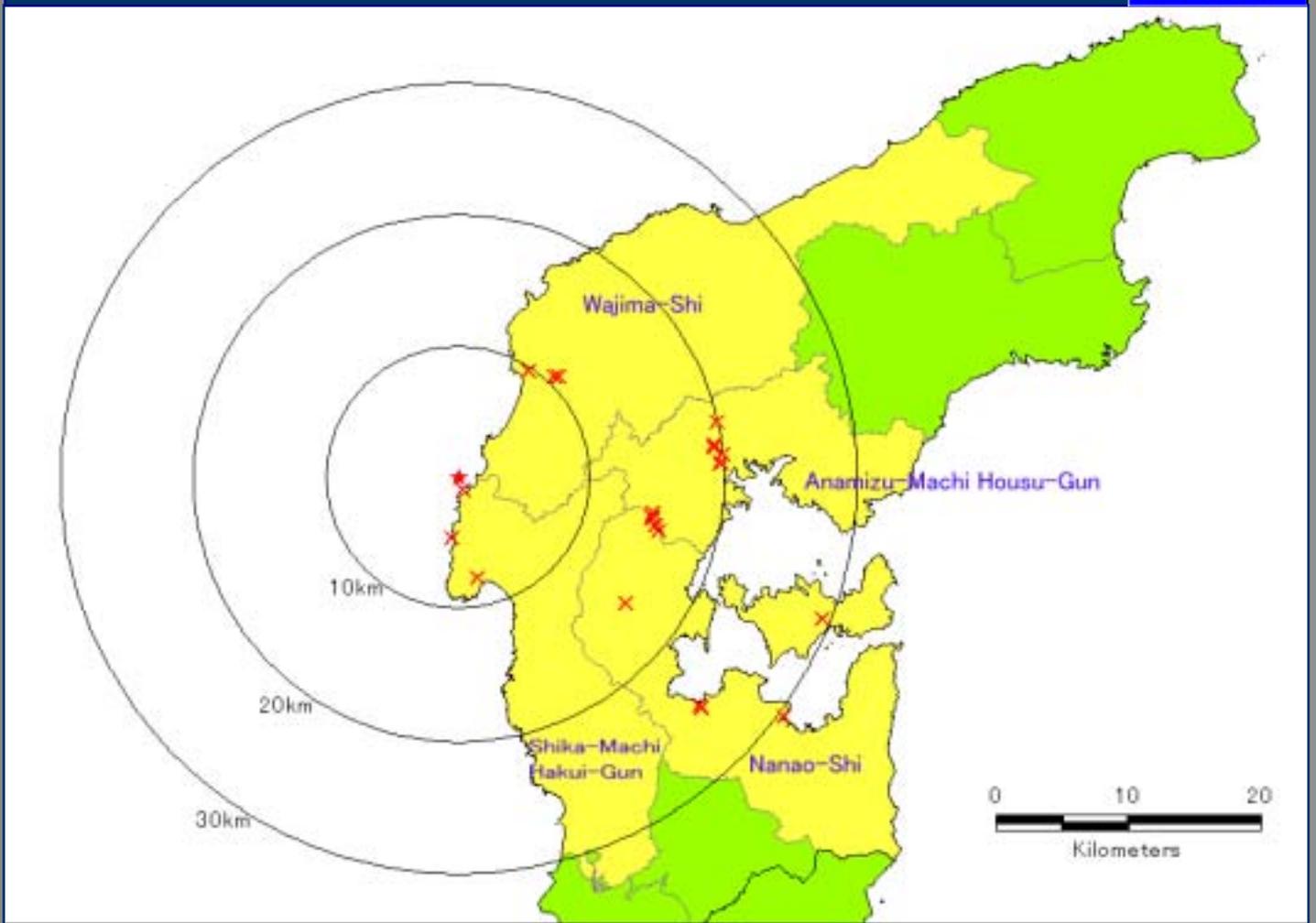


Flash Report on The Noto Hanto Earthquake



[Summary]

On 25 March 2007, an earthquake with the magnitude of 6.9 (Mjma) occurred in Ishikawa Prefecture, located about 300 km NW from Tokyo (Figure 1). The epicenter was located at 37.13N, 136.41E. According to the report from the Fire and Disaster Management Agency issued on 2 April, 1 was killed, and 297 were injured.

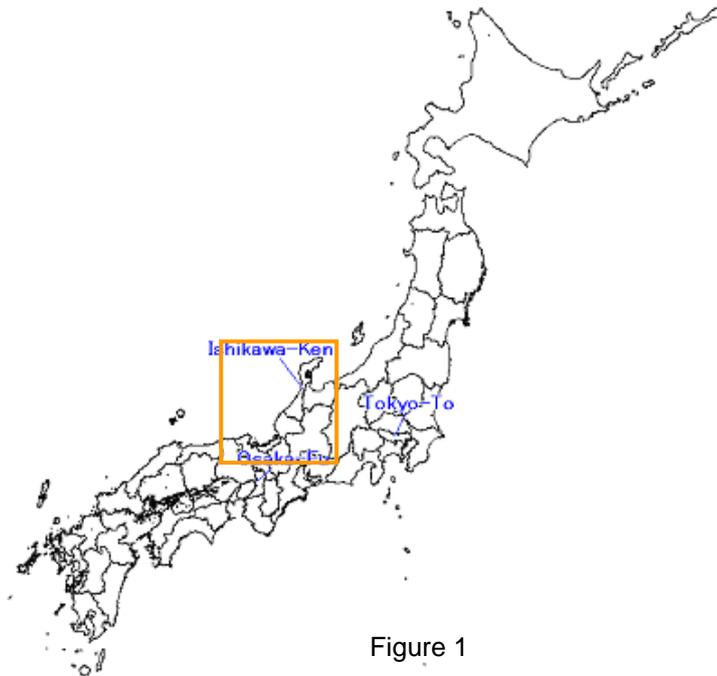


Figure 1

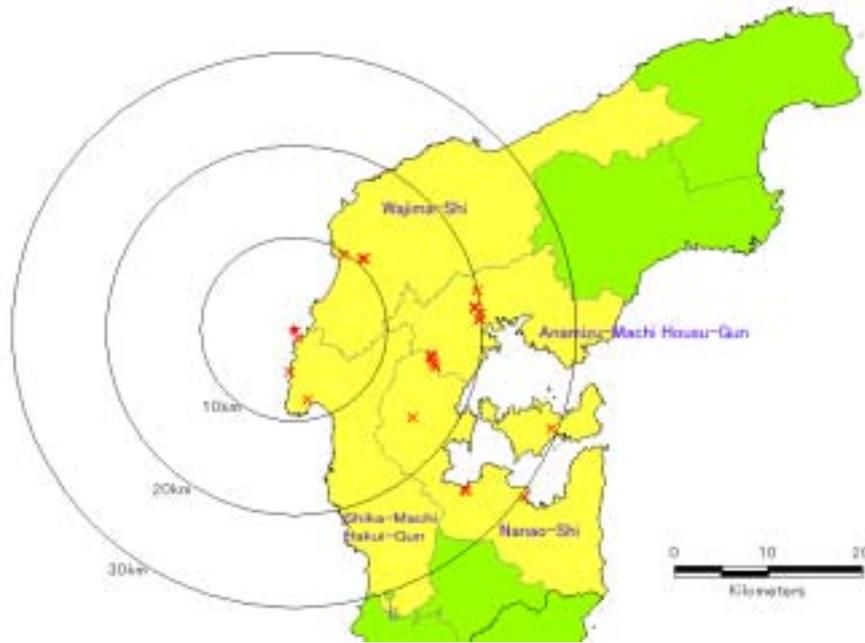


Figure 2

2 engineers from ABS Consulting, Minami Ozawa and Tsuyoshi Futami conducted a field survey in Noto peninsula from 27 and 28 March. The surveyed areas include Wajima city, Nanao city, Shika town and Anamizu town that all experienced a seismic intensity of 5+ to 6+ on the scale of the Japanese Meteorological Agency (JMA).

- Earthquake Motion -

The Peak Ground Acceleration (PGA) was 945cm/s^2 measured at Hakui-gun Shika town. Wajima city experienced the intensity of 6+ on the scale of the JMA. "Intensity 6+" in Ishikawa Prefecture had not been recorded since JMA observation beginning. The epicenter was located in the ocean, about 20cm of Tsunami is also observed at Suzu city and Kanazawa city.

However, the relationship between earthquake motion and damage was not simple. For example, the intensity was 6+ at the Wajima city, but the remarkable damage was limited to old wooden houses. The JMA's "Damage standard set for describing earthquakes according to seismic intensity" describes the intensity 6+ as "Majority of seismically vulnerable houses collapse. Many of the walls and columns of seismically designed buildings may fail," but this description does not match to the surveyed damage. This gap occurs because no proper calibration was conducted when the JMA accepted a new method of deriving an intensity level. Before the Kobe Earthquake, the intensity of an earthquake at a given city was determined by the designated staff at the city with reference to the standard set. In the new method currently used, the intensity is calculated based on the record measured by a seismometer placed at the city center. Further investigation on this calibration problem should be taken.

- Damage on the buildings -

The number of reported fire accidents was remarkably small. The lessons from the Kobe Earthquake could have helped and also the earthquake occurrence time helps the secondary disaster is stopped at least. The most of the damage was limited to old wooden houses, in other words, there was no serious damage on the RC buildings. The sudden fall of the suspended ceiling panel was seen as well as previous major earthquakes in these years. Non of the surveyed damage was new in the structural engineering point of view. In other words, the damage could have been mitigated if the caution urged by experts had been seriously considered.

- Risk Communication -

44 houses were completely destroyed and 96 houses were partially destroyed in Monzen town, Wajima city has population about 7,800. In this small town, there is about 3,700 people are over 65 years old (47%). This town made original Map which contain the information about location of the elder person lives, this map was made based on the 1995 Kobe earthquake experience. This map was used after the earthquake occurred, do the house-to-house visit by the welfare commissioner, and it induced it to the refuge while confirming the physical condition of the senior citizen and damage of the house. As a result, all senior citizens situation was able to be understood about 4 hours and 20 minutes after the earthquake occurrence. It seems that it becomes help that making and using such a map for suppress damage to the minimum, especially Japan that is said ageing society.

[Acknowledgement]

ABS Consulting would like to thank all the local government staff and the residents we visited for their kind response to our inquiries, even though they were in the midst of the recovery work.

[Earthquake]

It is thought the earthquake is treated as an inland type earthquake, which the plate on the land side intraplate fault slipped. The west of the Noto peninsula has fault which runs about 20km Northeast to Southwest. The Southeast side plate ran aground on the Northwest side plate by 1.4m. Kanazawa University and Tokyo University research team reported, they found 2 possible points in the fault which could be a source of this earthquake. At the Monzen town, there is 8cm displacement on the road was recognized. The Government earthquake investigating committee evaluate that this earthquake effect is minimal to the Ouchigata fault located Southeast of this area, which runs about 44km from Nanao city to Kahoku city. The Geographical Survey Institute reported Southwest 21cm displacement with 7cm upheaval at Togi area in Shika town and Northwest 12cm displacement with 2cm upheaval at Anamizu town.

[Damage on the buildings]

<Anamizu Town>

Anamizu town located in center of Noto Peninsula, Ishikawa Prefecture. The collapse of a lot of old wooden structure houses was seen (Photo 1). A lot of warehouses build with clay wall existed in this region, and a lot of cracks and spall of the clay wall were observed (Photo 2). The RC buildings were not noticeable damaged were observed, there is minor crack on the Anamizu Town hall building. There is no major damage observed in the town, however, the damage to the road was observed that was caused by ground disturbed. The garden lantern was fall down at the Anamizu shrine (Photo 3).



Photo 1



Photo 2



Photo 3

<Nanao City>

Nanao City is located on East part of Noto Peninsula which include Noto Island and the Nanao southbay is enclosed. A lot of damage on the bay shore facilities was seen. The pollution of the hot spring continued for two days at Wakura hot spring area.

Nanao City Noto island life study synthesis center, located in the center of Noto Island has gymnasium and martial arts facility. Ceiling panel fall were observed in both facilities. Total of 11 ceiling panels were fall at gymnasium (Photo 4) and there is no brace was not equipped (Photo 5). The weakness of the ceiling material that has been reported at each earthquake in recent years is asked again. Fortunately, human injury did not occur though the gym was used when the earthquake occurred.



Photo 4

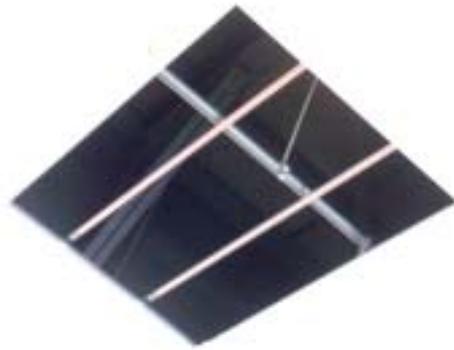


Photo 5

<Hakui-gun Shika Town>

Shika town is located in center of Noto peninsula and faces the Sea of Japan. Coast where rocks of fantastic shape, rare scenic beauty, and cliff are consecutive over about 30km, this site is one of the large treasure spectacles in the Noto Peninsula national park. However, a lot of cliff crumbles were seen because of this regional characteristic. There were a lot of collapsing residential houses, the secondary disaster by the cliff crumble in the hillback was feared (Photo 6).



Photo 6

<Wajima City>

Wajima city is located in the north end of Noto Peninsula has the most a lot of damage was observed. In the same district, the phenomenon that damage concentrated according to the street, and damage was hardly seen in other places.



Photo 7

A large roof with tight inclination is a traditional architectural style of Wajima. This roof uses heavy tiles and these heavy tiles drop everywhere. It is thought that the weight of the tile is a cause of the building damage. The wood factory collapse, which left the shape of the shed, was seen (Photo 7).

<Monzen Town Wajima City>

Monzen Town has the largest number of houses that collapsed. Kouzen temple in this town totally collapsed (Photo 8). The Torii gate collapsed in the direction of the south at Kushihi shrine (Photo 9) and the garden lanterns at Soji temple were also collapsed in the direction of the south.



Photo 8



Photo 9

A lot of collapses of the block wall were observed in this earthquake. The block wall with reinforcing bar also collapsed (Photo 10, 11).



Photo 10



Photo 11

[Port Facilities]

<Nanao City, Nanao port>

In the Nanao port where it had faced the Nanao bay, liquefaction was seen (Photo 12). It was observed to crack the shore protection and to move to horizontal direction on the seaward side by about 130mm (Photo 13).



Photo 12



Photo 13

<Shika Town Togi port>

Togi port faces the Sea of Japan, the pier has an earthquake crevice from root of the pier to the end of the pier (Photo 14). Liquefaction was seen in the earthquake crevice (Photo 15). The displacement of horizontal direction was about 220mm.



Photo 14



Photo 15

[Infrastructures]

<Noto Airport>

Noto airport runway had cracks and all aspects were blockaded on that day of the earthquake occurrence. The temporary restoration construction would be completed next morning and it became usual operation from the first flight from Haneda.

<Noto Toll way and Taduruhama road>

Noto toll way had large-scale ground subsidence, crevices and landslide occurred in total 11 points. These photographs were taken from normal road around the Noto Toll way Bessho SA (Photo 16, 17, 18).



Photo 16



Photo 17



Photo 18

<Shika Town Togi area>

A lot of cliff crumbles were seen in Shika town because of the geographical features characteristic to which the cliff ranged. The photograph is the one having taken at the Togi port entrance (Photo 19).



Photo 19

<Shika Town NotoKongo>

The cliff crumble was generated in the quay of Noto Kongo. The color of the sea had changed for the collapsed earth and sand (Photo 20, 21).



Photo 20



Photo 21

<Noto Island Twin bridge Noto>

There is a problem at Twin bridge Noto which connect the Nanao city and Noto Island, the elevation difference was found at the joint between the land and the bridge. It became the suspension of traffic, and alternate traffic of one lane became possible after the emergency measure. It still has a situation where there are weight limits of five tons in total weight, and the large-sized car cannot pass.

<Noto Island Notoshima Bridge>

The Notoshima bridge which connect Wakura hot spring area and Noto Island, the crack was found in four piers and it became a suspension of traffic at 0:00 AM of the 27th. The prospect of restoration could not be planed because necessity of the survey of an underwater part in the future.

[Lifeline]

<Electricity>

According to Hokuriku Electric Power Company, Nanao Ota thermal power plant No.2 machine automatically shut down due to this earthquake, high-voltage cable disconnection eight places and 29 utility pole damage turns out. About the maximum 160,000 houses experienced blackout due to the damage from this earthquake in Ishikawa prefecture and Toyama prefecture. On 25th March 15:00, about 500 houses still experienced blackout and it restored at 16:50 26th March.

<Water>

Water supply was cut off because of damage on pipes due to liquefaction and ground subsidence. About 13,000 houses were suffering from the disruption of water supply in Ishikawa prefecture and Toyama prefecture. 9 days after the main shock, 281 houses in Wajima town still facing difficulty of water supply.

<Gas>

Propane gas cylinder supply is used in many regions in Ishikawa prefecture and Toyama prefecture where a big shake was observed. According to Sea of Japan gas Ltd. that supplies the city gas to Ishikawa prefecture and Toyama prefecture, there is no defect was found during the inspection of gas supply after the earthquake.