Damage caused to buildings is estimated according to seismic intensities for each 1-km mesh, building conditions and ground conditions. Further distribution of seismic intensity is obtained based on data from observatories.

Figure 2 shows the flowchart for earthquake damage estimation. This system enables an estimate for damaged building and casualties to be obtained. Based on this damage estimation, the level of need for support is calculated by computer.

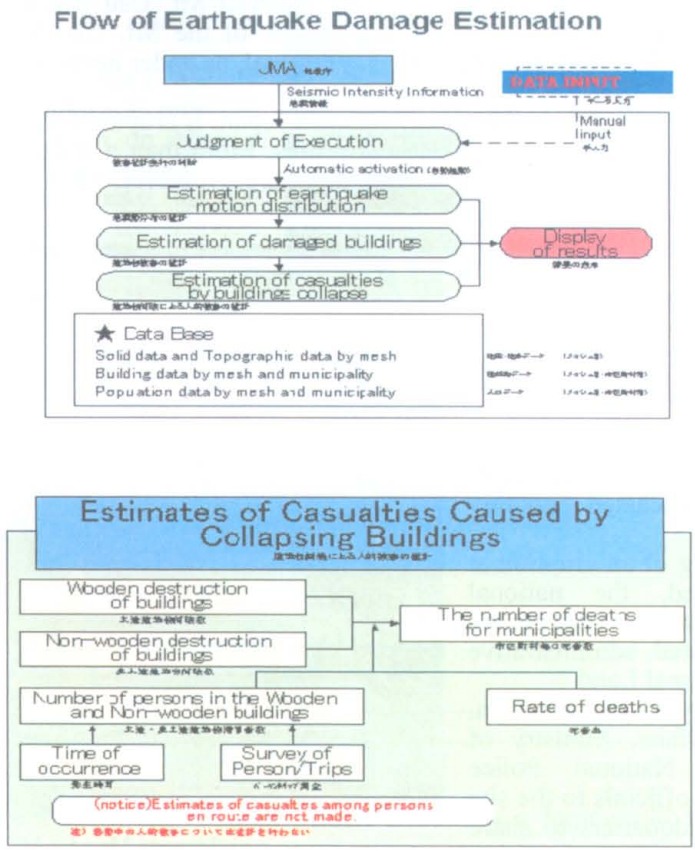

Figure 2: Flowchart of earthquake damage estimation

4. Conclusion

Catastrophic disasters cannot always be predicted. However, in any disaster, an appropriate information and logistic system can enable a prompt start to effective recovery and response, minimizing the secondary disaster. Such a system also assists immediate action by decision makers.

Accurate information is an absolutely key factor for the response.

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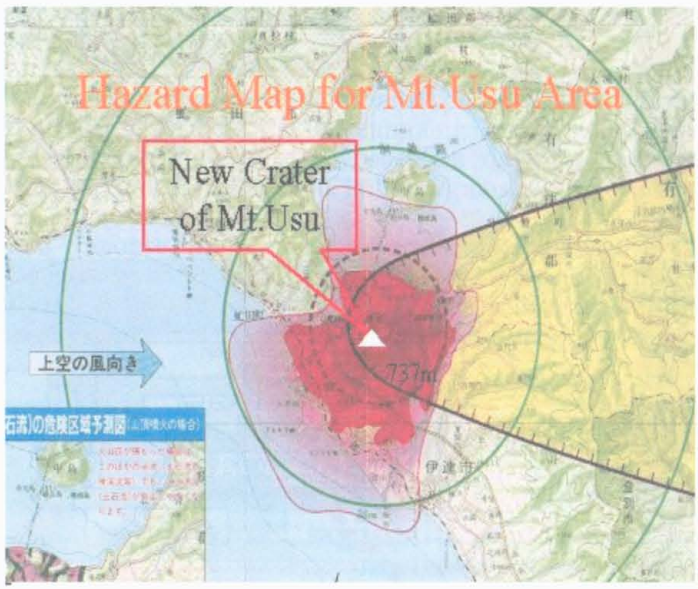
Japan

Effectiveness of Early Warning of Volcanic Eruption with Hazard Maps: The Experience of Mt. Usu in Japan

On March 27, 2000, the number of volcanic earthquakes increased around Mt. Usu volcano in Hokkaido Prefecture Japan.
The Coordination Committee of Volcanic Eruption Prediction convened its Mt. Usu Sectional Meeting and appointed a professor as its chairman. He had observed Mt. Usu continuously following its last eruption in 1977 and was known as the "Family Doctor of the Mt. Usu Volcano." He immediately determined that 16 volcanic earthquakes per day was unusual, as under normal circumstances there would be one or none.
Mt. Usu is located on the island of Hokkaido in northern Japan. It erupted for the first time in 23 years in March 2000. This area is well known for its hot springs. More than a million tourists, both local and foreigners, visit there each year to enjoy the beauty of nature. However, Mt. Usu has erupted seven times in its history and devastated the villages surrounding the mountain.
After its last eruption in 1977 the Japan Meteorological Agency (JMA), universities and other research institutes have continuously observed this volcano. They have monitored the volcano on a real-time basis by using seismographs and surveillance cameras.
The government has also prepared a hazard map and distributed to all residents so that people can be evacuated smoothly and promptly.
When the early warning of an eruption at Mt. Usu was issued, the national government immediately dispatched officials from designated administrative organs such as the National Land Agency, JMA, Ministry of Construction, Ministry of Home Affairs, Ministry of Transport, and the National Police Agency. These all sent officials to the site and set up a local headquarters to share information and decide on appropriate countermeasures.



(Hazard Map for Mt. Usu)

Local government officials from Hokkaido Prefecture and the three municipalities of Abuta Village, Sobetsu Village and Date City, as well as staff of designated public corporations including Nippon Telegraph & Telephone Corporation, Japan Railways and Japan Red Cross were dispatched to the site.
Three municipal governments issued Evacuation Advisories to local residents using not only their local community networks but also the mass media. Meanwhile, each ministry and agency began to facilitate the evacuation of residents by providing shelters and transportation. Japan Railways Hokkaido provided the service of evacuation trains and the Maritime Safety Agency prepared its vessels for evacuation at sea. The Self-Defense Force was mobilized for residents' safety.
The Evacuation Advisory was raised to an Evacuation Order, the highest level of warning. Since the residents all knew about the Mt. Usu hazard map, approximately 16,000 residents and all tourists were completely evacuated within one day.
The eruption occurred one and a half days after the evacuation was completed. Five craters were formed by the eruption and a plume of volcanic ash rose to a height of 3,200 m above the crater.
This was a large-scale volcanic eruption that brought huge economic loss to this hot-spring resort. However, due to the effective use of hazard map and early warnings, no one was killed or injured.

The absence of human casualties can be attributed to the coordinated efforts by the various disaster-related organizations and a combination of accurate early warnings and use of hazard maps. Accurate prediction thanks to continuous observations with the latest technology, as well as the creation of hazard maps and their distribution to residents, made possible the rapid establishment of an initial response system by the national government and related organizations.

In addition, strong networking among all the relevant ministries and organizations enabled decisions on the most efficient mode of transportation for evacuation and the immediate establishment of shelters. Cooperation on the part of residents who were aware of the hazard map for this eruption, and dissemination of information among residents by the media, ensured that evacuation went smoothly and contributed to the absence of deaths and injuries.

As with the Mt. Usu volcano, Japan's capacity for volcanic disaster management was reflected when another volcano, this time on Miyake Island, erupted in July 2000. Though one person was killed by an earthquake, no one died or was injured as a result of the eruption itself. It was reported that the island's entire population of 3,853 people was successfully evacuated.

(Eruption of Mt. Usu)

The Japanese archipelago is part of the highly volcanic Circum-Pan-Pacific zone. Although the continental shelf where Japan is located makes up only roughly 0.1% of the entire world, the region has 86 active volcanoes. Roughly 10% of active volcanoes in the world are in Japan. Statistics show that Japan experiences several volcanic eruptions of different scales almost every year. Japan has dedicated its efforts to reducing the damage from volcanic eruptions by using accurate hazard maps and early warnings. The government of Japan, together with local residents, will continue its efforts to find better ways to live with volcanoes.

- **Background**
  The recent volcanic eruption of Mt. Usu in March 2000 was a large-scale volcanic eruption that brought huge economic loss to this hot spring resort.

- **Objective**
  Effective early warning and hazard maps enabled safe evacuation at the time of the volcanic eruption of Mt. Usu.

- **Term/Time Frame**
  March 2000.

- **Activities Undertaken**
  Universities and other research institutes have continuously observed this volcano. They have monitored the volcano on a real-time basis by using seismographs and surveillance cameras. In addition, the government prepared a hazard map and distributed it to all residents so that people could be evacuated smoothly and promptly.

- **Major Achievements**
  Due to the effective use of the hazard map and early warning, no one was killed or injured. Distribution of hazard maps in a way understandable by residents who are at risk is an effective method of reducing disaster losses.

- **Contact Details**
  Asian Disaster Reduction Center

3.2.4 Promotion of Education and Public Awareness

Disasters and Education: Maiko High School in Japan

It is said that more than 90% of the people killed by the Great Hanshin-Awaji (Kobe) Earthquake lost their lives within 30 minutes. It is also said that more than 80% of the people who were saved were rescued by their neighbors, not by the Japan Self-Defense Force or Fire Service rescue teams. The most important lesson of this disaster is that the citizens noticed for the first time that they should protect each other's lives themselves. It was a crucial event that made citizens realize how little they were aware of and prepared for disaster.

Japanese people naturally regard schools as a refuge during the disaster. For example, during the Great Hanshin-Awaji Earthquake 310,000 people escaped from the collapsed and burning city to the schools. Schools also have another important function, in that that they offer the only place where disaster mitigation education can be carried out systematically. Schools thus have two functions: a place of refuge and a place of disaster mitigation education.

In disaster mitigation education so far, we have focused on emergency management just after a disaster has occurred place, such as training in evacuation and extinguishing fires. During the process of moving from emergency management to recovery, the students will come to notice that not only concrete aspects such as building codes, reconstruction of railroads and expressways, a reliable water and supply, and so on are important, but also that less tangible aspects, such as the importance of the community, help from neighbors, the importance of human life, and welfare and human rights are also closely related to disaster mitigation. This shows that disaster mitigation is closely related to every aspect of school studies. It is therefore is possible for the teachers to offer disaster mitigation education in every subject if they so wish.

Maiko High School started its environment and disaster mitigation course in April, 2002, seven years after the Great Hanshin-Awaji (Kobe) Earthquake. The purpose of establishing this course was to convey the lessons we learned from the Great Hanshin-Awaji Earthquake to the world and prepare citizens to cope with disaster. The educational goal of the course is to have the students think about how we live in a symbiotic society. It provides the students with disaster mitigation education concerning both the natural and the social environment.

Practical experience is the keyword of the environment and disaster mitigation course. Many people are invited to school to talk about their experiences during and after the disaster. These guest teachers come from universities, police stations, fire stations, life-line related companies, the city and prefectural governments, volunteer organizations, and so on.

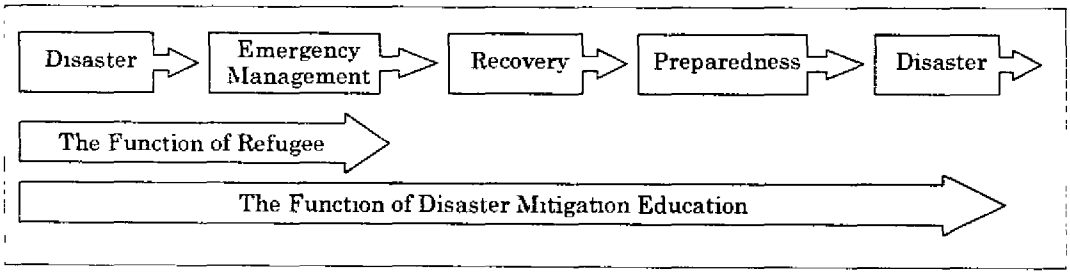


Figure 1: Disaster Cycle and School Functions

The students visit the Disaster Reduction and Human Renovation Institute, the Museum of Nature and Human Activities, and Hokudan-cho Earthquake Memorial Park. They go to Mount Rokko to investigate the faults, dangerous streams of debris flow, and the raised river beds that were the cause of floods in Kobe.