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Multiple disasters management: Lessons from the Fukushima triple events

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ABSTRACT

It has been five and a half years since the Great East Japan Earthquake (GEJE) in March 2011. This study summarize management and policy lessons from the GEJE. The recovery efforts that followed the triple disasters: the earthquake, tsunami and meltdown of the Fukushima Dai-ichi nuclear plant are in progress. The experience of the GEJE and tsunami prompted the building of embankments throughout the Pacific coastal side of the Tohoku region. The Cabinet's Reconstruction Headquarters used at least 19 trillion yen ($158 billion) for intensive reconstruction over five years through 2015. The local government of the affected area accelerated the decontamination of commercial land which is an important action for the recovery. The central government introduced the Electricity Business Act for implementing voluntary energy conservation measures for peak energy seasons. The GEJE has had an indirect effect on the health of the disaster victims via job uncertainty as well. Decontamination is crucial in bringing people and businesses back to the affected area and promoting sustainable economic recovery because it reduces uncertainty about the short and long-term health risks. An efficient health and occupation plan for the victims is essential for the integrated approach to multiple disaster management.

1. Introduction

The aftermath of the meltdown of the Fukushima Dai-ichi nuclear plant has severely complicated the process of recovery from the Great East Japan Earthquake (GEJE). The affected area has suffered from both economic damage and increased health risks due to residual radiation. Decontamination of the affected areas is still underway, but progress in the recovery is evident. Discussion about nuclear radiation now focuses on pressing local governments to conduct regular environmental radiation monitoring and to update radioactive deposition data. This study summarize management and policy lessons from the GEJE.

Although the debate continues about preparedness before the event and disclosure of its severity, it appears that Japanese authorities have taken actions to mitigate the impact of radiation on human health. These actions include evacuating more than 200,000 inhabitants from the vicinity of the site, monitoring food and water, and systematically scanning evacuees.

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However, the situation at the Fukushima Dai-ichi nuclear facility remains fluid, and the long-term environmental and health impacts will likely take years to be fully known (Dauer et al., 2011).

The recovery process has two main pillars that are closely entwined. One is decontamination and the associated reductions in health hazards, and the other is the aggregate economic recovery. Economic recovery is possible only if evacuees return to the affected area (see Sanaei et al., 2016), which requires the health risk from radioactive contamination to be reduced. Economic damage from the radioactive contamination is well documented (Tanaka and Managi, 2016; Yamane et al., 2011a,b). An increase of 1 μSv/h decreases the land price by 3.39% on average in Fukushima and Miyagi prefectures, and the estimated economic damage due to the radiation-related aftermath of the GEJE to Fukushima is approximately 64.1 billion Japanese yen (US $0.53 billion) (Tanaka and Managi, 2016). However, research shows that the land price decline is only partially explained by increased levels of radiation. Population decreases also have indirectly affected land prices. Thus, population increase, which would result primarily through the return of victims to the area, is crucial for economic recovery (see Shin et al., 2016).

According to the Reconstruction Agency of Japan's annual survey of the victims who have been evacuated from severely contaminated areas, the decision to return to Fukushima depends foremost on the recovery of infrastructure and public services that directly affect the recovery of their businesses. Another important concern for the evacuees is the speed in which the decontamination process takes place (Reconstruction Agency, 2014).

Decontamination is crucial in bringing people and businesses back to the affected area and promoting sustainable economic recovery because it reduces uncertainty about the short and long-term health risks. To date, more than 1500 billion yen ($12.5 billion) has been invested in the decontamination process. The *Act of Special Measures Concerning the Handling of Pollution by Radioactive Materials* has provided the legal basis to spend large amounts of money for decontamination, but the process is still incomplete (Yasutaka et al., 2013). The problem is that the Fukushima Dai-ichi nuclear plant has been continuously releasing radioactive substances. Therefore, the very source of radioactive contamination has yet to be stemmed.

Allocating resources to decontamination is difficult given the high cost and the limited budget for recovery from the multiple disasters. In the future, it may be useful to prioritize decontamination by ranking the capacity of the land to generate economic value. One possible solution for the recovery of the affected area would be to accelerate decontamination of commercial land and delay decontamination of farmland. Given budget limitations, commercial land has a relatively higher monetary value, and therefore the optimal length of the decontamination process for commercial land is 5–10 years as compared to more than 30 years for farmland (Munro, 2013).

2. Lessons in managing and recovering from the triple disasters

2.1. Dealing with energy shortages

The GEJE and the subsequent accidents in the Fukushima Dai-ichi nuclear plant catalyzed the revival of the energy security problem in Japan. Moreover, the accident destroyed the image of nuclear power as a safe and efficient energy source. As a result, the government shut down all 54 nuclear plants, causing the share of nuclear power in electricity generation to drop from 30% to zero for almost two years until the recent restart of the Sendai Nuclear power plant in Kagoshima on August 11th, 2015. This decline in electricity generated by nuclear plants boosted the share of imported fossil fuels for electricity generation.

Such policy changes increased the import cost of fossil fuels for electricity generation by approximately 3.6 trillion yen ($30 billion) per year as compared to before the earthquake (Ministry of Economy Trade and Industry (METI), 2010). Given that a large share of the additional fossil fuels come from the Middle East and North Africa, where many countries suffer from political instability, the government has restricted electricity consumption during peak demand seasons. The government restricted electricity use in 2011 through the Electricity Business Act, setting specific target numbers for 2011 and 2012, and then implemented voluntary energy conservation measures for peak energy seasons from 2012 to 2015.

Consumption behavior in Japan changed to deal with energy shortages in the short and long term. Restrictions on electricity usage reduced consumption by 8% (Okajima et al., 2015). In the industrial sector, restrictions reduced electricity consumption in both the short and long term. Electricity consumption decreased more in summer than in winter. In the residential sector, restrictions reduced electricity consumption only in the short term and only in summer.

The aftermath of the accidents has induced heated debate domestically and internationally as to whether nuclear power is required to secure energy in the short and long term. The government has developed a nationwide argument that takes into account the factors of safety, efficiency, economy, and environment, but the arguments are based on the future reduction of nuclear power dependency (The Energy and Environment Council (EEC), 2011). The government proposed three options for the energy mix by 2030: a nuclear-power-free society, 15% dependence, and 20%–25% dependence on nuclear energy (The Energy and Environment Council (EEC), 2012). Because the dependence in 2010 was 26% and the pre-GEJE target for dependence in 2030 was 45%, all the proposed options have ambitious changes in the level of dependence. As a result of the nationwide discussion, the government in 2012 announced a national strategy that seeks for the country to forego dependence on nuclear energy. The announcement reflects the voice of citizens informed about the impact of all the options on the energy mix, energy costs and the economy. According to The Executive Committee of the Deliberative Poll on Energy and Environmental Policy Options (2012), the majority of citizens support zero nuclear energy in the future.