Quake is 5th biggest, but Japan best prepared

March 11 2011, By ALICIA CHANG and SETH BORENSTEIN , AP Science Writers

(AP) -- Take the world's most earthquake-prepared country, jolt it with one of the biggest quakes in history and add a devastating tsunami minutes later. In the classic battle of Man vs. Nature, Nature won again.

Hundreds if not thousands of people are dead in Japan. One of the world's most technologically advanced and earthquake-prone nations is paralyzed by a 8.9-magnitude "megathrust." It was the fifth-strongest quake in the world since 1900 and the most powerful on record ever to hit Japan, but not the deadliest.

And it could have been worse.

"No matter what we do, we're not totally safe," said disaster preparedness expert Dennis Mileti, a former California seismic safety commissioner. "Nature can always throw an event at us that exceeds what we've designed for."

Because of warning systems, the tsunami wasn't as deadly worldwide as some in the past. Most buildings withstood the shaking. The quake was 700 times more powerful than the one that struck Haiti last year, but the death toll appears to be far lower than the 220,000-plus killed in the Caribbean.

Friday's quake caused a rupture 186 miles long and 93 miles wide in the sea floor 80 miles off the eastern coast of Japan. It happened 15 miles

beneath the sea floor.

All the way across the Pacific Ocean, in California and Oregon, the tsunami tore docks apart and knocked boats loose.

The quake was caused when one giant tectonic plate was shoved under another, the type of movement that produces the biggest earthquakes. It's the same kind of quake that caused the devastating 2004 Indonesian tsunami.

"You're looking at something that's rupturing a very significant patch of the Earth's crust," said David Applegate, senior science adviser at the U.S. Geological Survey. "If anyone is in the position to ride this out, it is the Japanese."

Earthquake experts in the U.S. say Japan has the strongest building standards in the world for withstanding earthquakes. It trains and prepares more for them. And unlike the United States, Japan adopted an expensive earthquake early warning system that gave people a precious few seconds to duck and cover.

And still the result was devastating.

"The energy radiated by this quake is nearly equal to one month's worth of energy consumption" in the United States, said U.S. Geological Survey scientist Brian Atwater.

The force of the quake was so strong that it moved the island of Honshu 8 feet to the east, said USGS geophysicist Ken Hudnut. It sped up the Earth's rotation by 1.6 microseconds, according to NASA.

USGS seismologist Lucy Jones said a friend who was in Tokyo for a tsunami planning meeting noted the shaking after the initial shock lasted

for about five minutes.

"No matter how well we do, things like tsunamis and the shaking are still going to cause damage," said Federal Emergency Management Agency Director Craig Fugate.

Japan, which has what Mileti calls "an earthquake culture," has long steeled itself for "the Next One," but this one happened hundreds of miles north of where experts expected. This area of Japan has not had an earthquake in this size range for more than 1,100 years, Applegate and Atwater said.

The quake happened at the intersection of the North American and Pacific plates in the northwestern chunk of the "Ring of Fire," in an area that "has been incredibly quiet," Applegate said.

Japan's worst quake in modern times was a magnitude-8.3 in 1923 in Kanto that killed 143,000 people, according to the USGS. A 7.2-magnitude quake in Kobe in 1995 killed 6,400 people. That Kobe quake surprised experts because there had not been a megaquake in the Kobe region in modern times, said Kathleen Tierney, director of the Natural Hazards Center at the University of Colorado.

Japan has been expecting an even bigger quake near Tokyo, something the Japanese call the "Tokai" earthquake, for the central Japanese region, Tierney said.

"This is not the great Tokai earthquake by any stretch of the imagination," Tierney said. "It is a good test. It is showing all the issues we'd expect to see in a great earthquake near Tokyo."

Japan's strong building codes for new construction don't help with older buildings. Still, the aftermath there offers a stark contrast to what

happened in Haiti.

"Japan is the most hard-constructed place for earthquakes on the planet; Haiti is the least well-constructed place for earthquakes on the planet," Mileti said.

Japan has an early warning system based on the type of waves generated by faults. That alerted residents about 15 seconds before they felt shaking. Sensors note the earliest arriving, fast-moving primary, or compression, waves, and for the past three years that causes alerts to be broadcast on Japanese television. It allows residents to get under doorframes and shut off gas in cooking stoves.

TV broadcasts Friday warned of a "huge" quake and urged viewers to take precautions.

For the past several years, the USGS and research teams in California have been studying how they might do earthquake early warnings in the United States, but there is no system in place.

In a sense, there was a warning that wasn't recognized.

Two days earlier, the region was rattled by a 7.2 quake. Scientists now consider that a foreshock. Foreshocks are basically earthquakes and are identified as precursors only after another quake follows. After a foreshock, there is only a 5 percent chance of an even bigger quake coming later.

"This was one of the rare instances where a big earthquake is followed by a bigger earthquake," said USGS geophysicist Doug Given.