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Extent of Damage to Japan's Infrastructure Still Unclear

By **HENRY FOUNTAIN**

Nearly two weeks after the earthquake and tsunami struck [Japan](#), engineers still do not know the full extent of damage to roads, bridges, rail lines and other infrastructure.

While much attention has been focused on the crisis at the Fukushima Daiichi nuclear plant, only fragmentary information has become available about damage to other large complexes, like water distribution and sewage treatment plants.

Even Japanese government agencies and professional engineering groups appear to have limited knowledge of the scope of the destruction along the northeastern coast of Honshu Island, where the tsunami hit on March 11, and further inland, where the quake damaged buildings and other structures and caused landslides.

"We don't understand the real situation," Hiroyuki Yanagawa of the [Japan Society of Civil Engineers](#) wrote in an e-mail. "We cannot investigate the area." The group is based in Tokyo, far from the affected region, where entry has been restricted largely to emergency vehicles.

In the United States, earthquake engineers who often travel to the scene of a major quake within days have been unable to go to Japan because of concerns about radiation.

Stephen Mahin, a structural engineering professor at the [University of California, Berkeley](#), and the director of the Pacific Earthquake Engineering Research Center, said that he and others had been planning to go but that the university had canceled their travel insurance.

He now expects to go next week, but will most likely be limited to Tokyo, about 140 miles from the damaged reactors.

"Inspecting earthquake damage is a risk, but it is a risk we know about," Dr. Mahin wrote in an e-mail. "Being dependent on public release of information on radiation hazards (or evacuation orders) that we have little control over is a different thing entirely."

The **National Science Foundation**, which finances field research after disasters and supported an engineering team that went to New Zealand **after the recent earthquake there**, said it was accepting proposals for Japan. The review process takes several weeks.

Some information about infrastructure damage is now trickling out. Incomplete as it is, the information helps explain why the Japanese government says that apart from the damage caused by the problems at the nuclear plant, recovery will take five years and cost hundreds of billions of dollars.

The Japanese Ministry of Land, Infrastructure, Transport and Tourism, which had been posting limited information about road and rail service since the quake, now says all expressways in the region are passable, and that **high-speed rail** service has been restored on all but two lines that have long stretches with damage to rails or to overhead electric lines. All airports are open to commercial traffic except the one in Sendai, where video cameras recorded a wall of water reaching as high as the jetways.

The ministry reported damage to about 50 sewage treatment plants. Other agencies reported that gas and water distribution had improved, though there were still many towns with limited or no service. None of the reports outlined the degree of damage to specific facilities.

Other assessments have been cobbled together by engineers based on reports from local agencies, photographs and, in some cases, personal observations. Engineers at the University of Tokyo listed 17 bridges that had been washed away by the tsunami; five sewage plants either damaged or destroyed; flooding at one damaged dam; and dozens of landslides and deposits of debris that have closed roads. In one case, they reported tsunami damage along an 18-mile stretch of coastal roads south of Iwaki.

A report by an engineer at Tokai University in Shizuoka, south of Tokyo, was more anecdotal, with photographs of roads blocked by landslides or warped as the ground underneath them subsided; rail lines tossed about like strands of spaghetti; collapsed electrical pylons; sewage plants buried in debris; and, in Sendai, huge storage tanks toppled over at a brewery.

A few engineers who study tsunamis lived through the disaster and described the destruction around them. Shunichi Koshimura, a researcher at the tsunami engineering laboratory at Tohoku University, and others reported that the lab was effectively destroyed and that much of the university was heavily damaged.

A day after the quake, Dr. Koshimura, who published a study last year about coastal effects of the 2004 Indian Ocean tsunami, tried to conduct a field study by car of the damage in the flatlands around Sendai but was turned back by debris and water.

Kit Miyamoto, an earthquake engineer born in Tokyo and living in San Francisco, was in Tokyo when the quake occurred. His flight home delayed and able to obtain the necessary permits, he drove up to the affected coast.

In an interview, Dr. Miyamoto described coastal rail lines that were swept away by the tsunami, and said the vast majority of the buildings that were destroyed were made of wood. "Almost all concrete and steel structures survived," he said, though they were often heavily damaged.

Dr. Miyamoto said some infrastructure in the area appeared to make the disaster worse. In the city of Rikuzentakata, one of the worst hit, a concrete channel funneled the tsunami surge, increasing its speed, height and destructive power.

"Construction like that makes things more dangerous," he said.