

Chapter 49

Disaster Research

Field of expertise: Disaster Survey and Research

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Summary

After the Great East Japan Earthquake, various disaster surveys were conducted and are still ongoing. In subsequent disasters, the results of these surveys have been promptly shared not only among experts but also among various stakeholders involved in the disaster to reduce risks and prepare for the next disaster. Disaster research is often burdensome for the affected people and the affected local governments, and they need to be conducted appropriately in accordance with the disaster cycle.

Keywords: disaster research, changes in disaster research, information sharing, burden on affected people, disaster cycle

Introduction

Disasters can be viewed as a cycle, with research required immediately after a disaster, within days or weeks, and over a period of months or years anticipating the next one. Disaster science is the whole compilation and interpretation of such surveys and data to reduce the disaster risk and prepare the next disasters regardless of scientific disciplines.

1: Problems Revealed by the Great East Japan Earthquake

What happened?

The Great East Japan Earthquake was the largest earthquake ever recorded in Japan with a magnitude of 9.0. The earthquake was felt in almost all of Japan, and the huge tsunami hit the vast coastal areas. The damage caused by the earthquake and tsunami varied according to the topography of the affected area, population and residential patterns, the location of industries and structures, and so on. In particular, in Fukushima Prefecture, the tsunami hit the nuclear power plant, releasing radioactive materials into the air and seawater, creating a complex disaster with the additional hazard, radiation. It is not easy to grasp the full extent of such a huge disaster. Although a great number of field surveys were conducted, each was often limited to the area of expertise and research interest, administrative responsibility of the ministry, or municipality

departments conducting the survey. It took a great deal of effort, money, and time to compile and share the results of the massive and various fields of survey.

The reality of the damage

For example, in the aftermath of the Great East Japan Earthquake, police and firefighters were the most widely used sources of information on human casualties. Even so, the first statistics on the number of fatalities were released on March 18, one week after the disaster, with 6,911 people reported nationwide, and the total number of fatalities as of April 5, when the number of fatalities in Fukushima Prefecture was first reported, was 12,321. As of March 11, 2012, the National Police Agency reported 15,854 dead, 3,155 missing, and 26,992 injured (National Police Agency, 2012). On the other hand, the Fire and Disaster Management Agency has reported 16,278 dead, 2,994 missing, and 6,179 injured as of March 13, 2012, as reported by each prefecture (Fire and Disaster Management Agency Disaster Response Headquarters, 2021). It is not a question of which organization is correct, but rather understanding the scale and damage of the disaster as well as the difficulty of grasping the entire picture.

Administrative surveys and information dissemination can consolidate the information from all local governments, are necessary and useful for getting a complete picture of the disaster and making policy decisions. As of March 11, 2012, the National Police Agency reported that 129,107 houses were completely destroyed, 254,139 houses were partially destroyed, 281 houses were completely or partially burned, 20,427 houses were flooded above floor level, and 15,503 houses were flooded below floor level. The Fire and Disaster Management Agency reported almost the same number for the same period. Although administrative surveys are very important, research conducted by researchers is also essential to explore the mechanisms of disasters, find the factors that affect the damage, and determine disaster risk reduction policies. As has been mentioned in other chapters, equipment for measuring seafloor movement using GPS and underwater sonar to determine the movement of the Pacific plate that caused the earthquake and tsunami was installed before the disaster as a nationwide collaborative research project. This was the first earthquake where the movement of the seafloor was accurately measured, and the movement of the tsunami from its occurrence offshore to its arrival at the coast was precisely captured. At the root of this research is the understanding that disasters occur repeatedly and are cyclical, starting with disaster onset, response, recovery, reconstruction, and lastly, preparation for the next disaster. Scientists recognized the importance of capturing the movement of the seafloor and preparing for early tsunami warnings.

2: Paradigms Destroyed by the Earthquake

Conventional wisdom and necessary responses

The intensity of the energy and geographic scope of the Great East Japan Earthquake created a wide range of damage depending on the characteristics of the affected area. The form and extent of damage differed greatly depending on the balance between the hazard and exposure (the strength of shaking, tsunami, and radiation), the vulnerability, and the coping capacity of people and communities. The damage was not limited to humans and buildings, but also had a major impact on roads, bridges, communication hubs, infrastructure for lifelines such as electricity, gas, and water, social systems such as government, medical, and educational institutions, production bases and supply chains of all industries. People's physical and mental health, lives, and communities were also greatly affected. There were large losses of families, culture and

historical memories of the communities.. Therefore, it was difficult to analyze the mechanism of damage and take effective countermeasures through only studying one aspect of the disaster. Although the protection of personal information is an important law that must be observed even in times of disaster, it is an obstacle to sharing information on affected people. Even within the contexts of an administrative survey, sharing information on the affected people with other administrative organizations, researchers, companies, etc. requires the consent of the individual. As a result, similar surveys were conducted over and over again. If the same survey is repeated and it is not clear what the purpose of the survey is, it only becomes a time-consuming, psychological burden for the affected people.

Surveys were not only conducted on the affected people. Many affected local government officers had to conduct surveys and reports to understand the damage to the residents and local communities at the request of the central government, even though themselves and their families were affected. In addition, they had to respond to the requests for cooperation and permissions from researchers.

3: A New Approach

The Great East Japan Earthquake created a stir in the way disaster research should be conducted. Particularly in the case of research involving human subjects, it is mandatory to be approved by an ethical review of the purpose of the research, scientific rationality, validity of the research methods, and ethics. This is based on the concept of the Ethical Guidelines for Medical Research Involving Human Subjects (Ministry of Education, Culture, Sports, Science and Technology & Ministry of Health, Labor and Welfare, 2014). While medical research must strictly adhere to these ethical guidelines, non-medical investigations can still be conducted by submitting a plan to an Institutional Review Board (IRB), whose members include both men and women as well as non-researchers, for consideration. By submitting the plan to the IRB, well-prepared and necessary research can be conducted, while simultaneously reducing unnecessary research. This also allows us to decide in advance how to thank the local governments and affected people for their cooperation and how to feed the research results back to the community. Such IRB review is not necessary for research on natural phenomena such as earthquakes, tsunamis, extreme weather, and floods, but if the research is related to the relationship with human society, evacuation behavior, and recovery and reconstruction activities of affected people and areas, an IRB review will help clarify why and what kind of research is being conducted.

Some phenomena, such as surface faults caused by inland earthquakes, will disappear due to recovery activities if not conducted immediately after the disaster. The debris from collapsed houses may contain valuable cultural assets and family memories. Evacuation centers and homes contain sensitive personal information, and the protection of personal information through anonymization is essential when conducting medical research. Various types of survey and Social research will be conducted on volunteer activities and on business continuity plans for corporate recovery, reconstruction, and preparation for the next disaster. In the field of education, there is a phenomenon called post-traumatic growth, in which people try to become stronger and more resilient after overcoming a disaster.

The Geographic Information System is very useful technology that enables us to visually identify hazards and damages on a map. These innovations have dramatically increased the amount of information that can be obtained from research, both quantitatively and qualitatively. Simulations and technology to capture the movement of the seafloor, robots to observe the temperature and salinity of seawater at fixed points around the world, advanced technologies such as images from satellites, and technology to convert cultural assets into digital data contributes

greatly to the research development. The results of disaster surveys can be immediately reflected on maps and superimposed on the other types of information such as social factors, as well as medical, public health, and historical information. The information obtained from the research is not the sole property of a single researcher, but is often shared globally.

4. Achievements and the Future

The International Research Institute of Disaster Science (IRIDeS) has been conducting emergency research on disasters in Japan and abroad as often possible, including the 2012 Jakarta floods, the 2013 Typhoon Haiyan in the Philippines, the 2014 Gorkha earthquake in Nepal, the 2015 Kumamoto earthquake, the 2017 Kanto-Tohoku heavy rain disaster, the July 2018 heavy rain disaster, the 2019 East Japan typhoon, and many others. In addition to holding debriefing sessions in which the general public and the media can participate in, the collected information is published on the IRIDeS website.

The IRIDeS is a multidisciplinary research institute for disaster science that brings together researchers in science and engineering, medicine, as well as the humanities and social sciences. For disaster research in particular, the Emergency Research Working Group was established under the Research Planning Committee, and experts in various hazards, medical care, social response, mapping, and history and cultural assets, are in charge of planning, implementing, and disseminating the necessary surveys and research. Results of the surveys cover a wide range of topics, including hazard mechanisms, disaster social and medical responses, housing reconstruction, and social vulnerability and characteristics in recovery and reconstruction. These results are compiled and reported in a collection of papers. In many cases, researchers from multiple fields conduct joint surveys. In the case of the Typhoon Haiyan and the Gorkha earthquakes, researchers from fields such as disaster medicine, remote sensing, and social response visited sites as a team, and were able to assess the damage to hospital buildings (which they would not normally have access to), survey flooded areas caused by storm surges, assess damage to sewage treatment plants, and provide humanitarian assistance according to the health status of the residents (International Research Institute of Disaster Science, 2014; 2016).

Conclusion - from the authors

The extent of damage caused by disasters depends on the intensity and exposure of the hazard, as well as the weakness (vulnerability) and strength (coping capacity) of the people and communities affected. The purpose, type, and quality of data, analysis methods, and interpretation of results will vary greatly depending on which aspect of disaster that the research focuses on. Similar surveys may have already been conducted in the past and the results may already be available. It is necessary to carefully consider whether a specific study is really necessary, why it is being conducted, and for whom it is being conducted.

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