

Chapter 3

Fukushima Nuclear Disaster and Ensuring Necessary Government Crisis and Risk Communication

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Contents

Chapter Goals	34
Introduction.....	34
Great East Japan Earthquake: A Three Pronged Disaster—	34
Two Natural and One Manmade	34
Major Initial Damage	35
Description of the Case	36
Research Theme and Basic Framework of Analyses	36
Building Nuclear Power Stations in Disaster-Prone Countries Such as Japan	37
Organizations Involved in the 3.11 Disaster	37
Sequence of Initial Events	38
Analysis of Management of the Fukushima Nuclear Disaster.....	38
Manmade Disaster Caused by Lack of Preparedness and Not Learning from the Past	38
Manmade Disaster Caused by Ineffective Organizational and	
Management Procedures and Requiring Radical Reforms for Recovery.....	41
Failure to Disclose Crisis Information to the Public	41
Delays in Disclosing Crisis Information in Japan	41
Delays in Disclosing Crisis Information to Local Residents	41
Failure to Disclose Crisis Information to Emergency Relief Organizations.....	42

Failure to Disclose Crisis Information Due to Inadequate Business Practices and a Lack of Government Transparency.....	42
Institutional Reforms to Aid Recovery from the Fukushima Disaster.....	43
Key Central Government Organizations Established for Nuclear Safety Recovery and Regulations	44
Nuclear Regulation Authority	44
Nuclear Emergency Preparedness System	44
Ongoing Effects of the Fukushima NPS Accident.....	45
Government Takes Major Responsibility for Decommissioning and Radioactive Water Issues	45
Evaluation and Analysis Based on Information Disclosed by Government, Statistics, and Media	45
Lessons and Implications for NPS Crisis and Emergency Management	49
Establish Effective, Transparent, and Accountable System of Government Crisis Communication	49
Establish Accountable and Transparent Government Records Management to Facilitate an End to the Fukushima Nuclear Disaster and Mitigate Future Disasters	49
Resilient Capacity Building, Citizens' Rights, and Government Responsibility: Learning from the 3.11 Nuclear Disaster	50
Conclusions	51
Questions for Discussion.....	51
Additional Reading	51
References	52

Chapter Goals

The goals of this chapter are to

1. Share some lessons learned from the Fukushima nuclear disaster.
2. Review and analyze government crisis and risk communication problems during the Fukushima nuclear disaster based on information and data disclosed to citizens.
3. Suggest how to strengthen accountable and transparent government risk and crisis communication management for nuclear emergency preparedness.
4. Explore resiliency capacity building for the safety of Japan's citizens and for nuclear disaster mitigation.

Introduction

Great East Japan Earthquake: A Three Pronged Disaster—Two Natural and One Manmade

The Great East Japan earthquake occurred off the Pacific coast area of Tohoku on March 11, 2011 (hereafter cited as the 3.11 disaster). The 3.11 disaster was three pronged:

1. *Earthquake*—Magnitude 9 on the Richter scale
2. *Tsunamis*—Over 20 meters high

3. Accidents—International Nuclear Events Scale (INES) Level 7 Fukushima Daiichi Nuclear Power Station (NPS) accidents, manmade disasters triggered by the tsunamis and possibly also by the earthquake (hereafter cited as the Fukushima nuclear disaster)

Major Initial Damage

Although this chapter deals only with the the Fukushima nuclear disaster and the immediate damage caused (the entire scope of damage has not yet been fully investigated or evaluated), the following information provides some understanding of the magnitude of the 3.11 disaster (Suzuki and Kaneko, 2013):

- Almost 16,000 deaths occurred and nearly 3000 people were missing.
- At least 130,436 housing units were demolished, 262,975 half destroyed, and 717,768 partially destroyed.
- The estimated damage was approximately 16.9 trillion yen (not including damage caused by the Fukushima NPS accident, which are still not known or disclosed); the initial 5-year (2011–2015) recovery cost has been estimated at around 25 trillion yen.
- Recovery work is being financed by a reconstruction income tax that citizens will pay for 25 years.
- About 470,000 evacuees lost their homes.

It is difficult to estimate the initial damage caused by the Fukushima nuclear disaster, as the situation is ongoing. The government and Tokyo Electric Power Company (TEPCO) from the beginning withheld necessary and critical information, even from evacuees. A valid scenario to end the crisis and estimates of the initial economic damage and recovery costs have yet to be determined. It is clear that the social and economic costs of the Fukushima nuclear disaster are substantially greater than the costs associated with the earthquake itself and subsequent tsunami disasters. Following is information that has been disclosed by the government that may help illustrate the huge scale of the damage caused by the Fukushima nuclear disaster (Reconstruction Agency, 2014a,b):*

- Over 150,000 evacuees have not returned to their homes; as of 2014, at least 100,000 were unable to return home due to radiation leaks or contaminated environment. The number of evacuees would grow even higher if it included citizens from the afflicted region who have chosen not to return to their homes.
- Although there were no immediate direct deaths, 1704 indirect deaths have been attributed to the disaster, as certified by the government.
- Operation of all of the remaining 48 nuclear reactors in Japan has been suspended for reassessment of their safety (there were 54 nuclear reactors before the 3.11 disaster).
- Afflicted residents and communities are to be compensated by TEPCO, which has been held liable, but also by government-aided payments of at least 9 trillion yen.
- Cleaning of radioactive contaminated soils began immediately, with the initial cost of approximately 5 trillion yen to be covered by the government from taxes.
- Costs associated with decommissioning the damaged nuclear power station are unknown but have been estimated at approximately 15 trillion yen by a government think tank.

* Cost estimate figures were obtained from various Japanese media outlets, including NHK Global Media Services and *Yomiuri Shimbun*.

Description of the Case

Research Theme and Basic Framework of Analyses

(See details reflected and cited in Suzuki and Kaneko, 2013.) Although TEPCO by law must assume major responsibility for recovery from the Fukushima nuclear disaster, the government has taken significant steps to provide relief, and since September 2013 has taken primary responsibility to facilitate recovery. In the years following the 3.11 disaster, the citizens of Japan gradually came to learn what happened from those directly involved in the 3.11 disaster or its emergency response. The government did not immediately disclose critical information at the time of the emergency, even to those ordered to evacuate. Reports issued in 2012 by the three major NPS accident investigation groups (Government Investigation Committee, Nuclear Accident Independent Investigation Commission, and Rebuild Japan Initiative Foundation) emphasized the failure to disclose nuclear risk and crisis information in a timely manner and pointed out that critical crisis information had not been shared by government emergency managers (central or local, particularly municipal governments, which are primarily responsible for local disaster management in Japan's disaster governance system).

In emergency management, two critical government communication issues arise with regard to not aggravating the situation further: (1) disclosing government information to the public so they can make informed decisions, as is the citizens' right; and (2) sharing information among the many government organizations involved in crisis management. Government crisis communication is not only for the public but also for the governmental organizations themselves to make them more effective and accountable during the emergency. Government crisis communication is a crucial part of the crisis management function. The key trait that government crisis management must have is transparency, as the government is in the end held accountable to the public, both nationally and globally.

Informed citizens can decide how best to proceed for their own safety. Emergency managers in various parts of the government, at the central or local level, need to have prompt and transparent crisis information shared among them so they can respond suitably to the emergency situation and facilitate safe evacuation of the affected citizens. Transparent information disclosure and timely government communication are becoming increasingly important in ensuring accountability and effectiveness of governance. This is particularly true at a time when a variety of communication resources are available to local citizens and the world community simultaneously.

In Japan, accountability is generally interpreted and used to mean the responsibility only to explain what happened, without taking on the responsibility of the results of the measures taken by the organization or individual managers. Individual accountability is rarely pursued, as it is considered difficult to do because of the traditional, consensus-oriented decision-making system and practices within Japanese organizations. Accountability is thus rather ambiguous in the collective decision-making system. To avoid assuming liability, bureaucratic organizations in government and in big business generally are resistant to disclosing information; hence, transparent information disclosure is not likely to be practiced.

This chapter concentrates on government crisis information disclosures that occurred at the time of the Fukushima nuclear disaster emergency and on the ensuing crisis responses taken by the government as of 2014. It is hoped that this focused undertaking will clarify the lessons to be learned from the nuclear disaster in Japan and provide some insight into establishing the safety resiliency necessary for disaster mitigation.

Building Nuclear Power Stations in Disaster-Prone Countries Such as Japan

The two major reasons why Japan has so many nuclear power stations are as follows:

1. Nuclear power station use has been promoted by political leaders, industries, and scientists as a significant source of electricity since 1956, after establishment of the United Nations' Atoms for Peace organization and the International Atomic Energy Agency (IAEA).
2. The use of nuclear power stations became particularly desirable after the 1973 and 1979 world oil crises and when environment pollution problems arose during the 1970s, as well as for environmental conservation reasons. The goal was to have nuclear power stations produce 50% of the electricity in Japan, which lacks natural energy resources.

When the 3.11 disaster occurred, the 54 nuclear reactors in Japan were producing 25% of the country's electricity.

Organizations Involved in the 3.11 Disaster

Below is a list of the organizations involved and the roles they played in the Fukushima nuclear disaster:

- The Nuclear Safety Commission (NSC), an advisory organization comprised of scientists and located within the Cabinet Office of the central government, from the beginning of the accident emergency provided direct technical advice to the prime minister.
- The Ministry of Education, Culture, Sports, Science, and Technology (MEXT) conducted SPEEDI radiation monitoring.
- According to the laws on disaster governance in Japan, local municipal governments are primarily responsible for local disaster preparedness, response, and mitigation; providing local emergency relief; and evacuating afflicted communities and citizens. They coordinate with and receive support from central and prefectural government emergency organizations, as well as non-governmental organizations.
- The Nuclear and Industrial Safety Agency (NISA) is the NPS safety regulator located within the NPS-promoting Ministry of Economy, Trade and Industry (METI), with local branch staff stationed at the Fukushima NPS.
- The Tokyo Electric Power Company (TEPCO), the leading private sector company, operated the Fukushima NPS under license of METI. The electricity company has assumed primary responsibility for the accidents, including the emergency response, recovery costs, and disaster liabilities.

In addition, for severe nuclear emergencies, the Nuclear Emergency Response Headquarters in Tokyo (headed by the Prime Minister), the Local Nuclear Emergency Response Headquarters located offsite in Fukushima, and the Joint Council for Nuclear Emergency Response were organized, as stipulated in the Special Law on Emergency Preparedness for Nuclear Disaster. These are set up as shown in Figure 3.1. The difficulties encountered during the 3.11 disaster under this institutional setup are analyzed in the following sections.

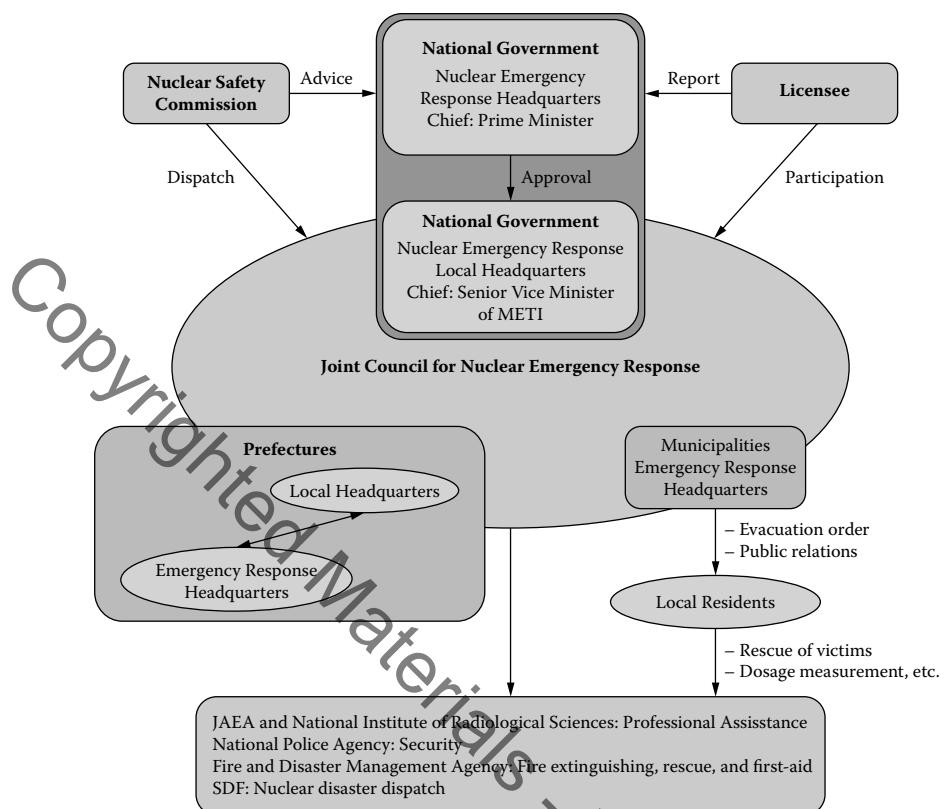


Figure 3.1 Organizations involved in nuclear emergency responses in Japan.

Sequence of Initial Events

The sequence of events at the Fukushima nuclear power stations are detailed in Table 3.1. It should be noted that the declaration of a state of nuclear emergency was issued immediately on the first day, together with an evacuation order for those living within a 3-km radius from the accident site. The accident was reported as being INES Level 3 by NISA on the second day of the accident, but that status was soon changed to Level 4 and within a month's time to Level 7, equivalent to the Chernobyl nuclear power station accidents. However, the meltdown, radiation levels, and direction in which the radiation was moving were not disclosed to the public at the time.

Analysis of Management of the Fukushima Nuclear Disaster

Manmade Disaster Caused by Lack of Preparedness and Not Learning from the Past

Despite being triggered by a natural disaster, the 3.11 Fukushima nuclear disaster was a manmade one caused by a lack of emergency preparedness to deal with multiple NPS accidents. Government safety regulators and advisors and NPS operators did not see the need to install the necessary safety mechanisms to protect against the occurrence of severe accidents, thus ignoring previous

Table 3.1 Sequence of Accident Events from March 11 to April 12, 2011

Date	Events
March 11	<p>Earthquake hits Japan.</p> <p>Fukushima Daiichi NPS accident occurs.</p> <p>Prime Minister declares a state of nuclear emergency, establishing the Nuclear Emergency Response Headquarters, but tells the press that no impact from radioactive materials outside of the facilities had been confirmed. Radioactivity is not, in fact, leaking out of any of the nuclear facilities.</p> <p>A nuclear disaster dispatch order is issued to the self-defense forces.</p> <p>Fukushima governor instructs mayors of Okuma Town and Futaba Town to evacuate their residents within a 2-km radius from the Fukushima Daiichi NPS.</p> <p>Prime Minister instructs the heads of Fukushima prefecture and four towns to evacuate their residents within a 3-km radius from the NPS and orders those within a 10-km radius to stay inside their homes.</p> <p>Chief Cabinet Secretary announces that the reactors have lost their cooling capability. A radiation leak was possible, but there was no danger of radiation spreading beyond the NPS site. The evacuation order has been issued merely as a precaution.</p>
March 12	<p>NISA rates the accident as INES Level 3.</p> <p>Chief Cabinet Secretary informs the public that no health danger is posed by radiation spreading in the evacuation zones; no concrete data indicates as such.</p> <p>Chief Cabinet Secretary announces that TEPCO needs to vent pressure in the Unit 1 core containment vessel.</p> <p>Prime Minister instructs residents within a 10-km radius from the NPS to evacuate.</p> <p>Prime Minister flies by helicopter to the Fukushima Daiichi NPS.</p> <p>NISA is informed of the possibility that the Unit 2 core containment vessel might cause a meltdown.</p> <p>Unit 1 explodes; no indication of danger is issued by the government.</p> <p>NISA reports that no reactor containment vessel meltdown can be confirmed.</p> <p>Prime Minister instructs the heads of relevant municipalities to evacuate their residents within a 20-km radius from the NPS due to risks posed by the reactors.</p> <p>Chief Cabinet Secretary announces that the explosions have not occurred in the containment vessels but in the reactor building due to the accumulation of hydrogen, so there has been no leakage beyond the site.</p>
March 13	<p>Chief Cabinet Secretary acknowledges the possibility of a hydrogen explosion in Unit 3; no suggestion of danger outside the plant facility is given.</p>

(Continued)

Table 3.1 (Continued) Sequence of Accident Events from March 11 to April 12, 2011

Date	Events
March 14	NISA reveals the first environmental radiation monitoring information gathered by the Local Nuclear Emergency Response Headquarters.
	Chief Cabinet Secretary verifies an explosion in Unit 3 but makes no suggestion of severe leakage of radioactivity; there is no indication of any danger.
	Chief Cabinet Secretary announces that the hydrogen explosion in Unit 3 has caused no damage to the containment vessel and no meltdown is presumed.
	Chief Cabinet Secretary announces that all units of the NPS are idle.
	Chief Cabinet Secretary reports that the cooling system resumed operation at 20:00 after Unit 2 fuel rods were exposed for some time.
March 15	TEPCO announces that the fuel rods in Unit 2 have again been exposed, at around 23:00 on March 14.
	Prime Minister meets with the TEPCO president and announces the establishment of Joint Nuclear Emergency Headquarters at the TEPCO Tokyo office to share information.
	Explosion occurs in Unit 2.
	Chief Cabinet Secretary announces that the suppression room connecting the reactor containment vessel of Unit 2 has been damaged.
	Fire breaks out in Unit 4.
	Prime Minister instructs the heads of relevant municipalities to order residents within a 20- to 30-km radius to seek refuge indoors.
	Chief Cabinet Secretary reports the fire that broke out in Unit 4; radiation levels around Unit 3 reach 400 $\mu\text{Sv/hr}$, possibly affecting human health.
March 18	NISA raises the rating to INES Level 5.
March 25	Contaminated radioactive water is found in the basement of the NPS.
March 28	Contaminated radioactive water is found outside of the turbine buildings.
April 2	Contaminated radioactive water is found accumulated in a pit near the intake channel of Unit 2; the water is flowing out into the sea from a crack on the lateral surface of the pit.
April 4	TEPCO discharges low-level radioactive water to the sea.
April 12	NISA raises the rating to INES Level 7 and announces meltdown.

lessons learned from the Three Mile Island and Chernobyl accidents, as well as from many past NPS accidents in Japan (GIC, 2012; NAIIC, 2012; Rebuild Japan Initiative Foundation, 2012). If information from the government nuclear safety regulatory organizations had been made transparent and shared with the public, such consequences might have been avoided.

Manmade Disaster Caused by Ineffective Organizational and Management Procedures and Requiring Radical Reforms for Recovery

According to reports by the Fukushima disaster investigation commissions (GIC, 2012; NAIIC, 2012; Rebuild Japan Initiative Foundation, 2012), the NPS safety regulatory organizational system was guilty of gross negligence with regard to preparedness for potential nuclear accidents despite actively promoting the use of nuclear power stations. It was found that

- The NPS safety regulatory system was established by NPS-promoting METI.
- Components of the regulatory system were scattered among several ministries, each with a different sector-oriented bureaucratic system, making it difficult to share necessary information necessary for decision making.
- Collusion among safety regulators and government promoters of NPS, NPS operators such as TEPCO, scientists, and the media worked to produce a myth of NPS safety and deflected any safety concerns.
- Organizational management based on a life-time employment system, groupism, and collective responsibility-based decision making were typical in organizations and society throughout Japan.

Such a system can easily result in a failure to disclose crisis information to the public and to share such information among the emergency managers from different ministries, as a collective and consensus decision-making system was the practice to safeguard ministry positions that offered employment for life (NAIIC, 2012; Suzuki and Kaneko, 2013).

Failure to Disclose Crisis Information to the Public

The Fukushima nuclear crisis resulted in a serious loss of citizens' trust in government due to its inadequate crisis management, as exemplified by the government's failure to disclose critical information to the public, particularly the evacuees.

Delays in Disclosing Crisis Information in Japan

Substantial delays in the disclosure of crisis and risk information to the public were apparent in the gaps of information disclosed overseas and in Japan (see Table 3.2). Much of what was being reported by foreign media earlier on had not been released to the citizens of Japan, which deprived them of the opportunity to make informed decisions about their safety.

Delays in Disclosing Crisis Information to Local Residents

Communication delays caused much hardship among the evacuees from areas close to the Fukushima nuclear power station. They were not given information about the crisis or risk of radiation necessary to make sound decisions, which sabotaged their efforts to help themselves for a long period of time.

Table 3.2 Comparison of Information Disclosed Overseas and in Japan

<i>Critical Information Disclosed</i>	<i>Overseas (Date Reported in Foreign Media)</i>	<i>Japan (Date Publicly Released by Japanese Government)</i>
Radioactive water in basement would soon overflow and it would be necessary to release it to the sea.	March 14, 2011	April 4, 2011
Radioactive releases by the NPS could continue for months.	March 14, 2011	April 12, 2011
Conditions could quickly lead to melting and ultimately to full meltdown.	March 14, 2011	April 18, 2011
Evacuees may not be able to return to their homes for a considerable period of time.	March 14, 2011	August 21, 2011

Source: Adapted from Suzuki, I. and Kaneko, Y., *Japan's Disaster Governance*, Springer, New York, 2013.

MEXT, in charge of radioactive monitoring by SPEEDI, did not confirm until July 27, 2012, that the radioactive contamination information was available from SPEEDI data from the beginning, and the agency acknowledged with regret that it did not release that information to the public.

Failure to Disclose Crisis Information to Emergency Relief Organizations

Insufficient sharing of crisis and risk information resulted in serious mistakes being made; for example, the Nuclear Emergency Response Headquarters issued a wrong evacuation order and became involved in an excessively detailed technical intervention that further delayed critical emergency responses. Such mismanagement can be attributed to the following causes:

- Lack of sufficient clarification in the relevant laws as to the roles of those engaged in nuclear accident emergencies, although the roles and step-by-step procedures of private-sector NPS operators were detailed
- Failure of TEPCO to disclose critical information and share it with members of the Nuclear Emergency Response Headquarters
- Insufficient or total lack of information sharing due to the compartmentalized Japanese bureaucracy within the Nuclear Emergency Response Headquarters, as well as among the various emergency organizations involved

Failure to Disclose Crisis Information Due to Inadequate Business Practices and a Lack of Government Transparency

During the process of investigating the 3.11 nuclear disaster, the National Diet of the Fukushima Nuclear Accident Independent Investigation Commission (NAIIC) discovered that the government did not keep records of the meetings held at the Nuclear Emergency Response Headquarters or other conferences immediately after the disaster. Parliament released this finding to the public. Its disclosure testified to the lack of transparency and accountability among those involved in Japan's crisis management and revealed weaknesses in its information disclosure and records management.

More recently, Japanese media reported that the Government Investigation Committee had conducted hearings with key government and NPS emergency managers, including the director of the nuclear power station. The media also reported that government investigation records included transcripts of hearings with nuclear crisis managers involved in the early stage of the nuclear disaster that would clarify what happened there. Despite a newly promulgated public records management law, the government continues to resist releasing the transcripts, using the excuse that public disclosure may endanger the privacy of the individual managers involved.

Institutional Reforms to Aid Recovery from the Fukushima Disaster

The existing emergency institutions were found to be inadequate to handle the necessary recovery activities. To promote the nuclear safety regulatory functions of the government and to add impetus to the Fukushima disaster recovery, new institutions were established with the enactment of 14 new Acts (see the Table 3.3).

Table 3.3 Acts Promulgated to Aid Recovery from the Fukushima Disaster

Date	Act
August 5, 2011	Act on emergency measures for the 2011 nuclear accident damages
August 10, 2011	Act on the establishment of the Nuclear Damage Compensation Support Authority
August 12, 2011	Act on the exceptional treatment of paperwork concerning the evacuees from the nuclear power plant accidents
August 30, 2011	Act on the special measures for environmental contamination by the radioactive materials emitted by the nuclear power plant accidents by the Great East Japan Earthquake
October 7, 2011	Act on the establishment of the investigative committee for TEPCO's Fukushima Nuclear Power Plant accidents
November 28, 2011	Act on providing life support to the TEPCO nuclear accident victims
March 31, 2012	Act on the special measures for reconstruction and development of Fukushima prefecture
June 27, 2012	Nuclear Regulation Authority Establishment Act Act on the promotion of life support measures for residents of the radioactive contaminated areas by the Fukushima accidents Amendment to the Disaster Countermeasures Basic Act
May 10, 2013	Amendment to the Act on the special measures for reconstruction and development of Fukushima Prefecture
June 5, 2013	Act on the special treatment of the nullification of prescriptions in the nuclear damage compensation dispute mediation procedure.
November 22, 2013	Act on the dissolution of the Japan Nuclear Energy Safety Organization
December 11, 2013	Act on swift and secure compensation for the 2011 nuclear damages

Key Central Government Organizations Established for Nuclear Safety Recovery and Regulations

Nuclear Regulation Authority

The Nuclear Regulation Authority (NRA) was established in 2012 as an external organ of the Ministry of the Environment (MOE) to maintain a separation between safety regulatory functions and the ministries that promote nuclear power station use (e.g., METI) and to integrate various regulatory functions that were at one time fulfilled by several different ministries. The NRA is expected to enhance transparency and neutrality in decision making regarding nuclear safety through transparent information disclosures. The NRA does not have the authority to grant licenses to electric power companies or promote NPSs so it may have an impartial relationship with electricity companies. It has improved technical expertise by inviting occasional international experts from the United States, United Kingdom, and France. The merger of the Japan Nuclear Energy Safety Organization with the NRA in 2014 was expected to further strengthen the NRA's technical expertise.

Nuclear Emergency Preparedness System

In 2012, the nuclear emergency preparedness system shown in Figure 3.2 was organized, with the NRA being the central nuclear safety regulatory management organization.

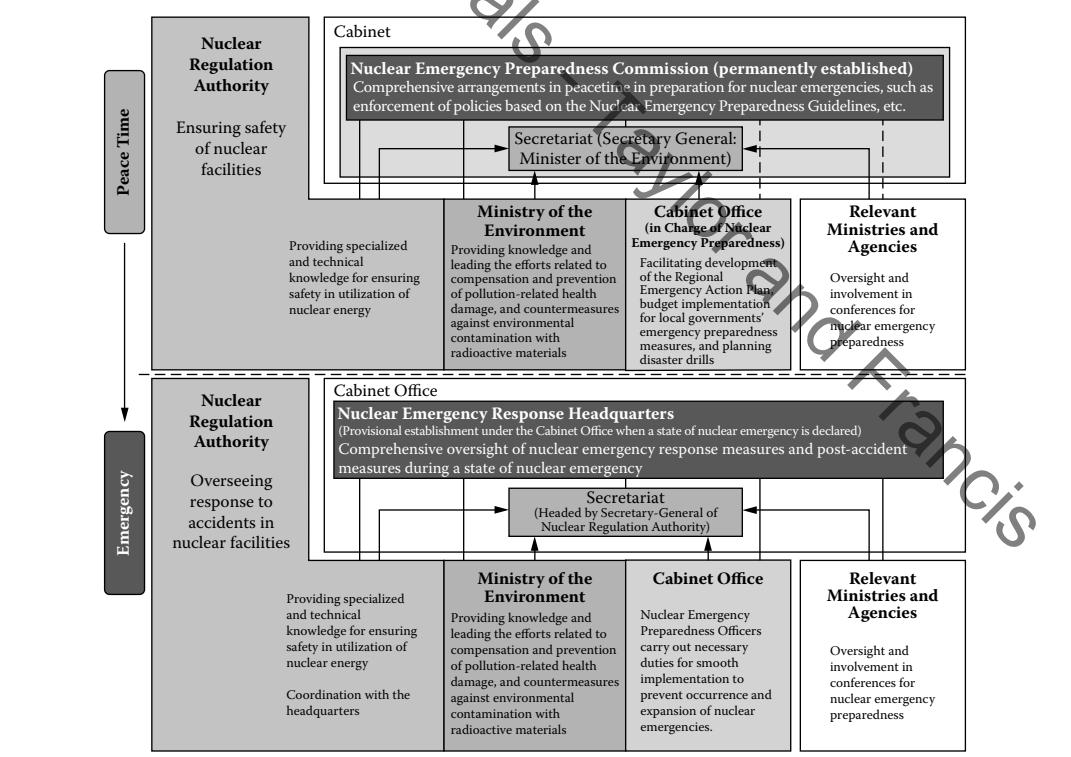


Figure 3.2 Nuclear emergency preparedness system (METI, 2013; Nuclear Regulation Authority, 2013).

Ongoing Effects of the Fukushima NPS Accident

As early as March 25, 2011, contaminated radioactive water was found at the Fukushima NPS site. After that, leakage of contaminated water continued, probably because of damage to the containment vessels. Another accident on March 18, 2013, resulted in a cooling system shutdown. On August 19, 2013, TEPCO discovered that contaminated water had leaked from the tanks. NRA first evaluated this accident as INES Level 1 but later revised their estimate to INES Level 3 after consultation with the International Atomic Energy Agency (IAEA) on August 28, 2013 (see Table 3.4 for details).

Government Takes Major Responsibility for Decommissioning and Radioactive Water Issues

As contaminated water leakage and decommissioning of the damaged NPS issues became serious issues, the Nuclear Emergency Response Headquarters, established on March 11, 2011, when the nuclear crisis occurred, assumed the major responsibility for dealing with them on September 3, 2013. The Inter-Ministerial Council for Contaminated Water and Decommissioning Issues was established on September 10, 2013. This council organized teams to address tasks associated with mitigating the contaminated water situation and with decommissioning.

As Figure 3.3 shows, the government appointed the Minister of Economy, Trade and Industry to be a team leader with METI bureaucrats, assuming secretarial functions in the implementation of concrete measures to cope with various contaminated water and decommissioning issues. The NRA's chairman is a member of the team, and the NRA is still responsible for nuclear safety checkups and technical examination and assessment of the validity of NPS-related safety issues. The Minister of Economy, Trade and Industry is now responsible for providing information on their policies and decisions with regard to the Fukushima nuclear disaster recovery to all responsible safety managers as well as the citizens. His accountability must now be monitored to ensure continuing crisis and risk information disclosure to the public and sharing among all the nuclear disaster recovery managers. It is particularly important as the current government is aiming at resumption of NPS operations as soon as the NRA completes the safety assessment.

Evaluation and Analysis Based on Information Disclosed by Government, Statistics, and Media

A scientific evaluation of the emergency management associated with the 3.11 disaster would require that some emergency management standards be established; however, this discussion does not offer such a scientific review. It does provide examples, both good and bad, as judged by the citizens immediately after the 3.11 disaster, and it highlights the nuclear crisis responses taken by the government. The evaluations provided here are more or less those shared by the majority of citizens in Japan, as determined by published polls and by the discourses of disaster investigation and research groups.

Relief and rescue operations immediately put into place by the responsible organizations after the earthquake were conducted in accordance with current laws, and the systems functioned as well as expected. These initial relief and rescue efforts were evaluated highly by the public. The relevant government organizations had actively reformed their systems to prepare for such emergency responses, and many collaborative arrangements had been made with nonprofit organizations

Table 3.4 Sequence of Accident Events from June 2011 to May 2014

Year	Date	Events
2011	June 9	METI instructed TEPCO to install treatment and storage facilities for highly radioactive contaminated water and to submit reports periodically.
2012	April 5	TEPCO announced leakage of radioactive water from the transfer pipe connecting to a desalination plant and a radioactive contaminated water storage tank.
	September 9	Nuclear Regulation Authority was inaugurated.
2013	March 18	TEPCO reported that the cooling system was shut down because of power failure.
	April 7	Media reported that contaminated radioactive water had leaked from the basement of the NPS site and contaminated water storage tanks.
	April 10	TEPCO announced a plan to transfer contaminated water to the groundwater storage tanks.
	April 26	Government organized a contaminated water treatment countermeasures committee to initiate discussion of how to reduce contaminated water leaks from NPS.
	June 19	TEPCO announced that underground water from seaside turbine buildings was highly radioactive contaminated.
	July 22	TEPCO announced that contaminated underground water was leaking into the power station port.
	July 31	NRA released their evaluation of the underground water contamination level.
	August 7	Government held a meeting at the Nuclear Emergency Response Headquarters to deliberate the contaminated water issues.
	August 8	METI convened the contaminated water treatment committee.
	August 19	TEPCO discovered leakage of about 300 cubic meters of contaminated water from the ground tanks. NRA rated this accident as INES Level 1 and later upgraded it to Level 3.
	August 26	METI minister visited the accident site and presented countermeasures to serve as the new principles behind plans to deal with the leak; government announced it would finance costs associated with solving the contaminated water issues (although TEPCO was legally liable).
	September 3	Government decided upon a basic policy for the contaminated water issue at the site and announced decommissioning of the damaged nuclear reactors.

(Continued)

Table 3.4 (Continued) Sequence of Accident Events from June 2011 to May 2014

Year	Date	Events
	September 7	NRA initiated their own monitoring of the level of radioactivity leaked by the contaminated storage tanks that had spread to the bay area near the site.
	September 8	In an address inviting the 2020 Olympics to come to Tokyo, Prime Minister Abe declared that the water leakage issues at the Fukushima NPS were under control and pledged there would be no danger in Tokyo. (A few days later, a TEPCO official who was summoned to a televised Parliamentary session said that the water leakage issue was not under control.)
	September 13	NRA began to release information about the current situation at the nuclear power station, including the fact that contaminated water was still leaking and radioactivity had been detected in the seawater. Since then, at least once in a month, the release of information has continued.
	October 28	NRA chairman met with the TEPCO president concerning decommissioning of the damaged Fukushima reactors.
	November 6–12	IAEA experts visited Fukushima to monitor the radioactivity levels of the contaminated water leaking from the nuclear power station.
	November 18	Transfer of fuel rods from the Unit 4 spent fuel pool began.
	November 25 to December 4	IAEA experts visited Fukushima again and announced that the level of radioactivity was not hazardous to human health.
	December 20	Government adopted a new policy for additional support for TEPCO to facilitate the recovery process and decommissioning of the nuclear reactors (although TEPCO was legally liable).
2014	January 9	Media reported that TEPCO continued to construct additional water tanks without appropriate radioactivity countermeasures.
	February 15–16	TEPCO reported to NRA several incidents of water leakage.
	February 20	TEPCO reported to NRA that water leakage was found from the upper part of Tank C-1 in the H-6 tank area.
	April 11	Government decided upon a new national energy strategy that recognizes nuclear power generation as an important “base-load” energy source, such that nuclear power plant operation was to be resumed after strict review by NRA.
	April 13	TEPCO reported to NRA the inappropriate transfer of contaminated water at the Fukushima NPS.
	April 15	TEPCO opened the Fukushima NSP site to the press to show where additional water storage tanks were being built and new bypass facilities for underground water were being operated.

(Continued)

Table 3.4 (Continued) Sequence of Accident Events from June 2011 to May 2014

Year	Date	Events
	May 13	TEPCO reported to NRA that 836 spent and new fuel assemblies out of 1533 were transferred from the Unit 4 spent fuel pool to the common spent fuel pool on site.
	May 27	NRA issued a press release on radioactivity levels in the seawater.

and private-sector companies. These reforms were based on the lessons learned from the Great Hanshin-Awaji Earthquake of 1995 and subsequent earthquakes. The well-respected emergency management system in place for the earthquake in 2011 itself provides the lesson that learning from previous disaster management cases can lead to better preparedness in the future.

Before the 3.11 disaster, the Japanese government had established a public safety-oriented governance system generally enjoyed by most of the citizens of Japan. The system was well known worldwide for the many examples of great longevity among the Japanese citizens, a national medical healthcare system, and strict water and food safety standards. Internationally, the country has been involved in and shared knowledge about building disaster governance capacity around the world, particularly since 1995 when the country contributed to the creation of a UN disaster governance international framework. Since the 3.11 disaster, various international meetings have been held in connection with the UN International Strategy for Disaster Reduction (UNISDR) program. The UNISDR World Conference on Disaster Risk Reduction was held at Sendai in 2015.

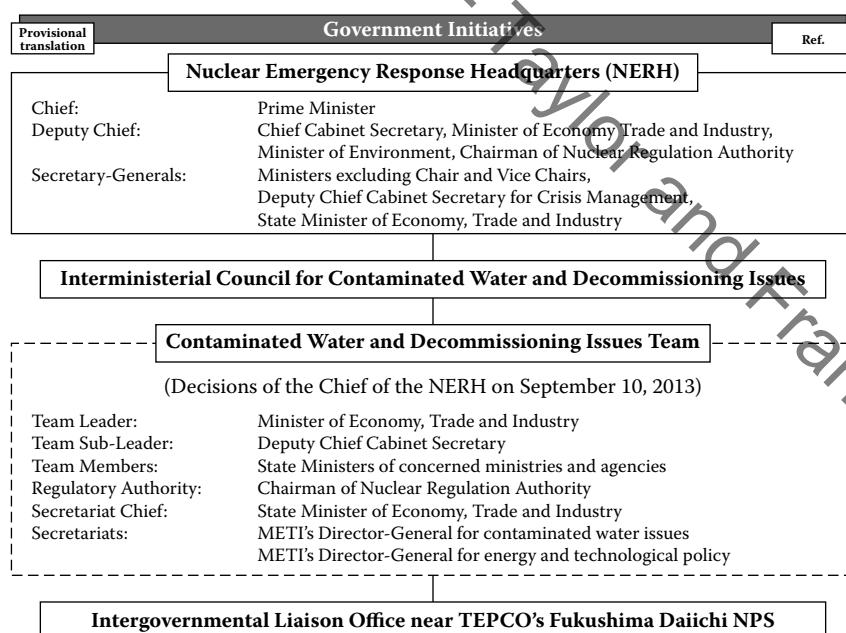


Figure 3.3 Government policies on decommissioning and contaminated water leakage. (From Government of Japan, *Information on Contaminated Water Leakage at TEPCO's Fukushima Daiichi Nuclear Power Station*, 2015, <http://Japan.kantei.go.jp/ongoingtopics/waterissues.html>.)

It was therefore a surprise for the majority of the citizens of Japan to discover during the 3.11 nuclear disasters that their lives were not as safe as they thought. It was then that the citizens of Japan and the world community learned that preparedness for nuclear power plants accidents had been grossly neglected, despite frequent alerts by professionals in Japan and overseas on the necessity of installing safety mechanisms at nuclear power stations. Local community evacuation drills had rarely been organized, and the lack of crisis preparedness resulted in the worst case of disaster management in Japan's history.

The Fukushima nuclear crisis may not be an exception to nuclear disaster preparedness worldwide, but it is difficult to compare Japan with other countries because nuclear crisis information can be a matter of national security that is not shared publicly. The Fukushima nuclear disaster is not yet over. During the long recovery process, the government has not yet shown to the public a valid ending scenario.

Lessons and Implications for NPS Crisis and Emergency Management

Establish Effective, Transparent, and Accountable System of Government Crisis Communication

For crisis and emergency management, preparedness is enhanced by learning from past lessons. The public should be made aware of the lessons learned through experience in order to better equip them with the knowledge necessary to deal with nuclear risks and have the greatest chance of survival. The roles of nuclear emergency managers and relief organizations must be clearly defined based on the lessons learned. It is crucial for the government to establish transparent and accountable government crisis and risk communication for all. The government should

- Improve the communication framework for public disclosure and sharing within several disaster management organizations.
- Strengthen public relations capability to promote information disclosure and sharing among relevant organizations.
- Prepare for worst-case scenarios to reduce the element of surprise in emergency and crisis management (GIC, 2012; NAIIC, 2012).
- Monitor parliamentary nuclear crisis and Fukushima disaster responses to ensure transparent and accountable government crisis and risk management (NAIIC, 2012).

Establish Accountable and Transparent Government Records Management to Facilitate an End to the Fukushima Nuclear Disaster and Mitigate Future Disasters

As described earlier, it was found that the government did not keep the records of meetings held at the Nuclear Emergency Response Headquarters or elsewhere during the emergency. A year later, the government reportedly assembled transcripts of emergency meeting records after the fact and released these to the public. These transcripts offered useful lessons for the emergency management system, particularly with regard to reorganizing the crisis and risk communication systems.

The as-yet-undisclosed transcripts of government managers and the local Fukushima NPS director at the time of the crisis are reportedly included in the government's investigation records (as of July 2014). These government records should be disclosed to the public according to a recently passed public records management law. Although the government is still resistant, it has been suggested that the government might consider disclosing them to the extent possible without jeopardizing national security or the privacy of the people involved. The Fukushima NPS director reportedly stated that it was difficult to gather crucial accident information at the damaged sites. Transparent and accountable records disclosure may provide useful lessons for better organizing nuclear accident risk and crisis management, as well as government crisis communication systems in particular. The implications of the lessons learned are that the following aspects must be strengthened:

- Public recordkeeping and disclosure by the central and local governments
- Utilization of public records to better prepare for possible future disasters and to more effectively disseminate crisis knowledge among both citizens and crisis managers

Resilient Capacity Building, Citizens' Rights, and Government Responsibility: Learning from the 3.11 Nuclear Disaster

In 2014, the Japanese government adopted a new energy policy that allowed for resumed generation of nuclear-energy-based electricity, although Japanese polls even now indicate that the majority of the Japanese citizens are against resumption of NPS operations. Following are some of their concerns:

- No practical decommissioning technology is available anywhere.
- Greater use of nuclear power stations is being promoted worldwide.
- Suitable sites to store radioactive nuclear wastes are difficult to find, in either Japan or anywhere else in the world.
- It is not possible to be perfectly prepared for a nuclear crisis that threatens the lives and safety of individuals and communities.
- The IAEA (2014) warned of the importance of better communication and the need to ensure that timely crisis and risk information is shared among the decision-makers and citizens.

In particular, the government of Japan must encourage resilient capacity building for nuclear disaster mitigation by

- Educating and training all of the professionals, bureaucrats, politicians, and citizens involved in disaster governance
- Emphasizing the importance of sharing nuclear crisis and risk information among all disaster stakeholders*
- Organizing drills for emergency evacuation
- Developing a valid plan to end the Fukushima nuclear disaster and eliminate further radiation risks, particularly now that the government is primarily responsible for facilitating decommissioning and reducing the spread of radiation from the nuclear debris
- Learning from the past experience, which is most essential for disaster mitigation and emergencies, and strengthening surprise management because any crisis situation always has surprises

* MEXT has proposed establishing a new focal research and training center in Fukushima in 2016 to develop safety decommissioning technologies. Innovations developed at the new center would be shared with professionals from around the world (*Yomiuri Shimbun*, June 20, 2014 issue, p. 1).

Conclusions

Disasters happen, particularly in natural-disaster-prone countries such as Japan. More than 3 years have passed since the 3.11 disaster, but the recovery process has been a slow one. Major earthquakes are predicted to occur in Japan in the future, so the lessons learned from the 3.11 disaster must be applied to building safety resilience capacity. Additionally, in Japan, the government needs to improve upon its accountable and transparent nuclear emergency management. Safety resilience capacity building needs to be aggressively pursued by the government of Japan, which has lost the trust of its citizens, and should seek the input of everyone involved. Some key lessons learned include the following:

- Nuclear crisis and risk information must be disclosed to all of those involved in a timely manner to ensure the citizens' rights and ability to choose the best course of action; such information would include evacuation routes and methods.
- Local municipal governments should hold drills for disaster emergency preparedness to help their citizens escape from danger.
- The central government should provide transparent and accountable nuclear risk and crisis information based on records from government or parliamentary investigative reports on the Fukushima nuclear disaster to local municipal governments, which are primarily responsible by law for planning disaster mitigation and emergency responses.
- The central government, through the passage of laws, should provide the necessary aid to local governments in support of their planning.

Questions for Discussion

1. Have you witnessed any type of government applying lessons learned from a crisis to improving their emergency and crisis management? If not, why do you think that hasn't happened?
2. How can a government ensure greater disclosure of accountable and transparent crisis and risk information to its citizens in this global communication era?
3. How can a government improve its records management in order to better assist both emergency managers and citizens and to enhance risk and crisis mitigation planning?
4. Informed, effective self-help and help provided by others are important elements in disaster mitigation. What should a government do to better prepare its citizens to survive a nuclear disaster emergency?

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