Chapter 33

Bringing our Predecessors' Disaster Experiences into the Future of Disaster Prevention

Field of expertise: Disaster Culture Studies

Yuichi Ebina

Translated by Catherine Sachi Kikuchi

Summary

Before the Great East Japan Earthquake, the reality of the 1611 Keicho-Oshu Earthquake and Tsunami had been underestimated, but we now have a clearer understanding of what happened through a review of historical documents and interdisciplinary research at the International Research Institute of Disaster Science. By not neglecting the disaster records and using various historical materials to clarify historical disasters, we can utilize our ancestors' disaster experiences for future disaster prevention.

Keywords: historical disaster, historical materials, Keicho-Oshu earthquake and tsunami, historical landform reconstruction

Introduction

In the wake of the Great East Japan Earthquake, information on historical disasters, especially those before the establishment of modern meteorological observation, has become more important in the analysis of large-scale disasters and disaster prevention planning. In this chapter, we will discuss research methods to utilize information on various historical disasters recorded in various historical materials and apply it to future disaster prevention.

1: Problems Revealed by the Great East Japan Earthquake

What happened?

In the Great East Japan Earthquake of March 11, 2011, a massive tsunami struck the Pacific coast of the Tohoku region, causing tremendous damage in a wide area around the coastal regions of Iwate, Miyagi, and Fukushima prefectures. At the time, it was described by the mass media as an "unprecedented disaster," and was perceived by many people as a disaster they had never expected. The Sanriku coastline along the coast of Iwate and northern Miyagi prefectures had been known as a tsunami prone area, and various disaster prevention measures had been

implemented based on the experience of the 1896 Meiji Sanriku Earthquake and Tsunami and the 1933 Showa Sanriku Earthquake and Tsunami. However, in the Great East Japan Earthquake, the scale of the tsunami was larger than these. In the Sendai Plain of Miyagi Prefecture and the coastal areas of Fukushima Prefecture, there was little awareness of the danger of tsunami disasters prior to the Great East Japan Earthquake, and without adequate disaster prevention measures, the areas suffered tremendous damage from the massive tsunami.

The reality of the damage

Even before the Great East Japan Earthquake, there had been warnings about the possibility of a huge tsunami hitting the Pacific coast of the Tohoku region, based on the discovery of tsunami deposits from the Jogan 11 earthquake tsunami of 869 and the existence of historical documents recording the 1611 Keicho earthquake tsunami. However, they had not been fully utilized in disaster prevention measures prior to the Great East Japan Earthquake. Before this point, disaster prevention measures were based on modern meteorological observation data from the Meiji era onward and historical disasters recorded in earlier documents were not taken into account.

2: Paradigms Destroyed by the Earthquake

Conventional wisdom and necessary responses

On October 28, Keicho 16 (December 2, 1611 on the Gregorian calendar), the earthquake and tsunami that caused massive tsunami damage along the Pacific coast of the Tohoku region was conventionally called the Keicho Sanriku Earthquake Tsunami, and its magnitude was about the same as the Showa Sanriku Earthquake Tsunami in terms of MW (moment magnitude). Previous studies have confirmed that there are historical documents describing the damage caused by this tsunami in various areas of the Morioka (Iwate), Sendai (Miyagi), and Soma Nakamura (Fukushima) feudal domains. It is important to note that the area affected covered the entire coast of present-day Iwate, Miyagi, and Fukushima prefectures, which is clearly larger than that of the Showa Sanriku Earthquake Tsunami, yet it was treated as being on the same scale.

In fact, the name, Keicho Sanriku Earthquake Tsunami, itself is a major problem. The term Sanriku was coined by the Meiji government when it divided the area along the Pacific coast of the Tohoku region, previously known as Mutsu Province, into Rikuzen Province, Rikuchu Province, Mutsu Province, and Iwaki Province. In other words, the Sanriku area did not exist in the early Edo period, and does not include the area affected by the tsunami, which is the coast of present-day southern Miyagi to Fukushima prefectures. These underestimations of historical information and inaccurate nomenclature are indicative of a research situation in which historians were not actively involved in the study of this historical disaster. Before the Great East Japan Earthquake, if this earthquake and tsunami had been accurately analyzed and examined from the perspective of historiography, it may have been possible to alert people to the tsunami disaster in the coastal areas of the Sendai Plain and Fukushima Prefecture.

3: A New Approach

In the wake of the Great East Japan Earthquake, the International Research Institute of Disaster Science conducted a comprehensive review of the historical materials on the Keicho-

Sanriku Earthquake Tsunami and developed a new research approach that integrates the humanities and sciences. The term Oshu was used in the historical documents of the time to indicate the Pacific coast of the Tohoku region, but in order to attempt to break away from the underestimation and accurately represent the extent of the damage caused, the name was changed to Keicho-Oshu Earthquake Tsunami.

The historical documents that recorded the Keicho-Oshu Earthquake Tsunami can be roughly categorized as follows: (1) the records of Vizcaino, a Spanish explorer who directly witnessed the tsunami, and those of court nobles in Edo at the time; (2) Sunpu Seijiroku (Records of the Sunpu Government), which describes the damage reported by Sendai Clan officials in Sunpu at the time; (3) historical documents of the Sendai Clan and Soma-Nakamura Clan; and (4) documents from Morioka Clan's Miyako, Yamada, and Oita areas in present-day Iwate Prefecture. These documents show that there were earthquakes that affected areas ranging from Tohoku to Edo, and tsunamis in the coastal areas of Tohoku feudal clans. One of the questions raised by previous studies is the description in the Sunpu Seijiroku, from (2) above. The description is that a boat swept away by the Keicho-Oshu earthquake tsunami washed ashore at Senkan-matsu, which used to exist at the top of Mount Sengan in the present-day Iwanuma City area, Miyagi Prefecture. From this description alone, it is difficult to believe that the tsunami reached the top of Mount Sengan, which is about 190 meters above sea level, and previous studies have suggested that Date Masamune[1] invented this description. However, according to the records of the Sendai Clan, the term Sengan-matsu refers to the pine forest that exists from the top to the bottom of Mount Sengan, and the old map Tamura Ukyoryo Chigyo Boundary Map (Sendai City Museum map collection), drawn 50 years after the Keicho-Oshu earthquake tsunami, shows that a tributary of the Abukuma River was flowing near the foot of the mountain at that time (Figure. 33-1). By reconstructing the historical topography of the time, we can point out the possibility that the river tsunami that entered from the mouth of the Abukuma River during the Keicho-Oshu earthquake tsunami went up to the base of Mount Sengan (Ebina, 2013).

Two years after the Great East Japan Earthquake, the Iwanuma City Board of Education discovered a new stratum of tsunami sediments that may have originated from the Keicho-Oshu earthquake tsunami in the sediment between the Jogan tsunami and the Great East Japan Earthquake tsunami in Shin-Hishinuma, Iwanuma City (Iwanuma City Board of Education, n.d.). This proves that the Keicho-Oshu earthquake tsunami struck the coast of the Iwanuma area, and explains how the information propagated and became what is described in the Sunpu Seijiriki. Furthermore, in collaboration with researchers in the fields of tsunami engineering and science, we extracted the traces of the Keicho-Oshu earthquake tsunami from the descriptions in the aforementioned (1) to (4) and related historical documents, measured the trace height at each point using the latest surveying technology, and estimated the tsunami wave source to explain the distribution. As a result, the seismic magnitude of the Keicho-Oshu earthquake tsunami was MW 8.4-8.7, which was larger than that of the Showa-Sanriku earthquake tsunami, once considered to be of similar magnitude (Imai et al., 2015).

In the new research on the Keicho-Oshu earthquake and tsunami, the historical documents describing the disaster will not be judged merely through what is said about the disaster itself, but the context in which it exists, and related documents will be analyzed as well. In addition, based on the interpretations obtained through the analysis of these documents, we have been able to clarify the reality of the tsunami by conducting interdisciplinary research with tsunami engineering and science.

[1] Date Masamune, 1567-1636, was a ruler in the Tohoku region and founder of the city of Sendai, Miyagi Prefecture.

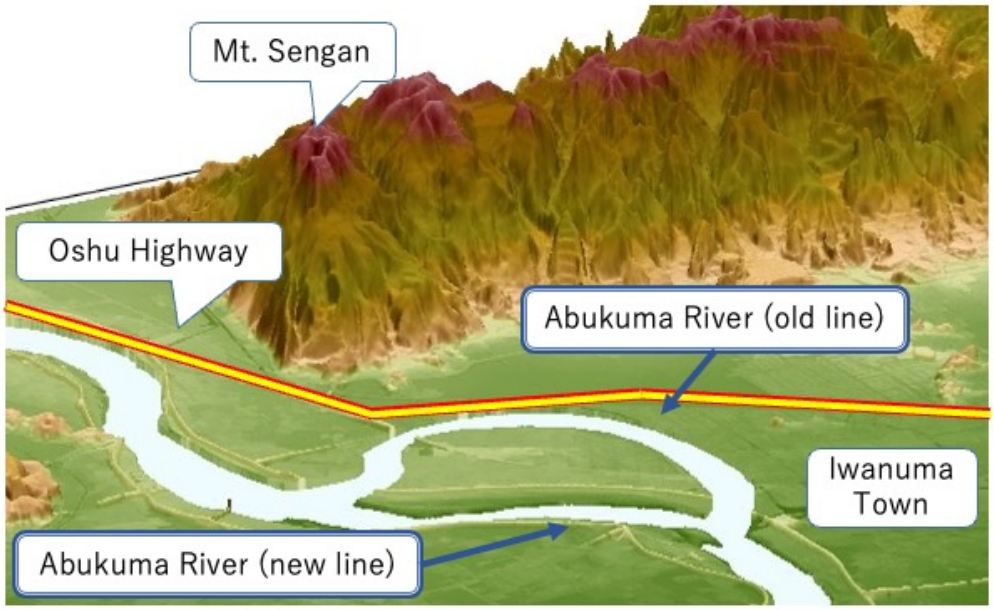

Figure 33-1. The topography of the Iwanuma area at the time of the Keicho Oshu Earthquake and Tsunami

4: Achievements and the Future

A new approach to disaster science

To use historical disaster records, not only for the clarification of past disasters but also for future disaster prevention, we are currently analyzing the relationship between the reconstruction of historical landforms and the causes of disasters. The landforms we see today, especially coastlines and river channels, have been greatly altered from the natural landforms of the past due to man-made development in modern times, and unexpected damage can occur in such places during disasters. In order to prevent disasters such as tsunamis and floods, it is necessary to reconstruct the historical topography from various documents to determine what the topography was like in the past. The information on historical landforms recorded in village maps and cadastral maps made from the Edo period to the early Meiji period are an important clue for this work. The International Research Institute of Disaster Science has introduced ultra-high resolution scanning equipment and is currently analyzing detailed data from old maps and blueprints.

For example, when the Great East Japan Earthquake struck Miyako City in Iwate Prefecture, a tsunami entered the city from the mouth of the Hei River, causing great damage. Comparing the topography of the city with what is depicted in the Rikuchu Hei-gun Miyako Village Drawing (Iwate Prefecture Library), from 1874, the tsunami's ingress route corresponds to the old channel of the Yamaguchi River, which used to run through the center of the city. Today, the old Yamaguchi River channel has been culverted and a city road runs over it, making it difficult to determine the risk of tsunami ingress from today's topography (Figure 33-2). In this way, the damage risk that is difficult to predict from today's topography can be found by reconstructing the historical topography using historical documents, which can be utilized for future disaster prevention measures.

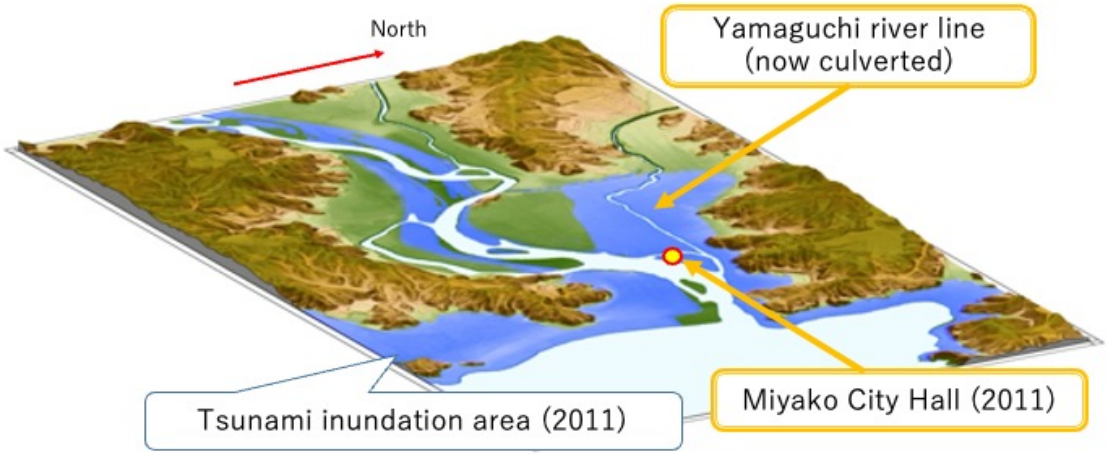

Figure 33-2. Historical topography and tsunami inundation in the Miyako region

Conclusion - from the author

Today, there is a vast amount of historical materials left in various parts of Japan, which contain the experiences and lessons of our ancestors, including information on past disasters. These are, in a sense, data left by our ancestors. They are messages for us, their descendants. New disaster science is required to not neglect it, but rather, carefully read and understand this information. We need to collaborate with many researchers to analyze the information from various perspectives and utilize it for future disaster prevention.

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