



Road Administrator's Response to the 2004 Niigata-ken Chuetsu Earthquake

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Overview of Presentation

- Introduction
- Overview of the 2004 Niigata-ken Chuetsu Earthquake
- Damage to roads
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- Restoration of roads
- Summary

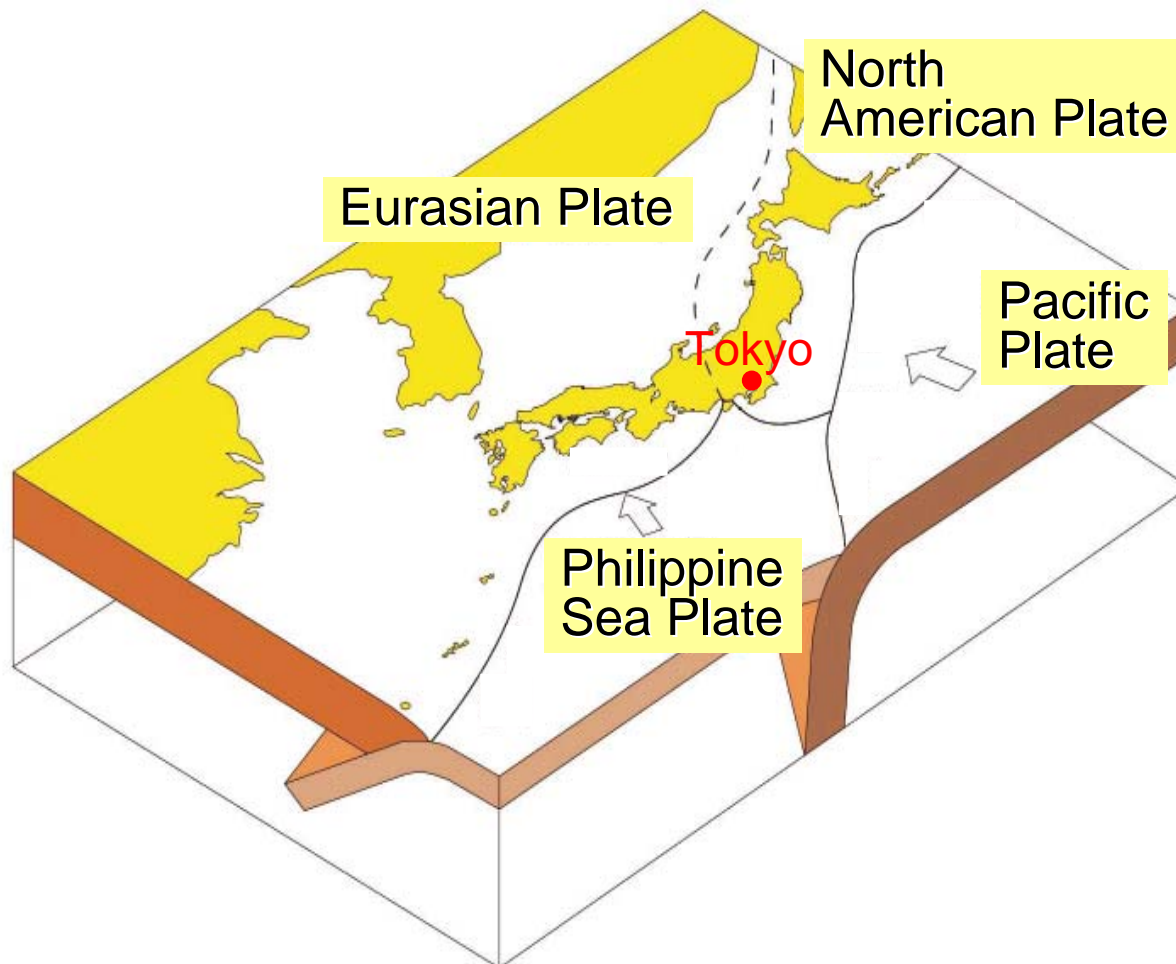


Introduction

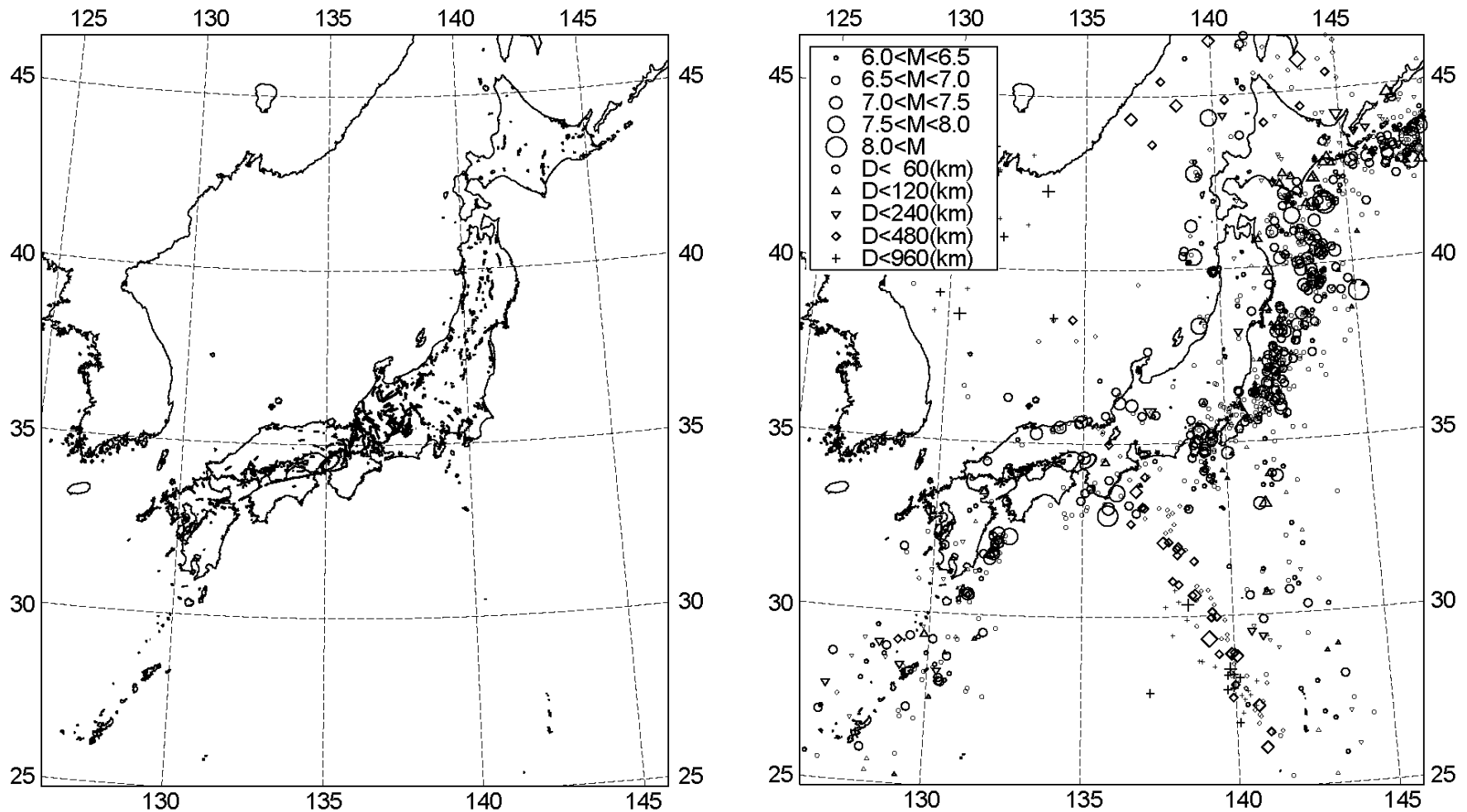
Why Japan is vulnerable to earthquakes?

- Plates and active faults
 - In the Pacific rim earthquake zone.
 - Located at the point where the Eurasian, the North American, the Pacific and the Philippine Sea Plates meet.
 - Approximately 2,000 active faults beneath the land area.
- Topography and geography
 - 70% of the land is mountainous.
 - Many major cities developed on soft alluvial plains.

Plates around Japan

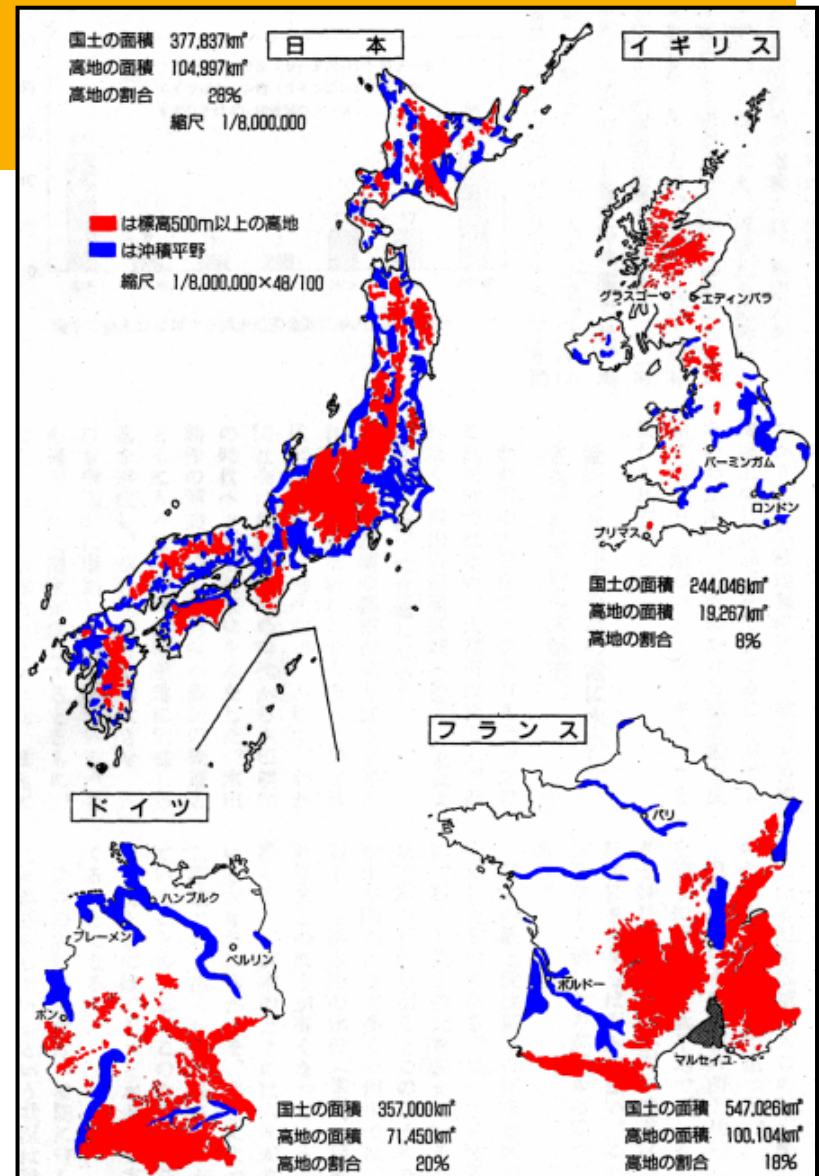
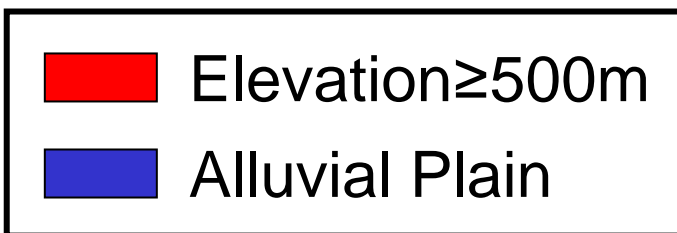


Distribution of Major Active Faults and Epicenters (1923-2003)



Geographical Features

- Comparison of Japan, UK, Germany and France.
- 28% of the land is higher than 500m in Japan.



Major Earthquakes

| Date | Region | Magnitude | Casualties & Missing | Destroyed Houses |
|----------|-----------------|-----------|----------------------|------------------|
| 6/28/48 | Fukui | 7.1 | 3,769 | 36,184 |
| 6/16/64 | Niigata | 7.5 | 26 | 1,960 |
| 5/16/68 | Off Tokachi | 7.9 | 52 | 673 |
| 6/12/78 | Off Miyagi | 7.4 | 28 | 1,183 |
| 5/26/83 | Off Akita | 7.7 | 104 | 934 |
| 9/14/84 | W Nagano | 6.8 | 29 | 14 |
| 7/12/93 | SW Off Hokkaido | 7.8 | 202 | - |
| 1/17/95 | Kobe | 7.3 | 6,443 | 104,906 |
| 9/26/03 | Off Tokachi | 8.0 | 2 | 116 |
| 10/23/04 | Niigata | 6.8 | 51 | 3,185 |



Overview of 2004 Niigata-ken Chuetsu Earthquake

Statistics of 2004 Niigata-ken Chuetsu Earthquake

- Origin time: 5:56 pm, October 23, 2004 (JST)
- Epicenter: Central Niigata Prefecture
- Magnitude: 6.8
- Focal depth: 13km
- Maximum seismic intensity: 7
- Aftershocks: 2 aftershocks with seismic intensity 6 upper (October 23), 2 aftershocks with seismic intensity 6 lower (October 23 and 27)
- Casualty: 51 (Direct death toll was 16), Injured: 4,805
- Destroyed houses: 3,185, Partially destroyed houses: 13,715, Partially damaged houses: 104,560

■ Fire Defense Agency

Landslide (W=250m, L=150m) at Myoken, Nagaoka City



Landslide Blocked River Course in Higashi-Takezawa, Former Yamakoshi Village





Damage to Roads

Earthquake-affected Region and Major Roads



Number of Locations Completely Closed to Traffic and Damaged

| Roads | | Locations completely closed to traffic and damaged |
|---|-----------|--|
| Directly managed national highways | Route 8 | 7 (8) |
| | Route 17 | 9 (31) |
| | Route 116 | 1 (2) |
| | Subtotal | 17 (41) |
| Prefecturally managed national highways | | 61 (242) |
| Prefectural roads | | 163 (728) |
| Municipal roads | | 845 (1,723) |
| Total | | 1,086 (2,734) |

Failure of Road Embankment at Tenno, National Highway Route 17



Damaged Pier of Ojiya Bridge, National Highway Route 17



Emergency Repair by Carbon
Fiber Jacketing

Spalling-off of Concrete Lining in Wanazu Tunnel, National Highway Route 17



Damaged Kan-etsu Expressway between Horinouchi IC and Echigo-Kawaguchi IC



Collapsed Road in Higashi-Takezawa, National Highway Route 291



Designated as MLIT proxy exercise of authority road section.

23e Congrès mondial de la Route - Paris 2007

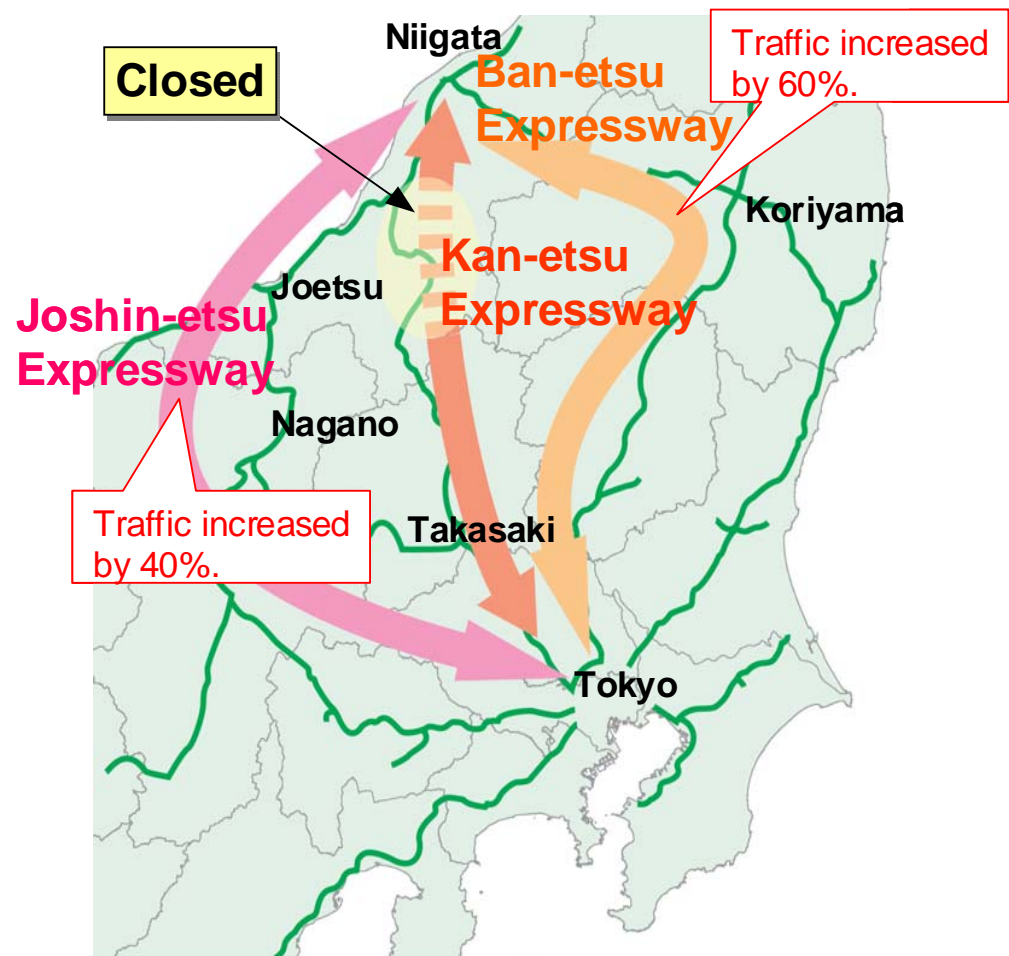
Disruption of Wide Area Transportation Infrastructure

- After the earthquake, traffic was stopped on the Kan-etsu and Hokuriku Expressways. On national highways, traffic was stopped or forced to travel alternately in one direction at 55 locations.
- The derailling of a train on the Joetsu Shinkansen further disrupted transportation between Tokyo and Niigata.



Benefit of Nationwide Network of Expressways

- Ban-etsu and Joshin-etsu Expressways took over the function of Kan-etsu Expressway.
- The average traffic volumes of Ban-etsu and Joshin-etsu Expressways from October 25 to 29 increased by 60% and 40%.





Road Administrator's Response

System Established by MLIT

- Immediately after the earthquake, the headquarters of the Ministry of Land, Infrastructure and Transport (MLIT) proclaimed an **emergency status** to cope with the disaster and established the **MLIT Emergency Disaster Countermeasure Headquarters (EDCH)**.
 - MLIT also provided officials to coordinate the activities of the local support countermeasure section established by the Government.
- On November 26, EDCH was reorganized into the Disaster Restoration Support Headquarters, which has been responsible for damage restoration and providing support.

System Established by Hokuriku Regional Development Bureau of MLIT

- The Hokuriku Regional Development Bureau (HRDB) of MLIT declared an **emergency status** and established the HRDB **Emergency Disaster Countermeasure Headquarters (EDCH)**.
- 20 MLIT Work Offices in and around the earthquake-affected region also declared the emergency, warning or advisory status, according to seismic intensity.



Meeting of Emergency Disaster Countermeasure Headquarters

System Established by Hokuriku Regional Development Bureau of MLIT, Cont.

- HRDB established the HRDB Restoration Headquarters on December 28. It took over the functions of EDCH to carry out rapid restoration and to support recovery.
- In order to support road disaster restoration by local governments, the following organizations were established inside HRDB:
 - Niigata-ken Chuetsu Earthquake MLIT Restoration Support Countermeasure Field Liaison Meeting
 - Restoration Support Headquarters for Municipal Roads Damaged by the Niigata-ken Chuetsu Earthquake
 - Restoration Support Headquarters for Damaged Municipalities

System Established by Japan Highway Public Corporation

- The former Japan Highway Public Corporation (JHPC) managing expressways adopted similar system to MLIT.
- The headquarters of JHPC proclaimed a **state of emergency** and established the **Emergency Disaster Countermeasure Headquarters**.
- The Hokuriku Branch of JHPC declared emergency status and established the Hokuriku Branch Disaster Countermeasure Headquarters. The management offices in the earthquake-affected region proclaimed a state of emergency, inspected expressways and took emergency response measures.

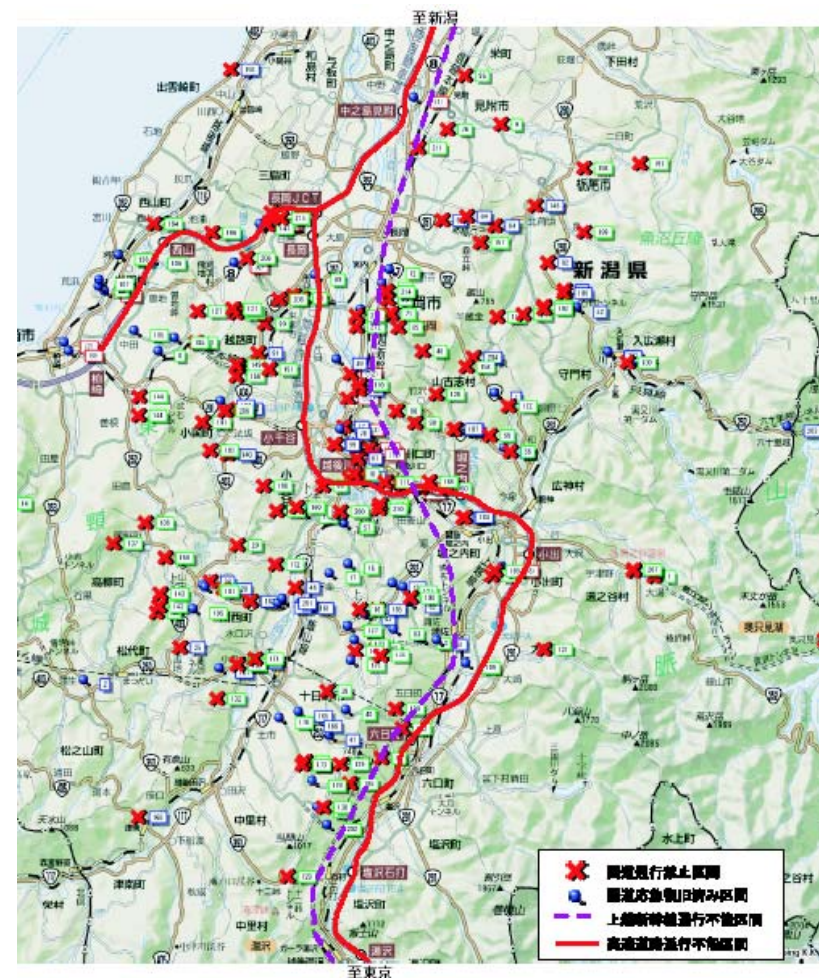
Provision of Information on Roads

- The road consultation section of HRDB was overwhelmed by countless inquiries on roads and traffic.
- The section extended its hours beyond the normal closing time of 5:00 p.m. to place staff on duty 24 hours/day.



Provision of Information on Roads, Cont.

- HRDB shared information concerning traffic closures on national highways and prefectural roads with Niigata Prefecture.
- Information was released on a web site since three days after the earthquake.



Provision of Information on Roads, Cont.

- Nagaoka Highway Work Office provided information about congestion on roads and on road closures on a cell phone web site.
- This site was accessed many times by people seeking information about the state of congestion in the Wanazu Tunnel and so forth.



Guide to Cell Phone Road
Information Web Site



Restoration of Roads

Restoration of Directly Managed National Highways

- Morning, October 25 (2 days after)

Emergency restoration work was completed except the Wanazu Tunnel, ensuring the passage of emergency vehicles and disaster region traffic.

- October 31 (8 days after)

Two-lane detour was constructed on the mountain-side of Route 17 at Tenno.



Restoration of Directly Managed National Highways, Cont.

- November 2 (10 days after)
Enabled alternating traffic on a single lane at the Wanazu Tunnel. Entire Route 17 was opened to traffic.

- December 26 (64 days after)
Two lanes were opened at the Wanazu Tunnel.

- December 29 (67 days after)
Restoration of highway was completed at Tenno.



Restoration of Kan-etsu and Hokuriku Expressways

- 1:00 p.m. October 24 (19 hours after)
Emergency restoration work was completed, enabling the passage of **emergency vehicles**.
- 10:00 p.m. October 26 (76 hours after)
Traffic restrictions were removed from the entire Hokuriku Expressway and from the Kan-etsu Expressway except for a section.
- October 27 (100 hours after)
Single lane traffic in both directions was released for emergency vehicles on the Kan-etsu Expressway.

Restoration of Kan-etsu and Hokuriku Expressways, Cont.

- November 5 (13 days after)

One lane was opened in each direction for ordinary vehicles and the closure was cancelled on the entire Kan-etsu Expressway.

- November 26 (34 days after)

All four lanes were opened.

Summary

- The 2004 Niigata-ken Chuetsu Earthquake caused the worst damage since the 1995 Kobe Earthquake. With its epicenter in a mountainous region, it caused many slope failures and landslides, cutting off the road network at numerous locations.
- Immediately after the earthquake, the road administrators devoted every resources to restoration. For example, road closures were cancelled on all directly managed national highways by the 10th day after the earthquake.
- While the function of Kan-etsu Expressway deteriorated and the Joetsu Shinkansen was suspended, the Ban-etsu and Joshin-etsu Expressways contributed to maintaining the transportation between Tokyo and Niigata.