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WORLD TRENDS

# In Expensive Seawalls, Little Defense for Japan

By NORIMITSU ONISHI

JAKARTA, Indonesia — At least 40 percent of Japan's 35,000-kilometer coastline is lined with concrete seawalls, breakwaters or other structures meant to protect the country against high waves, typhoons or even tsunamis. They are as much a part of Japan's coastal scenery as beaches or fishing boats, especially in areas where the government estimates the possibility of a major earthquake occurring in the next three decades at more than 90 percent, like the northern stretch that was devastated by the March 11 earthquake and tsunami.

Along with developing quake-resistant buildings, the coastal infrastructure represents postwar Japan's major initiative against earthquakes and tsunamis. But while experts have praised Japan's rigorous building codes and quake-resistant buildings for limiting the number of casualties from the earthquake, the devastation and death toll in coastal areas could push Japan to redesign its seawalls — or reconsider its heavy reliance on them altogether.

The risks of dependence on seawalls were most evident in the crisis at the Daiichi and Daini nuclear power plants, both located along the coast close to the earthquake zone. The tsunami that followed the quake washed over walls that were supposed to protect the plants, disabling the diesel generators crucial to maintaining power for the reactors' cooling systems during shutdown.

Peter Yanev, one of the world's

*Keith Bradsher contributed from Hong Kong; John Schwartz from New York.*

best-known consultants on designing nuclear plants to withstand earthquakes, said the seawalls at the Japanese plants probably could not handle tsunami waves of the height that struck them. And the diesel generators were situated in a low spot on the assumption that the walls were high enough.

That turned out to be a fatal miscalculation. The tsunami walls either should have been built higher, or the generators should have been placed on higher ground to withstand potential flooding, he said. Increasing the height of tsunami walls, he said, is the obvious answer in the immediate term.

"The cost is peanuts compared to what is happening," Mr. Yanev said.

Some critics have long argued that the construction of seawalls was a mistaken, hubristic effort to control nature and a wasteful public works project that successive Japanese governments used to reward politically connected companies in flush times and to try to kick-start a stagnant economy. Supporters have said the seawalls increased the odds of survival in a quake-prone country.

Reports from affected areas indicate that waves simply washed over seawalls, some of which collapsed. Even in the two cities with seawalls built specifically to withstand tsunamis, Ofunato and Kamaishi, the tsunami crashed over before moving a few kilometers inland, carrying houses and cars with it.

In Kamaishi, 4-meter waves surmounted the wall — the world's largest, erected a few years ago at a depth of 64 meters, a length of 1.9 kilometers and a cost of \$1.5 billion — and eventually submerged the city center.



MAINICHI SHIMBUN, VIA REUTERS

Japan's vast investment in seawalls paid few dividends this month though it may have given people a few extra minutes to escape. The tsunami crashed into Miyako on March 11.

"This is going to force us to rethink our strategy," said Yoshiaki Kawata, a specialist on disaster management at Kansai University in Osaka and the director of a disaster prevention center in Kobe. "This kind of hardware just isn't effective."

Mr. Kawata said that antitsunami seawalls were "costly public works projects" that Japan could no longer afford. "The seawalls did reduce the force of the tsunami, but it was so big that it didn't translate into a reduction in damage," he said, adding that resources would be better spent on increasing evacuation education and drills.

Gerald Galloway, a research professor of engineering at the University of Maryland, said one problem with physical defenses protecting vulnerable areas was that they could create a sense of complacency. "There are challenges in telling people they are safe" when the risks remain, he said.

Whatever humans build, nature has a way of overcoming it. Mr. Gal-

loway noted that New Orleans is getting a substantial upgrade of its hurricane protection, but he said "If all the new levees were in an we had a Katrina times two, a lot of people are going to still get wet. Similarly, he said, some of the flood walls in Japan, which can be almost 12 meters high, but vary from place to place, were simply too low for the wave.

Critics in Japan say that no matter how high the seawalls are raised there will eventually be a high wave. Still, some Japanese expert said the seawalls may have played a useful role in this crisis.

"This time, almost everybody tried to flee, but many didn't succeed in fleeing," said Shigeo Taka hashi, a researcher at the Asia-Pacific Center for Coastal Disaster Research in Yokosuka. "But because of the seawalls, which slowed the arrival of waves even just by a little a lot of people who would not have otherwise survived probably did. Just one or two minutes makes a difference."

## Nations Are Rethinking the Future of Nuclear Power

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industry in the United States was poised for a comeback before the accident in Japan. Mr. Obama and many leaders in the United States Congress agreed that nuclear power offered a steady energy source that would mitigate climate change, even as they disagreed on virtually every other aspect of energy policy. Mr. Obama is seeking tens of billions of dollars in government insurance for new nuclear construction.

Now, that is in question.

With China and India driving the expansion — and countries from elsewhere in Asia, Eastern Europe and the Middle East also

China plans to add more than 25 reactors, but most are already under construction, and it was unclear how many would be affected by the new order. China's electricity consumption continues to climb 12 percent a year.

India, with 20 nuclear reactors already in operation, plans to spend an estimated \$150 billion adding dozens of new ones around the country. Its forecast calls for nuclear power to supply about a quarter of the country's electricity needs by 2050, a tenfold increase from now.

Three of the world's chief sources of large-scale energy production — coal, oil and nuclear power — have all experienced eye-popping accidents in just the past year. The Up-

added, noting the confluence of disasters in coal mining, oil drilling and nuclear plant operations. "The accident certainly has diminished what had been a growing impetus in the environmental community to support nuclear power as part of a broad bargain on energy and climate policy."

Concerns about earthquakes and nuclear power have been around for a long time; new questions might also be raised now about tsunamis. Walt Patterson, an associate fellow at Chatham House in London, predicted that the problems at Japan's nuclear plants would refocus attention on safety and away from the economic viability of atomic energy.

One of the emirates, Abu Dhabi chose Braka because it is near the water and an existing power grid far from populated areas, and lie on a seismically stable landmass. Because the Persian Gulf is an enclosed sea, planners say there is little threat of a tsunami in the event of an earthquake.

By contrast, Iran's Bushehr nuclear plant, also on the Persian Gulf, is much less seismically stable, which worries environmentalists. Any nuclear leak there would quickly reach the wealthy emirates of Dubai, Abu Dhabi and others because of the gulf's currents.

Jordan, Kuwait, Qatar, Bahrain and Egypt are all also studying nuclear energy, and even oil-rich