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Transport of Radioactive Soil and Waste to the Fukushima Interim Storage Facility

—From Organizational Arrangement Perspectives

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Abstract

The Ministry of the Environment of Japan started transport of radioactive soil and waste to the Fukushima Interim Storage Facility in March 2015 following the decontamination works from the Fukushima Dai-ichi Nuclear Power Station disaster in March 2011. Although it was an unprecedented challenge and seemed unfit for the ministry with mainly regulatory functions, the ministry prepared the transport plan and smoothly started the initial works. This article reviews the planning and initial implementation processes mainly from the organizational arrangement perspectives. In addition to the organization's original expertise and experiences, the organization's absorptive capacity that stemmed from organizational culture contributed to the smooth implementation. It is recommended that organization's absorptive capacity be considered when setting up implementation arrangements for responses to an unprecedented challenge that requires quick decisions and flexible actions.

Keywords: interim storage facility, transport of radioactive soil and waste, response to unprecedented events, absorptive capacity, organizational culture

1. Introduction

This article reviews the planning and initial implementation processes for transport of radioactive soil and waste generated in the large contaminated areas off-site the Fukushima Dai-ichi Nuclear Power Station in Fukushima Prefecture, Japan, due to the Great East Japan Earthquake and Tsunami on 11 March 2011. Such transport has been unprecedented in Japan and for the Ministry of the Environment (MOE) in terms of its volume (up to 28 million m^3) and radioactive nature of substance. Naturally, the public concerns were high, and every action attracted high media attention against the MOE's performance. The article attempts to review factors that contributed to the smooth planning and initial implementation through factors mainly on the administrative arrangement aspects like the original experience and expertise and absorptive capacity including the organizational culture in response to such an unprecedented challenge. The research is mainly based on interviews and dialogues the author conducted with relevant government officials and stakeholders.

Implementation arrangements to respond to unprecedented events are normally decided based on the relevance and existing capacity of the responsible organizations. The assigned organizations need to undergo changes to fulfil the tasks. Meyer, Brooks, and Goes (1990) categorized two types of changes, namely first order (adaptation) and second order (metamorphosis) changes. The first order changes are continuous and occur within a stable system while the second order changes transform fundamental properties or states of the system. Harrald (2006) concluded that the nonstructural factors such as improvisation, adaptability, and creativity were critical to successful problem solving in disaster response. Lee, Bae, Oh, Hong, & Moon (2014) conducted system analysis on organizational conflict in the post disaster response of Hurricane Katrina and indicated importance of networking strength for the response success. Cohen (1990) labeled absorptive capacity as the ability of an organization to recognize the value of new, external information, assimilate it, and apply it. Absorptive capacity is largely a function of the organization's level of prior related knowledge and critical to its capabilities.

The Great East Japan Earthquake and Tsunami brought the government of Japan (GOJ) many unprecedented challenges.

Tanaka (2012) outlines the lessons from the accident itself. Among the unprecedented challenges were the measures for decontamination of radioactive material discharged by the Fukushima nuclear accident. The GOJ designated the MOE as the focal agency in this regard through the "Act on Special Measures Concerning the Handling of Radioactive Pollution" in August 2011. No government agency could have been a perfect match for such an unprecedented event. While the MOE had some experience and expertise related to "cleaning-up" measures like solid waste treatment and health related measures like pollution control, these roles had been limited to the regulatory side and the MOE's direct implementation experiences had been limited to small-scale preservation works in national parks.

The designated decontamination area, in which over 1 mSv/year of additional exposure dose were observed, spanned a wide area of eastern Japan for 100 municipalities in 8 prefectures. The MOE were designated to directly implement decontamination in heavily contaminated 11 municipalities in Fukushima Prefecture (Special Decontamination Areas) while municipal governments were tasked for decontamination in other areas. The removed soils and wastes from decontamination works were initially piled up in temporary storage facilities or buried underground on the spot within each municipality.

The GOJ planned an interim storage facility (ISF) near Fukushima Dai-ichi Nuclear Power Station to serve as a facility that gathers radioactive soil and waste from the temporary storage sites within Fukushima Prefecture, where the highest volume of soils and wastes were concentrated. The ISF was designed to store the soils and wastes up to 30 years until they are moved to final disposal facility (Figure 1). The MOE issued "Basic Policy on Interim Storage and Other Facilities" (MOE, 2011) and announced that it would make utmost efforts to put ISF into service within about three years from the start of the full-scale transfer of the soil or waste to temporary storage sites, which was commonly understood as January 2015.

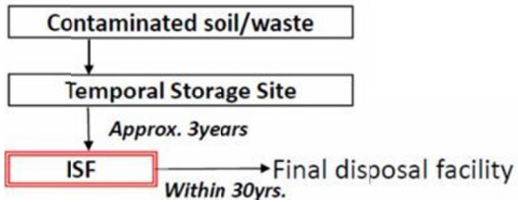

Figure 1. Storage and Disposal Scheme of Contaminated Soil and Waste in Fukushima Prefecture

Source: International Atomic Energy Agency (2013)

2. Overview of the Transport to ISF

The MOE estimated that the total transport volume will be up to 28 million m^3, of which up to 12.5 million m^3 will be transported by 2020, when the Tokyo Olympic and Paralympic Games will be held (Nishio, Kamei, Morikawa, & Ishikawa, 2016). The transport drew a tremendous amount of attention from the local mass media, municipalities, residents, drivers, etc. due to the high volume, people's fears against radioactive substances, and public frustration against the accident and the government's responses.

Preceding the transport planning and implementation, the ISF construction plan was discussed and negotiated with the local municipalities and residents. The MOE proposed an initial plan in March 2012. Fukushima Prefectural government accepted MOE's initiation of onsite surveys in November 2012 and established an Experts Panel on ISF in April 2013. The MOE tried to meet the initial schedule of starting ISF operation in January 2015 while the local governments and residents often criticized the MOE and GOJ on their hurried approaches.

The MOE started the official transport planning process by organizing "Working Group on Transport of Soil and Waste to ISF" in December 2013. The working group was headed by an expert in transport and included external environment and radiation experts and a local opinion leader. The main objective of the working group was to discuss the basic framework of the transport plan. The working group meetings were open to mass media, and they were reported with substantial details in major media in Fukushima, Tokyo, and elsewhere. The working group's chairperson made it clear in the first meeting that the MOE should "take all possible actions without making any taboos or assumptions" to gain public and local governments' support (MOE, 2013). The MOE was requested to take extremely quick decisions and flexible actions to commence the transport in accordance with the GOJ's target timeframe.

On 1 September 2015, the Fukushima Governor accepted the construction of ISF. However, he explicitly announced that the acceptance is only for construction and not for transport of soils and wastes into ISF. He demanded that five measures be confirmed before the commencement of transport, including the national provision of maintenance and periphery measures along the transport route and guaranteed safety on the ISF and transport.

The working group proposed the basic framework for transport in September 2014 after four rounds of meetings. The MOE held a consultation meeting with all the municipal governments in Fukushima Prefecture and issued the Basic Plan for the Transport in November 2014 and the Implementation Plan in January 2015 after two more rounds of the consultation meetings with the municipalities.

The initial transport started in March 2015 as a pilot transport for about one year, which was only two months behind the original target despite the high level of hardships. The working group assessed results of the pilot transport in December 2015 and concluded that the pilot transport had been largely smooth without major problems (MOE, 2015).

3. Factors for Smooth Planning and Initial Implementation

Some government officials noted in interviews that the MOE could not be a good match for the task of transporting soil and waste to ISF as it: (i) was not responsible for the nuclear disaster, (ii) had no experience in direct implementation of large public works projects, and (iii) was not an administrative agency for the transport sector. A local newspaper in its series to commemorate five years from the disaster raised anxieties that: (i) the MOE might have its limit as it is not a responsible ministry in the fields of establishing and implementing ISF and (ii) other ministries like the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) could not extend its cooperation of out-posting experts any further (Fukushima Minpo Newspaper 2016). Despite such handicaps, the MOE prepared the basic plan and the first implementation plan by January 2015 and commenced the transport in March 2015 without much delay from the original schedule. The MOE completed a pilot transport of 45,382 m^3 radioactive soil and waste from 43 municipalities in the fiscal year 2015 smoothly without major problems.

This chapter reviews the factors that contributed to the MOE's sound planning and smooth initial implementation despite the vast challenges.

3.1 Expertise from the Original Mandates

The MOE, formerly the Environmental Protection Agency (EPA), was established in 1971 in response to serious pollution-related diseases caused by Japan's rapid industrialization. The mandate for waste management was transferred from the Ministry of Health to the MOE when the former EPA was upgraded to the MOE in 2001. Large scale pollution diseases including the internationally notable Minamata Disease came to a large social concern, forcing the EPA to deal with the disasters created by pollutants from industrial activities. There are similarities between these pollution diseases and the Fukushima nuclear disaster in the sense that they both: (i) involved a large number of affected people spread across the regions, (ii) attributed the primary responsibilities to companies' industrial activities, and (iii) caused significantly large public unrest. It seems too distant past to be counted as experience, but MOE officials noted in interviews that the ISF team and its transport unit had regular coordination meetings with the Environmental Health Department, which is still in charge of Minamata Disease and other pollution diseases, and share know-how especially in risk management and communication. As the public had high anxieties over health impacts of radioactive soil and waste, this coordination benefitted greatly.

The MOE had another expertise from its original mandates related to transport to ISF. The MOE handled transport of polychlorinated biphenyl (PCB) wastes through the Japan Environmental Storage & Safety Corporation (JESCO), a special company under the MOE. JESCO was responsible for treatment and transport of PCB wastes. PCB was produced and used in all over the country until 1972, when the production and distribution was banned. PCB wastes were transported by licensed companies to JESCO's treatment facilities following technical guidelines set by the MOE. The MOE assigned JESCO to be responsible for some tasks related to ISF and transport to it because JESCO has acquired expertise in safe transport and monitoring of hazardous materials through management of PCB (Sugiura 2014). JESCO's experience and expertise were well utilized in establishing and implementing the monitoring systems for transporting vehicles and containers.

As shown above, the MOE's original experiences and expertise were utilized especially in: (i) risk management and communication and (ii) monitoring of transporting vehicles and containers. The MOE monitored radiation dose rates and other environmental indicators along the transport routes and disclosed them, and transported containers and transportation vehicles were individually tagged and checked on their contamination levels, locations, etc. The MOE and municipal governments established information centers in major locations such as municipal government offices and train stations. Such risk communication and management measures contributed to ease public fear for the unknown risks of nuclear hazards as the local residents were highly sensitive on invisible risks of radioactive substances and skeptical against Tokyo Electric Power Company and GOJ on the cause and handling of the nuclear disaster. Moreover, a majority of public could associate the MOE with protection of environment and preservation of national parks, and such perception was advantageous in obtaining public support compared to other agencies directly responsible for the nuclear disaster.

3.2 Organizational Culture and Capacity Enhancement

Original experience and expertise mainly contributed to mitigating the public fears against unknown risks of nuclear hazards. However, there were also doubts over the MOE's capacity to plan and implement a large-scale transport project. Also, as Cohen (1990) pointed out, the original institutional knowledge and expertise must have enhanced the MOE's absorptive capacity. This section reviews organizational culture of the MOE and its capacity enhancement through the initial experience of directly implementing the decontamination measures.

The MOE became responsible for decontamination of radioactive pollution when it was assigned through the GOJ's act in August 2011. Although the decontamination and ISF were handled by separate teams, the two teams were both under Environmental Management Bureau and worked closely under the common management and through regular coordination meetings. In the headquarters, the two teams had been physically placed next to each other and were merged into one large room in early 2015. The MOE established Fukushima Office for Environmental Restoration in January 2012 to enhance implementation and local coordination capacity. The Fukushima Office also had both decontamination and ISF functions and acted as a common focal in dealing with local governments and residents. In such organizational arrangements, the MOE made it possible to smoothly transcend the capacity acquired through direct implementation of the decontamination to the tasks of ISF and transport planning.

In addition to the capacity enhancement thorough direct implementation, it was found out through the interviews that MOE's organizational culture played an important role in taking "all possible actions without taboos and assumptions" as the working group's chairperson requested (MOE, 2013).

The MOE identified cooperation from other ministries as the most important factor for a quick start of decontamination works (MOE, 2016). The MOE had little experience or expertise in direct implementation of transport projects as it had been mainly a regulator and not a project planning or implementation organization. Its main function in transport was to review and provide opinions to environmental impact assessments of projects. The MLIT, on the other hand, was the key agency with transport sector expertise and project implementation capacity. Therefore, the MOE requested secondees from MLIT, and the section chief for the ISF transport unit was one of the secondees.

What are the organizational cultures of the MOE, and what roles did they play in ISF transport planning and implementation? The GOJ ministries are notorious for their strong sectionalism. That is especially true in a large ministry like the MLIT with a large amount of vested authorities and budgets. On the contrary, the MOE, at least until the Fukushima related works, was considered as a relatively new and small ministry (Table 1). The two ministries had contrasting organizational culture as well. According to the interviews with the officials from each ministry, the MOE generally had friendly atmosphere to external staff and flat decision making structure. The secondees in the MOE noted that such atmosphere promoted smooth and productive work environment.

Since its establishment in 2001, MOE's management and other staff included secondees and transferred staff from different ministries and agencies, which include the Ministry of Health, Labor, and Welfare, the Ministry of Finance, and MLIT. The administrative vice minister, the top level bureaucrat's post except for political appointees, was often taken by secondees or transferred staff from other ministries. Such unfixed personnel structure acted as the foundation of the openness in the work place.

In addition, the number of staff was rapidly increased after the Fukushima accident from 1,259 staff in fiscal year (FY) 2011 to 2,953 in FY 2015, more than doubled within the first three years, while the numbers of employees in the whole GOJ and other large ministries like MLIT were in a decline (Table 1). Such rapid influx of external staff inevitably made the work force diverse and flexible.

Table 1. Allocated Number of Staff in Relevant Government Organizations

	FY 2011 (=A)	**FY 2012**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016 (=B)**	**Increase (= B–A)**
MOE	1,298	2,010	2,814	2,762	2,920	2,953	1,655
MLIT	60,222	59,763	59,466	59,054	58,815	58,573	-1,649
Reconstruction Agency	0	118	169	183	191	197	197
GOJ Total	301,058	299,758	298,341	297,340	297,091	296,766	-4,292

FY = fiscal year, GOJ = Government of Japan, MLIT = Ministry of Land, Infrastructure, Transport, and Tourism, MOE = Ministry of the Environment.

Note: All the numbers are allocation at the end of each FY.

Source: Cabinet Secretariat (2016).

As a relatively new and small agency with staff from various career backgrounds, the MOE was often seen to have culture with openness and flat decision making, where externally recruited staff could work smoothly with the existing staff and new ideas could be created and grown. In other words, the absorptive capacity of the MOE for drastic changes was high. Such culture and capacity benefitted considerably at facing the unprecedented challenge and high media and public attentions on the ISF and transport to it. New conditions had continuously been set by the local governments based on harsh opinions from the public. The MOE was required to respond with new and innovative approaches with very quick decision making in various occasions. Conventional bureaucratic approaches, where lots of so-called "red tapes" hamper quick responses, should not have worked effectively in such circumstances.

4. Conclusion

This paper attempted to examine what enabled a relatively small and inexperienced institution to smoothly handle an unprecedented challenge. Through the interviews to and dialogues with various GOJ officials, some doubted why the MOE should have been assigned with the task of cleaning-up and transport of the radioactive soil and waste to the ISF as it was neither an organization with implementing capacity nor the responsible organization for the nuclear disaster. However, the MOE had promptly prepared the plans and started initial implementation of the transport to ISF despite unprecedented challenges and public pressure.

One factor turned out to be seemingly unrelated experiences from the pollution diseases and treatment of PCBs, which might not have been much considered when the implementation arrangements were decided. This factor was quite effective in mitigating the public fears over unknown risks of nuclear hazards. Another factor was the organizational culture with friendly atmosphere to external staff and flat decision making, which also increased the absorptive capacity of the institution to adopt to unprecedented challenges. This factor contributed to promptly acquire implementation capacity with a rapid influx of new and external staff.

It is recommended that review of organization's various experiences, culture, and absorptive capacity be necessary including the ones not seemingly directly related when setting up implementation arrangements for responses to an unprecedented challenge that requires quick decisions and flexible actions.

Disclaimer

The views expressed in this study are the views of the author and do not necessarily reflect the views of organizations that the author has belonged to.

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