

# **Risk and Crisis Management for Natural Disasters: Cases 1–27**

**This page intentionally left blank**

## How the Internet is a Useful Crisis Management Tool

---

**To improve contingency planning (CP) or crisis management, it is necessary to develop relevant infrastructure, particularly communication networks.**

Immediately after the Great Hanshin-Awaji Earthquake in 1995, the mass media provided round-the-clock news coverage of the disaster site on television and radio. Also, the names of victims, particularly of those who were confirmed dead, were continuously updated. However, information on survivors, such as their location, contact phone numbers and condition, was scarce although it was a matter of great concern for families, relatives and friends.

This is where the **Internet** came to play an important role.

On the evening of 17 January, only half a day after the earthquake, a bulletin board system (BBS) was set up on the Internet to exclusively provide seismic information. The next day, an online service provider, ATSON Inc., which operated ASAHI Net, began posting the names of people who had died. By 23 January, major online service providers, Nifty-Serve and PC-VAN, had each posted about 400 references of earthquake-related information on their websites (*Nikkei Industry News*, **24 January 1995**).

Among these references were many postings on the status of individual survivors, which tended to not be well-covered by the traditional mass media. Thus, personal computer networks demonstrated their superiority in transmitting and receiving information under circumstances where cellular and fixed-line telephones were disabled.

Unfortunately, it is also true that those without computers or those unfamiliar with personal computer communication were not able to send or receive information.

To ensure information access in future emergencies, it is critical to establish **wireless communication** networks connected to portable terminal devices.

## **KEY POINT**

**In managing a crisis, technology needs to be tapped.**

## **Recommendations**

In disaster-prone areas:

1. Wireless network devices must be made affordable and widely available;
2. Personal computer networks must be further enhanced;
3. The function of providing survivor information, such as their condition, contact numbers and evacuation location should be improved.

## Case 2

# How Communication Technology Must Be Harnessed in an Emergency

---

**In the event of a major earthquake, we are likely to depend on leased or private fixed-line telephone services, which, in reality, are not reliable. Unless we can access other means of communication, CP (contingency plans) will fail.**

The more urgent an emergency, the more important it is to make full use of all available public and private telephone lines. However, at the time of the Great Hanshin-Awaji Earthquake, more than 300,000 private telephone lines and 4,000 business leased lines were disabled. Further, over 145 mobile communication bases were damaged (*Yomiuri Shimbun*, **30 May 1995**).

On top of the massive system breakdown, the number of attempted telephone calls from Tokyo to the disaster area exceeded the usual volume by 50 times, which overwhelmed the already limited phone lines. Additionally, the number of available telephone lines was restricted to 10 percent. Thus, you were lucky if one out of 10 attempted calls you made got through.

This is where the Internet, although unanticipated to the Internet originating, came to demonstrate its effectiveness as a communication tool. There were 600,000 discrete access events superiorly from 50 countries around the world by the end of February in 1995.

Nifty-Serve received about a million accesses from inside Japan by the end of January, 1995. Assuming each visitor spent three minutes on average, it could be calculated that as many as 70,000 people used the Internet services.

Thus, the personal computer proved to be a very effective tool for obtaining information about earthquake victims. Based on past disaster procedures, authorities would post many fliers near public telephones, informing people where to go for relief supplies. We should make it a goal to provide such public service announcements electronically by using personal computer communication. However, the then president of Nippon Telegraph and Telephone Corporation (NTT), Mr. Junichiro Miyazu, admitted that NTT was not entirely certain that a bulletin board system would make a viable business.

We need to overcome such rigid thinking and look for alternative means of communication, including radio and satellite technology, in order to surmount obstacles and save lives in a time of emergency.

## **KEY POINT**

**In crisis management, it is essential to make full use of every communication medium available.**

## **Recommendations**

Disaster-prone areas must:

1. Build a wireless communication system that can function in an emergency;
2. Build a personal computer communication system that can function in an emergency.

## How Government Response is Crucial

---

**It is important for individuals to have their own contingency plans. However, many problems that arise from a major disaster are beyond an individual's capacity to solve them.**

Mr. Kazuhiko Arano, who survived the Great Hanshin-Awaji Earthquake, commented on how both the central and local governments were slow in responding to the situation. He said, "Don't expect assistance from the government ... the best sources of assistance are large supermarkets, individuals, and then local government, in that order."

As a citizen, I sincerely hope the Japanese government will try harder to do a better job the next time round because what individuals can do at the time of a major disaster is quite limited.

For example, it is almost certain some of the old housing for government workers will be completely destroyed if an earthquake of more than level 6 on the Japanese seismic scale hits the Hanshin-Awaji area. Yet, until the government decides to rebuild them, there is nothing you can do about it as an individual, even if you are a government employee.

If an ordinary citizen were to express a concern about an old government building in the neighborhood that might collapse should

a major earthquake occur, they would have much less influence and it is very unlikely that anything will be done immediately.

The same can be said about older bridges, expressways and tunnels. Unless you have an exceptionally strong political influence or a ferocious tenacity in communicating the high risk of their collapse, their reconstruction or repair would usually take years. Of course, if structural concrete blocks were to fall out of a tunnel, then inspections will be conducted immediately.

After the Great Hanshin-Awaji Earthquake and the following volcano eruption, Japan revealed to the world that its **emergency evacuation centers** were less than satisfactory. However, we have yet to see concerted efforts to improve the evacuation centers in quake and other natural disaster-prone areas.

Thus, countermeasures must go beyond individual efforts and include government support, otherwise contingency planning will fail.

## KEY POINTS

**Most countermeasures against disasters cannot be implemented by the individual.**

**Even if you feel that you have discovered a countermeasure, you still cannot be successful. No perfect countermeasure exists.**

## Recommendations

The government should:

1. Improve emergency evacuation centers;
2. Rebuild old, dilapidated housing as much as possible;
3. Reinforce older bridges, expressways and tunnels.

## How Supplementary Lifeline Utilities Must Be Developed

---

**Unless we actively take suggestions from specialists on how to develop supplementary lifeline utilities in order to make disaster prevention plans more effective, CP or crisis management will fail.**

Generally, **lifeline utilities** mean electricity, gas and water. Professor Kunihiro Hirai of Nagaoka Institute of Design predicts that the current systems, which rely on major electric and gas companies, will be completely disrupted if a disaster of large magnitude occurs. The same thing can be said about water service.

How can we pre-empt such a dire situation? Instead of expending resources to maintain fully functioning systems in times of disaster, he argues for developing supplementary lifeline utilities with the capacity to provide 10 percent of the normal supply.

For example, solar and wind power generators could be utilized as a means of supplementing electricity. For a sewage system, an adequate supply of water should be stored in large tanks to be used for rest rooms in parks and schools in the event of a major disaster. For gas, a supplementary system based on propane should be developed.

The question is how much progress we can make before the next disaster strikes.

In the case of hospitals and medical facilities, an effort should be made to approximate the capacities of the supplementary lifeline utilities at 100 percent.

At all levels of national and local governments, corporations, and individual families, we should place priority on strengthening the supplementary function of lifeline utilities and collaboratively increase their capacities.

## **KEY POINT**

**It is essential to develop supplementary lifeline utilities prior to the next disaster.**

## **Recommendations**

The government should:

1. Aim to develop supplementary lifeline utilities that can provide 10 percent of normal capacity;
2. Make an effort to increase the capacities of the supplementary lifeline utilities as close to 100 percent as possible at hospitals and other medical facilities.

## How Voluntary Support Must Be Catered for

---

**In crisis management, it is impossible to respond to every emergent situation as thoroughly as possible. In order to fill this gap, we need to be able not only to take appropriate action but also effectively utilize the help of volunteers.**

In the aftermath of a disaster, unforeseen events tend to occur at the same time. It is almost impossible to deal with each one of them thoroughly on a timely basis.

Due to a sudden change of their environment and prolonged anxiety, evacuees who have survived the disaster might develop health problems and need medical attention. In such cases, national or local government assistance may take too long to arrive. This is where **the role of volunteers** becomes important.

At the time of the Great Hanshin-Awaji Earthquake, it was reported that the afflicted area had accepted assistance from 44 nations and regions out of their offers of assistance from 76 nations, regions and organizations, including the United Nations, WHO and EU.

The assistance came in various forms. The United States provided **blankets, drinking water, and cots** through their military forces in Japan. They also sent seismologists, relief supplies, and staff to pitch tents. Switzerland and France provided rescue teams and search

dogs. Twenty-four nations, including Mexico, Thailand, South Korea, Australia, China, England, Germany and Russia, provided food, water, clothes, tents and other **relief supplies**. More than 16 nations, including the Netherlands, Italy, Ireland, North Korea, Taiwan and Belgium, provided financial aid.

At the same time, many people from all over Japan were voluntarily participating in rescue activities. For successful crisis management, to be able to receive various forms of assistance and distribute them appropriately on a timely basis is essential.

## **KEY POINT**

**Successful crisis management includes the ability to receive and distribute various forms of support from volunteers.**

## **Recommendations**

The government should:

1. Build a structure in advance that makes it possible to receive and distribute various forms of support from volunteers;
2. Build and organize a network in advance to facilitate effective volunteer activity in time of crisis.

## How to Deal with Psychological Stress

---

**Stress builds up in disaster victims over time. We need to be able to respond to the psychological needs of children, adults and the elderly in a flexible and age-appropriate manner.**

In the aftermath of a disaster, many victims are forced to live in highly stressful conditions. For example, earthquake victims have to live in constant fear of strong aftershocks. They would feel helpless after having lost their homes, assets and/or jobs. Furthermore, it is uncertain as to how long they would have to live in a shelter. Over time, stress builds up and takes a toll on their mental and physical health.

It is not possible to eliminate stress entirely, but one can minimize its accumulation. So children should be able to play with other children in the neighborhood. It is very important for them to laugh, exercise, eat and sleep well. It is important for adults to engage in light exercise for recreation, too. They should try to keep a positive outlook and avoid getting too pessimistic.

It should be helpful for them to interact frequently with friends and neighbors who are going through the same experience and find mutual comfort. After the Great Hanshin-Awaji Earthquake, many volunteers engaged victims in **psychologically therapeutic activities**

to reduce their stress. In some cases, it is important to consult with a professional.

Elderly people tend to become bedridden. It is important for them to get on their feet and care for themselves as much as possible. They should take up light exercises, if possible. It is not advisable for elderly people with failing energy and stamina to stay in an inconvenient and uncomfortable shelter for longer than necessary. It would be best if accommodation could be prearranged for them in times of disaster. Again, it is important that they participate in psychologically therapeutic activities.

## **KEY POINT**

**There are limitations in trying to manage stress on your own.**

## **Recommendations**

Disaster victims should:

1. Engage in light exercise for recreation;
2. Interact frequently with friends and neighbors who are going through the same experience and find mutual comfort.

## Why Ripple Effects Must Be Analysed

---

**Contingencies have dynamic, far-reaching ripple effects which have yet to be fully understood. This makes it difficult to predict what is going to happen subsequently during a natural disaster.**

The phrase “**butterfly effect**” refers to the idea that the flap of a butterfly’s wings in Tokyo may set off a tornado in Oklahoma. In other words, something seemingly insignificant could grow into monstrous forces of nature that ravage many lives. The term also describes the phenomenon of a tsunami; how the form and force of the waves near the epicenter might be small and ordinary, and yet can grow exponentially more powerful as they approach the shore.

These far-reaching ripple effects of elemental forces are still not fully understood. There must be very complex, non-linear causal relationships among the elements that may cause a chain of events to suddenly develop into a powerful force. Alternatively, small forces may gradually build up massive energy.

Hence, it is important to conduct repeated simulated experiments on an ongoing basis to discover the existence of causal relationships and ascertain their effects from various angles.

For example, in 1961, a meteorologist, Lorenz, was running simulations to re-examine his weather predictions. Before taking a coffee

break, he entered the rounded-off data (from six digits to three digits) and left the lab. When he returned from his break, he found totally unexpected and completely different results. This is an example of how natural phenomenon relates to chaos theory, which cannot be explained by simple causal relationships.

No matter how complex and difficult, it is important to deepen our understanding of the dynamic causal relationships and random consequences that might not fit the cause and effect of an event.

## **KEY POINT**

**Everything starts out small.** (Cicero)

## **Recommendations**

In contingency planning, one must:

1. Investigate the occurrence of unpredictable phenomena through simulations of dynamic events;
2. Continue efforts to improve our ability to predict emergent phenomena by analyzing dynamic causal relationships and far-reaching ripple effects on an ongoing basis.

## Why Preparation for Disaster Must Include Basic Precautions

---

**CP or crisis management will not succeed as long as there is a deficiency in basic precautions against disaster.**

Since late March 1995, Fujitsu Limited has held 16 disaster contingency planning seminars nationwide for their corporate clients, in which they conducted a survey among 2,000 participants on taking precautions against disasters. The results revealed that 55 percent of the responding companies had done nothing to protect their **computer systems against earthquakes** (*Nippon Keizai Shimbun*, 30 August 1995).

When compared by industry, more than 80 percent of the companies in the insurance and securities sectors were taking some kind of anti-earthquake measures; on the other hand, educational and medical institutions were behind in their efforts.

Almost 30 percent of the companies surveyed were taking some **measures to protect their computer hardware** (e.g., placing them on a quake-absorbing base). Yet only a small percentage of the companies were taking **precautions against data loss** (e.g., backing it up at multiple places). Furthermore, only 44.5 percent of the companies were taking some action to protect their computer system in case of disaster (e.g., having dual communication lines).

In May 1995, the Tokyo Metropolitan Government surveyed 3,000 residents, of which 2,220 responded. It revealed that 52 percent of the respondents had purchased **flashlights, radios, drinking water, and first-aid kits** — of which 24 percent had purchased these disaster supplies after the Great Hanshin-Awaji Earthquake.

At the same time, it was found that approximately 85 percent of the respondents did not know where the nearest water supply facilities from their homes were. Also, 86 percent of the respondents feared the possibility of a major earthquake.

As seen from the above, both businesses and individuals expressed concern about a potential major earthquake, and yet they seemed to be insufficiently prepared for one. It is important to further our efforts to better prepare ourselves against a disaster.

## **KEY POINT**

**A survey conducted by the Tokyo Metropolitan Government revealed that 85 percent of the respondents did not know where the nearest water supply facilities were.**

## **Recommendations**

To prepare for disaster, one must:

1. Find out the location of water facilities and emergency evacuation center nearest one's home.
2. Find out the location of water facilities and emergency evacuation center nearest one's office.

## What to Do in the Event of a Tsunami

---

**A major earthquake can set off not only fires but also tsunamis, depending on the location of its epicenter. Therefore, it is important to be prepared for either case. Regardless, the situation is of great urgency and requires prompt action.**

When a major undersea earthquake occurs, a warning about the possibility of tsunami will be issued promptly. However, the warning might not be released immediately after the earthquake. Instead, information on the earthquake itself, such as its magnitude, time and location, will be reported first.

Meanwhile, a tsunami could be forming. Depending on conditions, a giant tsunami could crash ashore within five minutes of an earthquake occurrence. The earthquake that struck at 10:17 PM on 12 July 1993 off the southwestern coast of Hokkaido, Japan's northernmost island, registered 7.8 on the Richter scale. Since this quake was centered under the sea, there was strong concern about the generation of a tsunami. As anticipated, in less than five minutes after the earthquake, a giant tsunami over 20 meters high struck Okushiri Island.

Under such circumstances, we cannot wait for a tsunami advisory on the television. Because the above mentioned earthquake

happened late at night and set off fire and landslides simultaneously, many people failed to escape in time. The death toll, including those still missing, reached 230 and the number of homes that were partially or completely destroyed hit 1,009. Some survivors who anticipated a tsunami following the major earthquake, barely made it by racing up a hill as fast as they could in their pyjamas in the dark. When they looked back, they actually saw their homes getting swept away by the roaring waters.

As a **tsunami countermeasure**, it is most important to take prompt action and evacuate as quickly as possible.

## **KEY POINT**

**When an earthquake's epicenter is located on the ocean floor, a major tsunami could occur even when the quake intensity is low.**

## **Recommendations**

When a tsunami strikes:

1. Everyone must evacuate as quickly as possible when an earthquake's epicenter is located on the ocean floor and in the vicinity of their home;
2. It is most important to move rapidly to higher ground.

## How to Distinguish Between Tsunami Advisories: Warning and Watch

---

**In some cases a tsunami warning is issued even when there is no felt earthquake.**

A **tsunami warning** or **watch** is issued by the authorities and disseminated by radio, television or vehicles with public address systems, usually within two or three minutes after an earthquake occurs.

A tsunami warning can be categorized into two types: high tsunami and tsunami. The former is an advisory against the possibility of a big tsunami with the water level as high as three meters (with average about 1 m high). The latter is an advisory against one with the water level as high as two meters (with average about 10 cm high).

A tsunami watch can be categorized into four types: tsunami watch, no tsunami, tsunami warning clear, tsunami watch clear. Tsunami watch means “there might be a tsunami with the water level as high as 10 cm.” No tsunami means “there is no danger of a tsunami.”

However, a tsunami is not always triggered by a major earthquake. There are cases where a tsunami warning is issued when there is no felt earthquake.

In that case, everyone must get away from the beach as quickly as possible and evacuate to a pre-designated area promptly.

*Earthquake Disaster Prevention Guide* (1995), compiled by the Printing Bureau of the Finance Ministry under the general editorship of the Fire and Disaster Prevention Department of the Home Affairs Ministry, advises that people should move away from the seashore and go to a pre-designated evacuation area as quickly as possible not only after a strong earthquake (above level 4 on the Japanese seismic scale), but also after a relatively small yet prolonged earthquake with slow undulating movements that last for a while.

When there is no pre-designated evacuation area, one must proceed to higher ground.

## **KEY POINT**

**A Tsunami can be caused by a relatively small earthquake.**

## **Recommendations**

Everyone must:

1. Familiarize themselves with the vocabulary used in the tsunami advisory;
2. Understand the difference between a tsunami warning and watch.

## The Hospital's Role in Crisis Management

---

**For crisis management and CP to be successful, hospitals must have effective measures to deal with natural disasters.**

Professor Shoji Shinozuka of Waseda University had said, "We were far from being well-prepared for a big disaster when the Great Hanshin-Awaji Earthquake hit. First, the governor of the stricken area, who is the highest level government official according to the Basic Law on Natural Disasters, spent as many as three hours inside the government building after the quake. Second, nobody was on duty at the National Land Agency, which is supposed to be in charge of disaster prevention." (*Yomiuri Shimbun*, **17 July 1997**). However, what is more important at the time of disaster is whether hospitals are well-equipped with anti-disaster measures, which will allow them to fulfill their primary function to save human lives.

The injured will be taken to a nearby hospital. Those severely injured, in particular, will require urgent care, but the question is whether the hospital will be sufficiently equipped to attend to them immediately.

In an emergency, a large number of people with life-threatening conditions will be brought to hospital. Yet, in many cases, there are not enough doctors and nurses who can treat them.

Or, at a multi-storied hospital, it will be difficult to move or evacuate patients without the use of elevators. Furthermore, if the electric power goes out, it will be impossible to perform operations without gas-powered electric generators.

At the time of the Great Hanshin-Awaji Earthquake, many hospitals had **emergency power generators**, yet most of them were water-cooled models and could not be used when the water supply was cut off.

The then director of the Nippon Medical School Chiba Hokusō Hospital, Dr. Yasuhiro Yamamoto, urged that hospitals should switch from water-cooled generators to **air-cooled** ones as soon as possible.

It has also been pointed out that although a just-in-time inventory system of medicine is effective in stock and disposal cost reduction, it is seriously flawed in that it will not have enough reserves in the event of emergency.

## **KEY POINT**

**One of the most important missions of hospitals is to save human lives at the time of disaster.**

## **Recommendations**

All hospitals:

1. Should be equipped with air-cooled electric generators;
2. Should have stockpiles of medicine available for emergencies.

# Case 12

## Why Hospitals Must Have Continual Access to Water

---

**At the time of the Great Hanshin-Awaji Earthquake, some hospitals were unable to perform operations on patients requiring urgent care because their water tanks were damaged. In order to provide effective medical treatment in emergencies, hospitals must have quake-resistant water storage tanks.**

It is most important to **maintain lifeline utilities at hospitals** in emergencies. However, in a major earthquake, hospitals could lose their supply of electricity, gas, and water.

In the case of the Great Hanshin-Awaji Earthquake, some hospitals lost access to water, which is indispensable for hospital operations, because their water storage tanks were damaged. Consequently, they were unable to provide patients with certain kinds of treatment such as dialysis.

Based on this experience, the highest priority should be given to the installation of power generators and quake-resistant water storage tanks at hospitals as disaster countermeasures.

If it is difficult for a hospital to secure sufficient amounts of water in case of a disaster, they might consider pre-arranging to obtain water from a nearby swimming pool with a water purification system.

However, if the swimming pool is meant to supply several days' worth of drinking water to disaster victims in the area, then it is not advisable to use it unless absolutely necessary. In that case, it might be a good idea to consider having water shipped in by air as part of an alternative emergency plan.

The decision to transport patients by air to a hospital outside the disaster area for treatment, or to have water shipped to a designated hospital in the disaster area, needs to be made promptly and on a case-by-case basis. Some factors to be considered include the capacity of the hospital, the degree of damage incurred to the facility, and the number of patients requiring urgent care.

At the time of the Great Hanshin-Awaji Earthquake, at least several hundreds of patients reportedly required urgent treatment.

## **KEY POINT**

**Hospitals need continual access to water for patient treatment and care.**

## **Recommendations**

Hospitals must:

1. Equip themselves with quake-resistant water tanks as well as power generators;
2. Consider having water shipped in by air in an emergency.

## How Schools Can Be Used as Evacuation Centers (1)

---

**Use school facilities as an evacuation center to make contingency planning more effective.**

At the time of the Great Hanshin-Awaji Earthquake, **school facilities** were not necessarily designated as evacuation sites. Yet they turned out to be invaluable shelters for local residents.

It is important to consider how we can make the school facilities, which are not necessarily suitable as a shelter, more disaster-resistant and functional as an emergency evacuation center.

In 1996, the Ministry of Education (currently the Ministry of Education, Culture, Sports, Science and Technology) announced their decision to strengthen the disaster-prevention function of public schools (*Nippon Keizai Shimbun*, **23 August 1995**). Of course, this effort should be extended to national and private schools as well. To push ahead with this initiative, we need to first identify what are the minimum requirements to be met if a school were to be used as an emergency evacuation center. Then models of such schools could be adopted throughout the country.

As school facilities mostly come under the jurisdiction of the Ministry of Education (currently the Ministry of Education, Culture, Sports, Science and Technology), the Ministry needs to work in

coordination with other ministries and agencies to make the earthquake disaster prevention schemes more reliable and effective. These ministries and agencies include the Ministry of Home Affairs (currently the Ministry of Internal Affairs and Communications), the Ministry of Construction (currently the Ministry of Land, Infrastructure and Transportation), the Fire and Disaster Management Agency, and the Meteorological Agency.

We need to draw up different scenarios depending on when a disaster occurs. For example, the extent or degree of disaster-control functions that schools are expected to perform should vary, depending on if a disaster happens when teachers, staff members and students are in school, or on their way to school, or when nobody is in school.

Further, we need to take other factors into consideration in deciding on the minimum requirements to be met by the school, such as whether there are other disaster-prevention facilities in the neighborhood. We need to have flexible plans for different conditions to make disaster-prevention schemes more effective.

## **KEY POINT**

**Schools make appropriate evacuation centers if they meet certain requirements**

## **Recommendations**

All schools should:

1. Strengthen their potential disaster-prevention function to prepare for their use as an emergency evacuation center;
2. Meet minimum requirements for their use as emergency evacuation centers — and this should be modelled throughout the country as soon as possible.

## How Schools Can Be Used as Evacuation Centers (2)

---

**It is important to consider the duration and number of people that schools, used as evacuation shelters, can accommodate in the worst-case scenario.**

When planning to use school facilities as an **emergency evacuation shelter**, it is important to think first about the duration and number of people that a particular school will be able to accommodate. Merely specifying the maximum duration will not be helpful because difficulties will arise when the number of disaster victims significantly exceeds the optimum capacity.

It is probably reasonable to set three days as a minimum base number. However, unless we have a good grasp of the facility's capacity limitation, it is not useful to discuss its minimum requirements.

Instead of setting an arbitrary number as the absolute upper limit, it is more important to take into account the area's population and other potential evacuation facilities and then form an estimate of how many people will need to be accommodated in this particular facility in the worst case scenario. This is important because there is a possibility that disaster prevention planning could turn out to be ineffective at a critical moment.

Minimally, what will be needed in a school are accommodations for people to sleep, to store potable water and food (temporarily stored in an unoccupied classroom), and to prepare meals using emergency fuel (e.g., propane gas), and a **swimming pool** for water storage. Further, a purification system will be needed to convert swimming pool water to drinking water during the emergency.

According to estimates by the Ministry of Education (currently the Ministry of Education, Culture, Sports, Science and Technology), an eight-lane, 25-meter-long swimming pool has the capacity of storing about 400 tons of water, which is enough to serve about 800 people for three days (*Nippon Keizai Shimbun*, **23 August 1995**). Additional considerations **include reinforcing classrooms against earthquakes** and establishing **stress management programs for the disaster victims**.

## KEY POINT

**There must be accurate estimates of the housing capacity of school facilities as an emergency shelter to address any shortages in advance.**

## Recommendations

Schools should have:

1. Facilities that can be used to store water and food in an emergency;
2. Facilities for cooking and serving meals;
3. A purification system installed.

## How to Get the Injured to Hospital

---

**When an earthquake with a magnitude of 7, or a Japanese seismic intensity of 5, occurs, it is crucial that the emergency medical service is ready to dispatch ambulances promptly upon request.**

It is unlikely that an earthquake of this magnitude will cause extensive damage to emergency medical facilities. In most cases, emergency medical services should be able to dispatch **ambulances** upon request.

It is highly desirable for ambulances to be equipped with a geographical information system (GIS), with which they can see not only the condition of the roads but also the location of obstructions along the route. Without the GIS, it could take much longer for an ambulance to get to its destination. In the worst case, they might not be able to get to the destination at all.

The Off Miyagi prefecture earthquake of 1978, which struck around 5:14 p.m., registered 7.4 on the Richter scale and 5 on the Japanese seismic intensity scale. Although as many as 6,757 houses were partially or completely destroyed, deaths were confined to 28. Yet, emergency phone lines were flooded with calls for ambulances and the response rate was reportedly less than 10 percent. (Ambulances managed to serve only 28 out of 9,300 injured persons.)

Furthermore, the power failure caused by the earthquake paralyzed the communication networks. The ambulances on the road lost radio contact with the dispatcher at the emergency radio base. To make matters worse, traffic lights did not function due to the loss of power, which caused havoc to the transportation system in the area.

Under such chaotic circumstances, local residents need to take some emergency measures themselves. It is very important for them to obtain knowledge and skills through disaster-prevention training.

## **KEY POINT**

**During disasters, emergency medical services will be inundated with requests for ambulances.**

## **Recommendations**

If a disaster strikes your area:

1. Use other means of transportation (e.g., car, motorbike) to take an injured person to a hospital as soon as possible, when an ambulance is not available;
2. Seek help from a neighborhood disaster-prevention and rescue organization when it is not feasible to transport an injured person yourself.

# Case 16

## How to Call an Ambulance

---

**At a time of disaster, we may encounter a situation where we need to call an ambulance for an injured person. In a situation like this where every minute counts, it is important to follow the emergency call procedures and explain the situation and your location clearly and concisely.**

In the aftermath of a major earthquake, emergency phone lines will be flooded with calls reporting numerous injuries.

In order to enable the highest number of calls to be connected, calls must be kept short. However, we tend to take up a lot more time than necessary in an emergency because we are agitated. To avoid this, we should have a basic understanding of **how to call an ambulance**.

After dialing 1-1-9 (to call an ambulance), follow the next four steps to be concise.

First, say, "This is an emergency." Second, tell them your name, address, and a nearby **prominent landmark** (e.g., a building or sign) or two to help the emergency crew locate you. Third, tell them what has happened and what the current condition of the injured person is. In other words, clearly explain the **urgency of the situation**. And fourth, which often gets forgotten, tell them **someone will be signaling in front**

**of the house.** That can significantly help to shorten the time needed to locate you.

We can expedite the arrival of an ambulance by following the above steps. It might be a good idea to have the procedures recorded on a piece of paper near the phone.

## **KEY POINT**

**When calling for an ambulance, it is critical to explain the urgency of the situation and give accurate and precise directions.**

## **Recommendations**

When calling for an ambulance, you should:

1. After dialing 1-1-9, say, "This is an emergency;"
2. Decide before on a recognizable landmark nearby to guide the driver to your home;
3. Have somebody stand in front of your house after making the call.

# Case 17

## How to Deal with Rumors

---

**Regardless of whether it is induced by a natural or man-made disaster, false rumors tend to develop from the chaos. Crisis management will not succeed if people blindly believe rumors without ascertaining their authenticity.**

In a time of disaster, whether it is an earthquake or terrorist attack, communication systems get shut down and **misleading rumors** tend to arise from the chaos.

“There was a bigger earthquake in such and such area”, “A huge tsunami is coming tonight”, “Our drinking water has become contaminated”. In most cases, this kind of information gets distorted in the process of circulation due to fear and spreads rapidly, setting off a chain reaction.

In an emergency, it is prudent not to blindly believe hearsay. We should always try to verify its authenticity with a reliable source, such as the local government and mass media.

At the time of the Great Kanto Earthquake of 1923, many people were seized with intense fear and panic due to insufficient fire control service, malfunctioning fire hydrants, collapsed bridges, and disrupted communication systems. It was further exacerbated by a rumor that petroleum tanks had exploded and everyone was going to die.

In order to deal with such rumors effectively, it is important to stay calm and take the minimum steps required to **check safety conditions** after an earthquake has stopped, without worrying too much about the possibility of aftershocks. These include turning off a stove, shutting off the gas, moving flammable substances to a safe location, and reinforcing the home.

Then, tune in to a public or private broadcast on the radio or television to verify the authenticity of the information related to the earthquake, tsunami, subsequent damage, and rescue efforts. In addition, try to sift through the information by using a cell-phone and **PC communication**, if possible.

## **KEY POINT**

**At a time of disaster, it is important to stay calm and collected so that you can have good judgment.**

## **Recommendations**

In an emergency, one should:

1. Verify hearsay with a public or private broadcaster;
2. Verify hearsay by using the Internet.

## **How to Prepare for the Breakdown of Electrical Substations (Lifeline Utilities): An Example from the Taiwan Earthquake**

---

**If electrical substations break down, even when buildings sustain little damage, it can have a serious impact on political, economic and civil activities.**

The Taiwan Earthquake, which occurred at 1:47 a.m. (local time) on September 21, 1999, originated in the middle of Taiwan, but caused a massive blackout in the northern part of the country, including Taipei. It took as many as 18 days before electricity was fully restored on October 8.

One of the main causes for the massive blackout was the breakdown of two major substations near Taipei: the Tienlun and Chungliiao ultra-high voltage substations. Although 60 percent of the country's demand for power was concentrated in the north, many of the main power plants were located in the south. When transmission lines from the south to the north broke down, the system's capacity to supply power plummeted drastically and caused the massive blackout in the north. It can be said that this earthquake hit "Taiwan's Achilles' heel".

Fortunately, Taiwan Power Company had taken a lesson from the Great Hanshin Earthquake and compiled an anti-earthquake measure manual. According to the manual, the restoration priorities were

given to government agencies, hospitals, and transportation and communication systems. Among the various government agencies, the Hsinchu Science Park Administration, an internationally influential high-tech industry park, was given the highest priority with power restored on September 24, only three days after the quake (*Nikkei Industry News*, **9 December 1999**).

However, most people in the area were left without power for days and had to drive on roads without operable traffic lights. To maintain fairness among the regions, power was rationed to residents according to geography and different availability time-slots were allotted, such as from 7 a.m. to 3 p.m. in region A and 3 p.m. to 11 p.m. in region B.

Yet, despite attempts at fairness, certain regions were given priority over others. People in areas where the recovery of power was delayed voiced much dissatisfaction. To pre-empt similar disruptions, it is essential for each business and organization to voluntarily install a backup power system to **maintain the function of lifeline utilities** in an emergency.

## KEY POINT

**Consider the relative importance of lifeline utilities on a routine basis during ordinary times.**

## Recommendations

Businesses and organizations in earthquake-prone areas must:

1. Install an emergency power generator;
2. Familiarize themselves with the emergency measures in case a substation breaks down and prepare for an emergency.

# Case 19

## How a Disaster Can Be Turned Into a Lesson

---

**The Sumatra Earthquake Tsunami of 2004 caused the worst damage in recorded history. This is partly attributed to the lack of knowledge about the danger of tsunamis on the part of the residents and tourists in the affected areas.**

A huge earthquake with a magnitude of 9 occurred around 8 a.m. (local time) on 26 December 2004, approximately 160 km off the west coast of Sumatra, Indonesia, at a depth of 10 km below sea level. This earthquake caused devastating damage to more than 10 countries with coasts bordering the Indian Ocean. The poorest segments of the populations and tourists were the hardest hit. It was reported that giant tsunamis that followed the quake inundated the coastal areas with waves 10 meter-high on average (but as high as 34 meters in some places) at speed of 700 kilometers per hour. It was one of the deadliest natural disasters in history, which killed or left missing more than 300,000.

It has been pointed out that it was not the earthquake itself, but the resulting massive tsunamis which crashed ashore at tremendous speeds that caused so much death and destruction in this disaster. The fact that most of the hard-hit areas were beach resorts, such as Thailand's Phuket area, contributed to the high death toll. Many

tourists were spending their Christmas holidays at the resorts. They were reportedly from Sweden, Germany, England, France and other European countries.

It is important to note that these resorts had not been hit by tsunamis before and neither had the tourists. The Thailand Meteorological Agency did not issue a tsunami warning or watch after the earthquake. Nor did they issue an emergency evacuation advisory in the coastal area.

Local people reportedly went out to the beach after the tide receded, drawn by the curious sight. Many of the tourist victims from Europe lived far from the ocean and probably had little knowledge of the danger of tsunamis. The damage of this unfortunate natural disaster was exacerbated by both human negligence and ignorance.

Devastating disasters which should have been recounted from generation to generation have not been ingrained in people's memories. Many years ago in Japan, a book by the title of *The Straw Torch*, had talked about the ravaging power of a tsunami and the importance of prompt evacuation. This story was introduced to the United States and Great Britain at the end of the 19th century in a chapter titled "A Living God", in the book ***Gleanings in Buddha-Fields***.

A tsunami had crashed ashore in Wakayama Prefecture 32 hours after the 8.4-magnitude Tokai earthquake in 1854. An old man who had anticipated it lit a torch made of rice straw and led villagers to high ground, thus saving many lives.

This story was used as a Japanese reader in elementary schools for 10 years from 1937. Many local governments still use it to teach disaster prevention in elementary schools. This is a theme that is recognized as important in the elementary school curriculum. Learning the devastating power of a tsunami at a relatively young age is an effective way to raise public awareness and should be continued.

## KEY POINT

**Succeeding generations need to learn from historical disasters, so that they do not repeat the same mistakes.**

## **Recommendations**

Schools should:

1. Use audio-visual materials to teach about disaster experiences at home and overseas;
2. Incorporate lessons learned from disasters in the elementary school curriculum.

# Case 20

## The Mid-Niigata Prefecture Earthquake (1): How the Media was Unhelpful

---

**Mass media should refrain from repeating images and information that stir up fear in the audience.**

According to a survey conducted by the Niigata Prefecture Hotel and Inn Association in November 2004, the number of cancellations of reservations for overnight stays and banquets between 23 October the day of the earthquake, and 10 November reached 312,000 and continued to rise afterward. The average cancellation rate within the prefecture was about 80 percent, but there were some areas where the cancellation rate was more than 90 percent. The total economic loss was estimated at eight billion yen.

Although the area along the Niigata and Nagano Prefectures border sustained little damage, the number of skiers in Echigo-Yuzawa up until 5 January was down by 30 percent from the previous year because the earthquake struck just before the ski season started. There was a rash of cancellations of reservations for banquets and weddings in the disaster-stricken area as well.

The main industry in this quake-stricken area is tourism. Winter, particularly, is the most profitable season. Some people might have acted out of consideration for the victims and refrained from engaging in festivities in the disaster area. Still, many cancelled their

reservations out of fear that the area might not be safe. Thus, it can be said that tourism in the disaster-stricken area suffered **damage from harmful rumors**.

Damage from harmful rumors means “economic loss attributed to ungrounded, unsubstantiated information”. A person (or persons) who starts such a rumor passes along information as if it were a fact without confirming its authenticity.

Mass media, particularly television and radio, send correspondents to a disaster site to report on the extent of the damage, and the scale and character of the earthquake. They also feature experts and analysts who talk about lessons to be learned from the disaster. The audience, constantly bombarded by information, develops an ominous impression as well as fear.

The TV media particularly, tends to focus on presenting negative information and rarely does follow-up reports after normal operations are restored. As a result, the audience believes that the stricken area is still unsafe. A spokesperson for the Niigata Prefecture Hotel and Inn Association expressed regret over the financial distress caused by the mass media. He said, “The excessive media coverage was the biggest factor that caused so much economic damage to the business in the area. We asked the media to report then the areas adjacent to the central region of Niigata Prefecture were safe, but they were slow to respond.”

Instead of focusing on sensational images or information, mass media should report the story objectively, responsibly and thoroughly until the resumption of normal operations. The mission of public broadcasting is to cover the disaster until safety and order are restored.

## **KEY POINT**

**When only provided with unsettling information, the audience tends to overreact out of fear. The media should take the responsibility of covering a disaster story until all concerns for safety have been objectively met.**

**Recommendations**

1. The media should report facts objectively and impartially, instead of focusing on certain information to attract audience attention.
2. When it becomes clear that damage has been done by misinformation, the local government, industry and trade groups or businesses concerned should set the record straight.

# Case 21

## The Mid-Niigata Prefecture Earthquake (2): How to Keep Means of Communication Open

---

**In the aftermath of a major earthquake, ordinary telecommunication lines tend to get severed or flooded by heavy access. Ensuring communication connection in an emergency is one of the most important tasks.**

The backbone communication networks of Nippon Telegraph and Telephone East Corporation (NTT East) sustained serious damage by landslides triggered by the earthquake. Many of the main communication lines got severed in the area along the Shinano River, particularly around Nagaoka City, where IP telephone lines converged. As a result, a total of 4,450 subscribed telephone services were disrupted in the towns of Oguni and Koshiji and the village of Yamakoshi.

After a large earthquake, many people outside the stricken area are concerned about the safety of those affected by the disaster and flood telephone lines by trying to call them. Except for emergency phone lines, NTT and mobile phone companies place restrictions on access to regular phone lines before they get saturated. In fact, after the Mid-Niigata Prefecture Earthquake, restrictions were placed on the transmission of voice data over NTT subscribed phones and cell phones in the disaster area.

Nonetheless, people were able to use IP phones, send and receive e-mail from mobile phones, and access the Internet in areas where communication lines were available. An IP phone is a telephone service which uses the Internet connection to convert voice data to packets. To avoid the disruption of e-mail usage and web access as much as possible in the aftermath of the disaster, NTT DoCoMo placed different levels of restrictions on the voice service and i-mode service (which allows customers to connect to the Internet and gives them instant access to various sites using their cell phones).

Yet, this kind of communication system will be disrupted if the batteries which power the routers and servers run out, the networks themselves get severed, or the communication base station is damaged.

## **KEY POINT**

**Data packet transmission service may be available at the time of a disaster, but necessary subsystems (networks, batteries, etc.) need to function as well.**

## **Recommendations**

1. In a time of disaster, mobile phone companies should place restrictions on access to networks based on the type of data transmission method and continue to provide data packet transmission service.
2. Residents should have an extra supply of batteries and backup electric power generator.

# Case 22

## The Mid-Niigata Prefecture Earthquake (3): Why it is Critical to Restore a Region's Industry

---

**Ensuring safety in the disaster area is a top priority. Yet, the reconstruction of the area requires more than merely restoring the stability of daily life.**

Manufacturing is a main industry in the central Niigata region. There are large-scale automotive part manufacturing operations in Nagaoka City and electro-mechanical component manufacturing plants in Ojiya City. If manufacturing operations cannot be restored quickly, the economic output in the area is estimated to go down by 200 billion yen a year and 13,000 jobs will be lost.

Yet, the mid-Niigata region has traditionally been known for agriculture. It is a prominent grain belt, famous for its high-quality rice, for example, the Koshi-hikari brand, from the Uonuma area. The brewing of alcoholic beverages and manufacturing of snack foods made from rice is also popular in the region. There are quite a few communities where agriculture is the key industry. The primary agricultural industry employed over 10 percent of the workers in 15 cities, towns and villages in the region. According to Niigata Prefecture, the agriculture, forestry and fishery-related economic losses caused by the earthquake amounted to 1.3 billion yen as of November 2004. Also, serious damage was done to businesses

engaged in raising nishiki-goi, an exotic decorative variety of koi fish, in the villages of Ojiya and Yamakoshi.

A stable housing environment and close proximity to the crop-growing fields are the minimum requirements for the success of agriculture. There is now growing concern that this earthquake may have caused many farmers to **give up their agricultural operations**. Continuous farmland preservation helps the conservation of the natural environment in the area. If many people abandon farming and leave the land, it will have significant ramifications for environmental conservation and thus, a far-reaching effect beyond the mere decline of an industry.

The government gives the highest priority to helping disaster victims put their lives back in order by ensuring their **security, food, and housing**. They take a step-by-step approach to reconstruct the disaster-stricken area to a minimal level, by following the National Disaster Act and National Disaster Victims Relief Law.

However, in a mountainous area interspersed with fields, such as the central Niigata region, ensuring housing by building temporary living facilities is far from enough for the reconstruction of the community. Without assistance for the **restoration of their traditional industry**, many of the disaster victims will not be able to make a living, let alone reconstruct the community as a whole.

## KEY POINT

**The reconstruction of a disaster-stricken area should be handled on the basis of medium- and long-term needs that take the restoration of the regional specific industry into consideration.**

## Recommendations

In reconstructing a disaster area, the government should:

1. Take the regional, geographical and industrial characteristics of the area into account and grant exceptions to the Natural Disaster Victims Relief-related bills as appropriate;
2. Make it the highest priority to help the disaster victims put their lives back in order.

## **The Mid-Niigata Prefecture Earthquake (4): Why there should be Private Insurance against Earthquake Damage**

---

**In recent years, large-scale natural disasters have been happening more frequently. This has led to the improvement of legal support for disaster victims. Yet, a comprehensive support system to aid the fundamental recovery of victims' lives is still under development.**

Earthquake damage in the Mid-Niigata Prefecture was exacerbated by **heavy snowfalls** that occurred shortly thereafter. **Figuring out how to apply laws related to disaster relief** remains an issue.

Mr. Kamimura, a lecturer at Nagaoka University of Technology, said, "Nineteen lives were lost in the accidents during snow removal operations. It's actually 20 if you include the accident in Yamakoshi Village in which a snow-plow truck driver fell into the river while working." He pointed out that despite a high number of deaths and casualties from heavy snowfall and subsequent removal operations, damage from snow is not treated as a disaster.

Many houses in the central Niigata region collapsed under the weight of heavy snow that fell shortly after the earthquake. While an evacuation order was in effect, the quake victims were not allowed to return home. Thus, they stayed in a shelter while worrying about the condition of their housing. They would have wanted to return

home to remove the snow from the roof of their house before the onset of winter to avoid the collapse of their home.

The Natural Disaster Victims Relief Law addresses the improvement of a disaster victim's housing environment. Yet, this law is limited to assistance for the demolition-related expense of a house damaged by a disaster and does not cover reconstruction or repairs of the house. Since a house is considered a personal asset, the government limits the use of public funds for this purpose.

It is prudent for the property owner to protect their personal assets with **insurance against earthquake damage**. However, private earthquake insurance usually only covers the damage to personal properties incurred by fire, destruction, and loss directly caused by an earthquake, volcanic eruption, or tsunami. Earthquake insurance might not cover damage caused by a combination of an earthquake and heavy snow.

## KEY POINT

**The government will not insure against the loss of personal assets incurred by a natural disaster.**

## Recommendations

Homeowners should:

1. Protect their own personal assets;
2. Purchase private earthquake insurance, just in case.

## How to Plan for Evacuation During Torrential Rain

---

**It is difficult to predict exactly when torrential rain is going to occur, how long it is going to last, and how severe it is going to become. It could suddenly bring about substantial damage.**

A record **torrential rain storm** occurred in a localized area of the central Niigata Prefecture (Nagaoka and Sanjo districts) and Fukushima Prefecture (Aizu region) in July 2004. It caused the banks of five tributaries in the Shinano River system to burst at 11 points which concurrently created landslides. The disaster caused many casualties, including 16 deaths, as well as tremendous housing damage.

Over time, **torrential rain** becomes increasingly dangerous and can cause substantial damage to residents in the area. A mudslide caused by a torrential rain is a typical example. In the mountain areas, a mudslide tends to occur on the hillside when the amount of rain exceeds the water retention limit of the soil. Similarly, flooding occurs when the amount of rainfall exceeds the capacity of a river. Either way, damage can be immense.

To avoid serious damage, it is important to tune into the weather news bulletin once the downpour starts and act on the latest information before the situation escalates. According to a survey by the Hiroi Research Team at the University of Tokyo (*Residents' Behaviors and the*

*Circulation of Disaster Information at the Time of the Torrential Rain in Niigata and Fukushima in 2004*), almost everybody (97.7 percent) in the affected area wanted “authorities to issue **an evacuation order and instructions** at the earliest practical stage, even if there is a chance that it might not turn out as severely as predicted.”

If local authorities and mass media, especially television and radio, start providing information on the torrential rain and the extent of damage at an early point, residents can avoid missing an opportunity to evacuate voluntarily even before the official evacuation order is issued. Access to accurate and timely weather information will help residents correctly assess the situation and make rational judgments.

Authorities should evaluate the extent of damage promptly and work with the media to provide evacuation information sooner rather than later to protect the safety of the residents.

## KEY POINT

**Torrential rain can cause substantial damage. It is critical to start gathering information at an early stage to minimize damage. Local authorities should work with the media and prepare to provide an evacuation order and instructions as soon as possible.**

## Recommendations

1. The authorities should carefully evaluate the optimum timing of when to issue an evacuation order and instructions to the residents sooner rather than later;
2. They should prepare the wireless simultaneous public address system to make the speedy transmission of information possible in a disaster-stricken area.
3. People who have never experienced a serious natural disaster before tend to under-estimate the severity of the situation. Everyone must try to start gathering accurate information at an early stage of disaster development so that good judgments can be made as to when, how and where to evacuate.

## How to Prepare for Hazardous Secondary Effects

---

**Research on large-scale earthquake prediction and potential damage is progressing. It aims at estimating direct damage caused by an earthquake in inland areas. With a large earthquake, however, the potential danger from petrochemical industrial complexes in coastal areas needs to be considered as well.**

The Central Disaster Prevention Council is spearheading research on damage prediction and disaster prevention against potential large-scale earthquakes in Japan (e.g., a Southern Kanto earthquake, a Tokai earthquake, an Eastern Nankai earthquake, a Nankai earthquake).

Anticipated damage by a large earthquake includes collapsing houses, structures and earth, catastrophic fires in urban and residential areas, and the subsidence of structures caused by the liquefaction of the ground. In addition, damage from a tsunami should be considered in coastal areas.

We need to further consider secondary damage as well. For example, **petrochemical industrial complexes in coastal areas have a high risk of catching fire** as a result of a massive earthquake.

Many of the areas where large earthquakes are predicted have attracted capital investments for heavy chemicals industry operations. This occurred during the high-growth period of the Japanese economy

from the 1960s to the beginning of the 1970s. A seismologist, who used computer simulation of the motions of the petroleum tanks in the Tokyo Bay area, has predicted that more than 60 would burst into flames if a Tokai or Nankai earthquake occurs.

A petroleum tank fire is caused by what is called the “sloshing phenomenon”. The tank is vigorously shaken by the earthquake in a direction which coincides with the seismic center. As a result, the oil spills out of the tank and is ignited by sparks from the collision between the floating roof and the side wall. The fire of a naphtha storage tank in Tomakomai City, after the Tokachi offshore earthquake in September 2003, happened as a result of this process.

If the oil leaks through cracks in the tanks into sea water, the situation will be even more dire. It would be extremely difficult to contain or extinguish.

Another concern is **how earthquake-resistant** outdoor petroleum tanks are. Presently there are 1,329 tanks in Japan larger than 550 kiloliter that contain combustible fuel. About 64 percent of these tanks were built before seismic design standards became strengthened, have not had their seismic capacity evaluated, or are yet to be reinforced.

The existing Fire Protection Law requires all tanks to satisfy seismic design standards by 2020. The Fire Defense Agency is working to move up the deadline. Since a large-scale earthquake is a natural disaster that could strike any time, the moving up of the deadline should be done as soon as possible.

The problem is partly due to a lack of urgency on the part of the regulatory authorities toward large-scale production facilities, such as petrochemical complexes. Yet, it is also due to the inability of some production sites to respond quickly to the seismic design and disaster prevention code and standard.

When the fire of a naphtha storage tank in Tomakomai city after the Tokachi offshore earthquake occurred on 26 September 2003, Yokkaichi City which operates many similar production facilities responded very quickly. Several days after the earthquake, the city sent a team of people from the Disaster Prevention Division and the

Safety and Fire Prevention Division to the disaster site. This shows their dedicated efforts to try to learn from the incident about what fire-fighting problems had been experienced and what could have been done to minimize the damage. Then, they announced that they would examine the condition of the local petrochemical tanks in their own city and call an emergency meeting for the local petrochemical industrial complex establishments.

One of the authors grew up in Suzuka City, adjacent to Yokkaichi. I still remember the strong, offensive odors that we experienced whenever I rode along Route 23 with my father when I was young. But now the odors are hardly noticeable, thanks to the regulatory authorities who served as the driving force for the environmental cleanup. Also, state and local governments have worked hard to actively tighten up the regulations. Success came from joint efforts by the relevant production facilities and state and local governments. We hope to see more of these pro-active approaches to crisis management against the large-scale earthquakes that have been predicted.

In seismic disaster, it is not enough to consider direct damage; it is imperative that we pay attention to energy facilities, particularly petrochemical complexes. Relevant local governments and regulatory authorities need to **work hand in hand to improve the safety** of these facilities.

## KEY POINT

**In the context of earthquake disasters, one must identify and study in advance the potentially most hazardous secondary effects.**

## Recommendations

The government must:

1. Move up the deadline for satisfying the earthquake-resistance standards for petrochemical complex facilities.
2. Take corrective measures toward the facilities which have yet to meet the earthquake-resistance standards.

3. Consider revising the current Fire Protection Law and ease the regulations regarding firefighting equipment. (It has been pointed out that the inspection and certification system of firefighting equipment specified in the current Fire Protection Law makes it difficult to adopt newly developed, more superior firefighting equipment.)
4. Work with local government to implement some policies to facilitate the last two recommendations of the above three.

## What We Can Learn from Hurricane Katrina

---

**In crisis management, a balance of foresight and resource allocation is critical.**

Hurricane Katrina was one of the worst natural disasters in U.S. history, which caused a horrifying number of deaths and injuries as well as massive destruction of homes. It also left many ironies and hard lessons.

The first irony is in its name. The Monastery of St. Katrina (Catherine) is a designated World Heritage site located near Mount Sinai, the place where God gave Moses the Ten Commandments. Why did a hurricane named Katrina, which is a symbol of benevolence, end up bringing such devastation to humans?

The second irony is that following the 11 September 2001 terrorist attacks, the **Department of Homeland Security (DHS)** was created to develop counter-measures. Subsequently, the **Federal Emergency Management Agency (FEMA)** was downgraded from a cabinet level agency and absorbed into DHS. FEMA demonstrated their effectiveness under the Clinton Administration (e.g., a speedy response to an earthquake in Los Angeles and an early evacuation effort at the time of a hurricane in the southeast). Yet, it was intensely criticized for its ineffective, uncoordinated response to Hurricane Katrina, which led its director, Michael Brown, to resign.

The third irony is that the National Guard troops, who were intended to provide evacuation assistance and relief operations, were seriously short staffed to handle disasters of this magnitude. At the time, 40 percent of Mississippi's and 35 percent of Louisiana's National guards were deployed to Iraq. Further, necessary equipment for this kind of disaster — such as Humvees and other vehicles designed to operate in high water conditions, fuel and water tankers, and generators — were not readily available for use.

The fourth irony is that **global warming** might have contributed to this catastrophe. Sir David King, the UK Government's Chief Scientific Adviser said, "It has been known since 1978 that hurricane strength is highly correlated with sea surface temperature. The sea temperature in the Northern Hemisphere has increased by 0.5°C for the past 15 and 20 years. It is easy to conclude that the increased intensity of hurricanes can be correlated to global warming." His comment can be taken as a criticism of the United States for their lack of support for the **Kyoto Protocol**.

And the fifth irony is that the main victims of this hurricane were the poorest 100 thousand population, which accounted for 20 percent of the residents of New Orleans, who did not have means to evacuate themselves. In other words, they did not have cars or credit cards and were unable to find any way out of the city, which led to hundreds of deaths.

## **KEY POINT**

**The ability to develop foresight and include unanticipated situations in a disaster prevention and response strategy is critical.**

## **Recommendations**

The authorities should:

1. Provide emergency unemployment benefits to people who have lost jobs due to the disaster.

2. Provide long-term emergency shelters to those who have lost their homes due to the disaster.
3. Immediately release stockpiles of food and clothing from government-stocked warehouses throughout the country.
4. Provide food, water, clothes, medicine and other necessities through various business organizations, supermarket chains and drugstores.
5. Deploy large-scale medical teams to the disaster site for epidemic disease prevention.
6. Provide relief through early payment of property damage insurance to victims.
7. Coordinate with national, state and local governments to work together to develop a disaster recovery plan for rapid implementation when needed.
8. Develop a disaster protection and evacuation plan and implement it before the next hurricane and earthquake strikes.

# Case 27

## The Great Sichuan Earthquake: Why Wide-Area-Coverage Evacuation Centers are Needed

---

**When a large-scale earthquake disaster strikes, large, sturdy school buildings (or public facilities) serve to forestall the expansion of secondary damage.**

On 12 May 2008, a major earthquake of the direct-hit type occurred in the Province of Sichuan, which is located in the central-western part of the People's Republic of China. The catastrophic event came to be known later as the Great Sichuan Earthquake. By "magnitude," a denotation of the scale of seismic severity, the tremor was confirmed to have been of the order of 7.9 to 8.0, counting as one of the severest events of its kind ever to hit any part of the world. According to an announcement dated 4 September 2008 released by a national committee of experts of the Chinese government, the direct damage suffered would amount to a good 845.1 billion yuan (about US\$122.4 billion). The same source further states that Sichuan Province accounted for 91.3 percent of the entire earthquake-incurred damage, or 771.6 billion yuan in monetary terms. Since the budgeted general revenue for 2007 was 85.034 billion yuan, a figure released by the financial administration source of the same province, the amount of the earthquake-incurred damage would have corresponded to approximately nine years' worth of the same province's financial revenue, according to some observers.

The Ministry of Civil Affairs of China announced in its 22 July 2008 report that, as of noon, 21 July 2008 local time, the number of those who perished in the disaster was 69,197, and that the injured numbered 374,176, and those missing, 18,222. It is surmised that, as of the time of writing in December 2008, the numbers of dead, wounded and missing persons would have substantially increased.

What has been pointed out as problematic in connection with this catastrophic event is that there was no support system in place for disaster prevention or disaster mitigation applicable at the national level, and that earthquake-resistant building design was not yet widely practiced. It is thought that the slow response in immediate post-tremor life saving and relief operations was at least in part responsible for the spread of the damage. In dealing with circumstances such as this, it becomes a matter of burning urgency to accept offers of assistance from other countries equipped with experience and technology in rescue and relief operations. The Chinese authorities were late in making a political decision to accept such offers, and it may be said that it was this delay in decision-making that resulted in the soaring number of victims.

Reportedly, the number of collapsed and destroyed residential structures is simply staggering. Almost 7,000 school buildings are said to have collapsed in Sichuan Province alone, and more than 10 percent of all victims are believed to have been accounted for by teachers and students crushed to death under collapsing school buildings. The fact that buildings duly complying with earthquake resistance standards were few, alongside the fact that much construction suffered from “corner-cutting” at the hands of builders, certainly contributed to the astounding magnitude of the disaster.

The collapse of great numbers of school buildings in the Great Sichuan Earthquake testifies to the tragic failure of preventing unnecessary damage. That many human lives were lost under collapsed structures speaks for itself. Just as significantly, it is truly regrettable, that school buildings were not utilized as shields against secondary damage in the post-tremor phase.

When a natural disaster strikes, school facilities act as very valuable regional facilities to support disaster-mitigating efforts. In countries with relatively well-organized disaster prevention regimes, school facilities are invariably designated by local municipalities as wide-area-coverage evacuation centers. Citizens affected by an earthquake or any other natural disaster will seek shelter at such locations. There is much merit to having such designated evacuation facilities to which disaster victims can be directed. For one thing, by having disaster-affected citizens gather in one place, it becomes possible to grasp the situation concerning the victims on the ground at an early stage. The municipal authorities concerned will thus be able to obtain a quick picture of the extent to which the affected citizens over whom they have jurisdiction have sustained physical injuries and property damage. They can then take indicated measures for providing appropriate medical treatments and health and sanitation management, as well as put procedural measures on the fast track toward fulfilling the requirements for the application of disaster-related laws concerning the restoration of normal life. The next step is the post-disaster formation of a community based on the idea of mutual help. In many cases, vulnerable people, especially the aged population, are apt to be exposed to a severe post-disaster psychological shock which will prove extremely stressful for their health. Those living close to them must provide support for such people with little disaster resistance. In Japan, when a large-scale natural disaster breaks out, portable telephone companies launch their disaster victims' message board service. This system makes it possible for people in and around disaster-affected areas to post appropriate messages regarding their safety or other messages which can be retrieved on the inquirers' terminal monitors.

## KEY POINT

**When a large-scale earthquake strikes, secondary damage is determined by where the tremor-affected people happen to be immediately following the tremor.**

## **Recommendations**

The government must:

- Designate large and sturdily built (public) school facilities as wide-area-coverage evacuation centers for use when a large-scale natural disaster occurs. It will also be necessary to secure access routes to insure that the evacuation centers can function effectively;
- Keep area residents informed of the evacuation centers that are ready for use in case of an earthquake-generated emergency.