monitoring system, which tests the air for radiation and is updated every two hours. They also test rainwater, drinking water, and milk. Commercial services are also available for radiation monitoring. For example, one company sells Geiger counters that can be connected to a computer and can send data constantly to the company's network. The data are then compiled to create a real-time map.[39]

The United States military also maintains specially trained and equipped military forces capable of performing monitoring and mapping. However, these forces have been significantly reduced in recent years.[40]

Recommendation: The U.S. should assess the results of the Japanese monitoring and mapping effort and apply appropriate lessons learned to its own radiation mapping and monitoring program, while expanding its efforts to ensure adequate capacity for mapping activities and conducting effective risk communications.

In particular, the U.S. should consider allowing private citizens to assist with mapping in the event of an accident. Hotspots can occur on private property, and identifying and remediating these spots is important. This also tends to be very important information to residents. Fortunately, there are tamper-proof, backpack-sized detectors that require no more expert knowledge to operate than turning on an on/off switch. These could be made available to residents to test their properties, providing them with peace of mind or alerting them to the existence of a hotspot. This data could also be incorporated into a local map to further refine the radiation mapping and gauge remediation efforts without increasing the need for more government manpower.[41] Further, the U.S. needs to reconstitute specially trained and equipped military forces that would assist in monitoring and mapping in the wake of a catastrophic release of hazardous material.[42]

Finally, the federal government needs to do more to strengthen its capacity to communicate the risk of low-dose radiation exposure. The U.S. should press the IAEA to reform the International Nuclear and Radiological Event Scale to more effectively educate the public on the actual radiation risks associated with a particular number designation. In addition, the Administration should develop more effective public–private partnerships in critical risk communication, such as on low-dose radiation exposure, through the Department of Homeland Security's Critical Infrastructure Partnership Advisory Council.[43]

38. Ibid.
39. Jeff McMahon, "Four Sites Where You Can Monitor U.S. Radiation Levels," *Forbes*, March 28, 2011, http://www.forbes.com/sites/jeffmcmahon/2011/03/28/three-sites-where-you-can-monitor-u-s-radiation-levels (accessed March 29, 2012).
40. See Advisory Panel on Department of Defense Capabilities for Support of Civil Authorities After Certain Incidents, *Before Disaster Strikes: Imperatives for Enhancing Defense Support of Civil Authorities*, September 15, 2010, http://www.rand.org/content/dam/rand/www/external/nsrd/DoD-CBRNE-Panel/Report-Advisory-Panel.pdf (accessed March 29, 2012).
41. International Atomic Energy Agency, "Final Report."
42. See The Heritage Foundation, "A Strong National Defense: The Armed Forces America Needs and What They Will Cost," Heritage Foundation *Special Report* No. 90, April 5, 2011, http://www.heritage.org/research/reports/2011/04/a-strong-national-defense-the-armed-forces-america-needs-and-what-they-will-cost.
43. Carafano, "The Great Eastern Japan Earthquake."

III. Disaster Assistance and Compensation

Providing financial assistance and compensation for losses in a large-scale disaster is always a major post-recovery task. Decisions on assistance and compensation will affect not only the pace of recovery, but also economic growth and attitudes toward preparedness for future disasters. In Japan, the earthquake and tsunami caused catastrophic damage to infrastructure, property, and industry in the affected areas. Assistance and compensation came from several sources. The damage was then compounded by the subsequent nuclear accident, which caused the evacuation of all people within 20 kilometers of the reactor.

Observation #8: Evacuation placed a steep financial burden on family businesses and the government.

Evacuation required people to leave their homes with very little and to find food in a disaster-torn area. To aid the displaced people, the Japanese government set up shelters where people could stay while they had nowhere to go and provided food for those that were outside. However, shelters are not homes, and people were understandably anxious to leave them. This can cost a family severely because under Japanese law insurance companies are not required to pay for earthquake damage unless supplemental insurance is purchased. Many people were still carrying a mortgage on a home that they were legally not allowed to enter. Understandably upset, many people have sought compensation from TEPCO, the operator of the Fukushima plant.

Under Japanese law, nuclear plants are required to compensate people for damages if an accident occurs. However, the operator of a nuclear plant is exempted from liability when the accident is caused by a "grave natural disaster of exceptional character or by an insurrection."[44] Under pressure from the government, TEPCO agreed to compensate the evacuees. To receive the compensation, the evacuees must go through several complex steps, including filling out a 60-page form with a 160-page instruction manual and attaching receipts for lodging, transportation, and medical costs. To help with the complexity of the process, the Japanese government agreed to send about 100 lawyers and experts to the temporary housing complexes.[45]

Those who were forced to leave their homes would initially receive 5,000 yen per person for transportation and up to 8,000 yen per day for hotel expenses. They would also receive 5,000 yen for costs associated with decontamination efforts to mitigate radiation exposure. People could also be compensated for psychological suffering caused by the forced evacuation. Businesses can be compensated for lost profits and additional costs caused by the nuclear disaster, based on the difference between profits for the first five months after the nuclear accident and profits for the same period in recent years. People and businesses would also be compensated for property damage along with costs for decontamination of businesses and homes.[46] Additionally, TEPCO initially announced that it would pay evacuated towns $20 million yen in "apology money."[47] While TEPCO has agreed to pay compensation and apology monies, the sheer number of claimants may make this all but impossible.

In addition to "official" assistance and compensation, the government had to deal with massive assistance received from around the world. For example, within minutes of the earthquake, companies such as Microsoft and Google volunteered their services to aid in the relief effort. Other companies, such as Zynga, used their social networking games to enable people all over the world to donate money to the relief effort.[48]

44. Mari Yamaguchi and Shino Yuasa, "Japan's Evacuees Annoyed at Compensation Offer," ABC News, April 15, 2011, http://abcnews.go.com/Business/wireStory?id=13379619&page=2#.T3Sq99koqa8 (accessed March 29, 2012).
45. Reuters, "Compensation for the Fukushima Crisis Victims," October 18, 2011, http://www.reuters.com/article/2011/10/18/us-japan-nuclear-compensation-factbox-idUSTRE79H08Y20111018 (accessed March 29, 2012).
46. Ibid.
47. Yuri Kageyama, "Japan Nuclear Plant Evacuees Demand Compensation," ABC News, January 20, 2012, http://abcnews.go.com/Business/wireStory?id=13362389#.T3Sr29koqa8 (accessed March 29, 2012).
48. Kurt Schiller, "Disaster Response: Technology Makes a Difference," *Information Today*, May 2011, http://www.infotoday.com/it/may11/Schiller-Disaster-Response.shtml (accessed March 29, 2012).

Finding: Numerous post-event factors of a mass catastrophe—including the nature of the disaster, perceptions of liability, cultural and economic factors, and the extent of losses—greatly influence compensation models and implementing procedures. After a disaster, there is often enormous political pressure to script procedures to meet the perceived needs at the time. The U.S. has experienced similar challenges in providing assistance and compensation after 9/11 and the Gulf oil spill. The best way to deal with these challenges while facing the heart-wrenching losses in a large-scale disaster is to have a framework in place beforehand. In other words, the best strategy is to have in place a robust system for disaster compensation that places a maximum premium on individual responsibility.

The first step in addressing this issue is to ensure that unique compensation programs are limited to truly unique and catastrophic events and that they do not set a precedent for handling "normal" disasters. This is a particular concern in the United States, where Presidents have declared disasters with increasing frequency, creating a new federal entitlement for disaster assistance. For almost two decades, U.S. Administrations have implicitly reduced the threshold of what qualifies as a natural disaster eligible for a federal declaration. This "defining disaster down" approach has largely driven the cost-sharing provision in the 1988 Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) under which the federal government pays 75 percent or more of the response and recovery costs. This helps to explain why disaster declarations are granted months *after* the events, when the emergency has passed and the effects have clearly been handled without federal involvement.

In the Stafford Act, the express threshold for a declaration is a disaster "of such severity and magnitude that effective response is beyond the capabilities of the State and the affected local governments and that Federal assistance is necessary."[49] Despite this clear requirement, FEMA has approved disaster declarations for many natural disasters that historically and factually were not beyond the capabilities of states and localities. Other than hurricanes, earthquakes, volcanic eruptions, and tsunamis, most natural disasters in America lack the potential to meet the Stafford Act definition. Even most hurricanes, earthquakes, volcanic eruptions, and tsunamis do not meet the Stafford Act requirement.

Recommendation: The United States should raise the threshold for receiving federal disaster assistance and compensation as high as possible. This will have the salutary effect of ensuring that states, local governments, businesses, and individuals pay more attention to meeting their responsibilities to prepare for disasters.

First, Congress should amend the Stafford Act to limit eligibility for FEMA disaster declarations to hurricanes, earthquakes, volcanic eruptions, and tsunamis and explicitly exclude other types of natural disasters. The law should also include severity and magnitude thresholds for these four types of disasters to ensure that only truly national emergencies qualify for federal involvement. Further, the government should adopt a high economic threshold requirement for any program that is created to prevent a national catastrophic natural disaster from bankrupting the insurance industry. For example, one insurance company has suggested a $125 billion trigger for a lender-of-last-resort program. Such a trigger is necessary given the federal tendency to expand eligibility downward. This tendency will increase if premiums accumulate during years without any eligible events.[50]

The United States should return to a model in which accountability rests with the governors and the people. The private sector, state governments, and even the federal government—but only as a last resort—could take many actions that would provide greater stability to the insurance market at a lower cost to most taxpayers. To qualify for any federal catastrophic natural disaster program, a state should meet five requirements: no rate caps, sound building codes, no redevelopment of disaster-prone areas, tort reform to eliminate or significantly reduce frivolous lawsuits by lawyers seeking to capitalize on sensational headlines and public sympathy after a natural disaster, and state-mandated property and casualty (P&C) insurance. Under the mandate, states must require individuals and businesses in known hurricane, earthquake, and flood zones to purchase P&C insurance, including state-based earthquake and hurricane insurance and federal flood insurance. Such a

49. 42 U.S. Code § 5191(a).

50. Matt A. Mayer, David C. John, and James Jay Carafano, "Principles for Reform of Catastrophic Natural Disaster Insurance," Heritage Foundation *Backgrounder* No. 2256, April 8, 2009, http://www.heritage.org/research/reports/2009/04/principles-for-reform-of-catastrophic-natural-disaster-insurance.

mandate would increase the capital reserves of insurance companies and the liquidity of government insurance programs.

Further, accepting voluntary assistance can reduce the need for unique government assistance and compensation programs after an unprecedented disaster. In particular, ensuring the capacity to take online donations and other forms of aid is crucial. In a survey after the Japanese earthquake, half of all respondents indicated that they had made or would make a donation to Japanese relief efforts, many donating online.[51] This means millions of Americans donated to help disaster victims using cell phones and the Internet, providing millions of dollars that could cover some of the costs of rebuilding. It is imperative that the federal and state governments be able to accept such donations.

51. Phil Leggiere, "Japanese Crisis Spurring Spike in Digital Relief Funds," *Homeland Security Today*, March 29, 2011, http://www.hstoday.us/briefings/daily-news-briefings/single-article/japanese-crisis-spurring-spike-in-digital-relief-funds/33ab3c4bea7d935b779c34d118384dd3.html (accessed March 29, 2012).

IV. Population Resiliency

One of the most significant and underappreciated aspects of disaster response is responding to mental health issues caused by stress and trauma. These issues surface with both victims and responders. Addressing these issues effectively is critical to establishing population resiliency.

Observation #9: The earthquake's devastating scale required the national government to create a comprehensive mental health care response.

The Ministry of Health, Labour and Welfare (MHLW) was placed in charge of the government's response and immediately began to form teams of professionals from national psychiatric hospitals. These teams were assigned to specific areas to avoid duplication of effort.[52] However, the system took several days to begin working effectively. In the meantime, the Japanese Society for Psychiatry and Neurology set up a disaster response operations center for mental health care and declared the general policy of post-disaster mental health countermeasures. All of the MHLW teams were provided with explanations of the MHLW's mental health care policy and were instructed to send daily and weekly reports to the local government's mental health office.

Of urgent concern were psychiatric patients whose treatments were interrupted by the disaster or who did not have access to their prescribed medications. The MHLW responded by allowing hospitals unaffected by the disaster to accept more patients than normally allowed under Japanese law and minimized shortages by restricting people in other parts of the country from filling their prescriptions with more than a 30-day supply of the most needed antidepressants and anticonvulsants, rather than the normal 180-day supply.[53]

Despite national efforts, suicides skyrocketed in the wake of the earthquake. "A more than 20 per cent rise in the amount of suicides in one month was likely attributable at least in part to the widespread anxiety Japanese society felt in the aftermath of the catastrophe, an official said."[54] This was only the most extreme negative effect on the population. Many victims of the earthquake experienced severe distress resulting in a wide range of mental health issues from post-traumatic stress disorder to acute delirium. These were compounded by traumatic memories of the shaking ground, the tsunami, and the loss of loved ones. Living in a shelter can also amplify these effects by conferring a sense of victimhood on the survivor rather than a sense of well-being.[55]

Finding: There will likely never be enough mental health professionals to address the wide range of needs that appear in the wake of a catastrophic disaster. Thus, taking measures to enhance the population's resiliency beforehand and identifying means for self-help during and after a crisis are vital.

The Japanese experience is far from unique. Despite the fact that cultural factors heavily influence how populations respond to a disaster, all people are human. Mental health challenges will always be great in the wake of a disaster. The strength and resiliency of the community will be key factors in determining the extent of the challenge. This is undoubtedly also true for the United States. The 1996 University of Delaware Disaster Research Center report found that when community ties "are strong, supportive, and responsive to the individual's physical and emotional needs, the capacity to withstand and overcome stress is heightened."[56]

Recommendation: Building strong, caring communities and establishing means for people to take care of themselves after a disaster are the best means of mitigating mental health challenges after a catastrophe.

In the United States, most state and local emergency management plans were developed without direct involvement from the community. As a result, people tend to have little faith that these plans offer the best

52. Yoshiharu Kim, "Great East Japan Earthquake and Early Mental-Health-Care Response," *Psychiatry and Clinical Neurosciences*, Vol. 65, No. 6 (October 2011), pp. 539–548, http://onlinelibrary.wiley.com/doi/10.1111/j.1440-1819.2011.02270.x/full (accessed March 29, 2012).
53. Ibid.
54. Agence France-Presse, "Suicides in Japan Spiked After Earthquake: Survey," *The Straits Times*, March 9, 2112, http://www.straitstimes.com/BreakingNews/Asia/Story/STIStory_775753.html (accessed March 29, 2012).
55. Kim, "Great East Japan Earthquake and Early Mental-Health-Care Response."
56. Charles E. Fritz, "Disasters and Mental Health: Therapeutic Principles Drawn from Disaster Studies," University of Delaware, Disaster Research Center *Historical and Comparative Disaster Series* No. 10, 1996, p. 75, http://dspace.udel.edu:8080/dspace/handle/19716/1325 (accessed December 1, 2007).

courses of action to protect themselves and their families. On the other hand, disaster planning that includes community input produces not only higher quality plans, but also far higher levels of community approval and confidence in their ability to take care of themselves.[57]

Giving people something to do in the wake of a disaster can help to minimize feelings of despair and helplessness. In a large-scale crisis in which communications are interrupted, access to the disaster area is limited, and infrastructure is disrupted, it is essential to determine where the needs are the greatest and where assets and resources are available. Extending this situational awareness to frontline responders is extremely difficult, but community residents are often the most important source of information and means of communication.[58] This exchange can happen most effectively when citizens know what information is needed and how to organize and communicate it during disasters.

Communities should also be prepared to institute self-help mental health programs. Citizens tend to feel more secure and better cared for when members of their own community respond to their needs. Even informal community conversation can provide talk therapy and other immediate measures to relieve stress.

Enabling individuals to contribute to their own long-term health monitoring also helps to reduce stress. Large-scale disasters can produce many ill effects that do not become apparent until days, weeks, months, or even years after the crisis. At the World Trade Center site, responders, victims, and members of the surrounding community were exposed to a variety of environmental hazards, and the effects on long-term health are still not completely understood.[59] Individuals can help themselves to cope with long-term health consequences by knowing what kinds of information to retain to make long-term health monitoring more effective.

Observation #10: Inaccurate or sensationalized information can cause unnecessary panic and confusion in a population.

No aspect of the response by the Japanese government was more troubling than its inability to effectively communicate the risks associated with the radiation release from the Fukushima plant. Inaccurate assessments did more harm than good in communicating the risk of low-dose radiation to the public. Moreover, some analysts used the opportunity to comment on the disaster as an avenue for advocating for or against the efficacy of nuclear power rather than focusing on effectively communicating the risks.

The International Nuclear and Radiological Event Scale, which is maintained by the IAEA, also showed poor utility as a risk-communication tool. At one point, the Japanese government elevated the Fukushima plant to "seven," the level of a major accident. This placed the accident on par with the 1986 Chernobyl reactor disaster, even though the Fukushima plant released far less radiation. The Japanese eventually corrected misleading information about the dangers posed by the released radiation through the aforementioned radiation maps and publicly available data, but this took months.

Concerns over radiation were not the only challenge. Rumors proliferated, particularly on the Internet, ranging from fears of toxic clouds from fires to reports that the earthquake was caused by "foreign powers" using "earthquake weapons." Such rumors are often axiomatic in the wake of large-scale disaster and can increase fear and anxiety.

Further, in some respects, the government exacerbated the situation by not giving enough information to the Japanese media immediately after the accident—information that the media could have shared with the people. After the initial nuclear concerns abated, the Japanese press then turned to focus on what volunteers, local people, and victims did. Generally speaking, the Japanese media tends to be highly critical of the leadership. In this case, the media's criticism may have increased anxiety among the people, rather than instilling confidence and action.

Unquestionably, the lack of understandable, credible, and actionable information, particularly regarding

57. Roz D. Lasker, "Redefining Readiness: Terrorism Planning Through the Eyes of the Public," New York Academy of Medicine, September 14, 2004, http://www.redefiningreadiness.net/pdf/RedefiningReadinessStudy.pdf (accessed October 26, 2007).

58. For example, see Brian A. Jackson, D. J. Peterson, James T. Bartis, Tom LaTourrette, Irene Brahmakulam, Ari Houser, and Jerry Sollinger, *Protecting Emergency Responders: Lessons Learned from Terrorist Attacks* (Santa Monica, CA: RAND, 2002), http://www.rand.org/pubs/conf_proceedings/2006/CF176.pdf (accessed October 25, 2007).

59. Robert M. Brackbill et al., "Surveillance for World Trade Center Disaster Health Effects Among Survivors of Collapsed and Damaged Buildings," Centers for Disease Control and Prevention, *Surveillance Summaries*, April 7, 2006, http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5502a1.htm (accessed October 25, 2007).

the nuclear contamination, exacerbated mental health challenges.

Finding: Communicating accurate information in the aftermath of a disaster is vital.

The United States is clearly vulnerable to flawed risk communications and rumors, such as Japan experienced. For example, after Hurricane Katrina, rumors spread of hundreds dying in the Superdome. In fact, six people died: four of natural causes, one of a drug overdose, and one of suicide. Most displaced persons at the scene behaved well and followed instructions from the National Guard and other emergency responders.[60] Yet fears of violence at the Superdome slowed recovery because responders were forced to wait for additional security before moving into the facility in full force. If the correct information had been communicated properly to officials and the media, the response might have been much more effective.

Furthermore as noted in the previous Heritage report, the use of social media during a crisis can be problematic. One constant challenge is information assurance: knowing whether the data are precise and reliable. Particularly during a large-scale crisis, information can be spotty because communication systems are down and officials have difficulty collecting information and providing situational awareness. In addition, in a swiftly changing environment, first reports can later prove erroneous. Social media can compound this issue by widely and quickly spreading rumors, perfidy, and faulty information.[61]

Recommendation: The U.S. government needs to continue to develop methods and capabilities to ensure the legitimacy of government communication, particularly through social networking. Further, the federal government needs to integrate risk communication in state and local "train the trainer" programs aimed at building community preparedness.

In particular, the U.S. government should do more based on comprehensive, practical, and unbiased research that specifically serves its needs for understanding and utilizing social networks, including understanding the science of networks. Understanding social networking requires a multidisciplinary approach to research that combines social science techniques with hard science disciplines. This mix of disciplines is often called "network science," which examines how networks function.[62] The government should then use that knowledge to study how to create, improve, and engage with networks to improve communication.

60. Donna Britt, "In Katrina's Wake, Inaccurate Rumors Sullied Victims," *The Washington Post*, September 30, 2005, p. B1, http://www.washingtonpost.com/wp-dyn/content/article/2005/09/29/AR2005092902360.html (accessed October 25, 2007).

61. Carafano, "The Great Eastern Japan Earthquake."

62. For example, see Committee on Network Science for Future Army Applications, *Network Science* (Washington, DC: The National Academies Press, 2005), http://www.nap.edu/catalog.php?record_id=11516 (accessed March 29, 2012).

Before the Next Disaster Strikes

In many respects the lessons to be learned from the Great Eastern Japan Earthquake are ones that the United States should already know well. Many are reminiscent of the challenges the U.S. has faced in recent large-scale disasters, such as Hurricane Katrina, the Gulf oil spill, and the events of 9/11.

Addressing the shortfalls of catastrophic disaster response is vital because catastrophic disasters are among the few challenges that can bring even the most wealthy and powerful nations to their knees. Yet these shortfalls are often avoidable calamities. In many cases they involve government doing less, not more, and placing the responsibility for caring for communities where it belongs—on the communities themselves—and reserving for the federal government the responsibilities that only the national government can fulfill. The federal government should focus its activities on the most efficacious activities rather the most politically expedient acts.

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