

The Hokkaido Toho-oki Earthquake

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City water pipes broke in Kushiro-city and in many other towns and cities. More than 10,000 of the 13,000 residences in Nemuro-city were without water on October 5. Fourteen supply trucks provided temporary service. As of October 6, 6400 residences were without water service.

Roads were blocked at 68 locations due to settlement and other damage. This included 62 locations in Hokkaido and 3 locations in Miyagi Prefecture on Honshu. National Road No. 391 was closed at 3 sections, and 26 prefectural roads were closed at 27 sections. Six bridges collapsed and there was a reported slope failure at one location.

Immediately after the earthquake all Japan Railways lines in Hokkaido were stopped. The Tohoku Shinkansen was also stopped. Most rail service was back in operation by October 5.

Liquefaction was observed at piers in Kushiro harbor. Evidence of possible liquefaction was also observed at other locations.

The Japan Meteorological Agency issued a tsunami alarm at 10:28 p.m. for the Pacific side of Hokkaido and Tohoku, and a tsunami warning for the Okhotsk side of Hokkaido and the Pacific side in the Kanto area. Expected arrival times were issued for each location. A tsunami wave was observed in Nemuro Hanasaki-harbor at 10:58 p.m. that measured 1.73 m in height. In Kushiro harbor the wave measured 0.82 m. The tsunami alarm and warning were lifted at 5:55 a.m. on October 5.

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Learning From Earthquakes

Magnitude 7.0 Earthquake Hits the Philippines November 15, 1994

At 3:15 a.m. Philippine Local Time on November 15, 1994, a magnitude 7.0 (M_s) earthquake struck approximately 125 km south of Manila. The quake occurred on the Lubang Submarine Fault in the Verde Island Passage, which separates the islands of Luzon and Mindoro. The location of the epicenter was calculated as 13.5° N latitude, 121.1° E longitude, with a focal depth of about 7 km. The following intensities (Rossi-Forel) were reported: Mindoro - 7, Manila - 4, Quezon City - 3. Two strong aftershocks were felt in Manila shortly after the main event. A magnitude 5.1 event, also associated with the Lubang Fault, occurred at 2:30 p.m. local time on the day of the quake. (Data generated by Philippine Institute of Volcanology and Seismology, aka Philvolcs.)

Most of the damage and casualties were concentrated on the lightly developed island of Mindoro. The island population is approximately 1 million, and the built environment consists mainly of agricultural and fishing villages, coconut plantations, and some scattered coastal tourist resorts.

Tsunami waves up to 1.5 m high were reported along the north coast of Mindoro, primarily in the area of Calapan, capital city of Oriental Mindoro Province.

Approximately 74 deaths had been reported as of November 17, most of them children swept away from houses in fishing villages along the coast. Many homes were destroyed by the tsunamis. Damage to structures has also been reported in the area of Puerto Galera, a major tourist area on the northern Mindoro coast.

Eighteen bridges were damaged or destroyed, and extensive road damage due to liquefaction and lateral spreading occurred. The main pier at Calapan Harbor was heavily damaged, limiting ferry access to the area. The power barge which supplies electrical power for much of Mindoro was dislodged from its moorings; it ran aground 2 km from its original site. This resulted in extensive power outages throughout Mindoro. Damage to government infrastructure is reported to be restricted to the island of Mindoro and is estimated to total \$4 million.

As of November 16, Philvolcs had monitored 980 aftershocks. They expect that aftershocks will continue to be felt in Manila for about 1-2 weeks. Philvolcs has also voiced a concern that Taal Volcano, approximately 70 km north of Mindoro and currently showing signs of abnormal activity, may become more unstable as a result of the recent seismic activity along the Lubang fault.

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