

## Studies detail post-Fukushima radioactivity levels

*Two studies of Japan's soil contamination will help officials decide what to do with land tainted after the nuclear disaster. A third finds that radiation levels in people were lower than predicted.*

By Amina Khan, Los Angeles Times 1:02 AM CST, November 20, 2011



Tokyo Electric Power Co. officials and Japanese journalists this month look out of bus windows as a van carrying workers passes by on the grounds of the Fukushima Daiichi nuclear power plant. (David Guttenfelder, Bloomberg / Pool / November 12, 2011)

Eight months after a magnitude 9 earthquake and resulting tsunami crippled Japan's Fukushima Daiichi nuclear power plant and spewed radioactive material for hundreds of miles, scientists have produced maps showing how much fallout was found in the environment in the weeks after the disaster.

In two studies published last week in the journal *Proceedings of the National Academy of Sciences*, researchers identified "hot spots" where the radioactivity levels were highest as well as the areas that were most safe.

The maps could help the government decide what to do with different tracts of land: whether to abandon them, return them to farming or remove contaminated topsoil first. They also should help scientists build better models to predict how radioactive particles are carried by wind and rain and channeled by mountains after such disasters.

In one study, researchers examined levels of the radioactive isotope cesium-137 in soil collected in and around the Fukushima plant. With a half-life of 30.1 years, cesium-137 poses a much longer-term risk than other isotopes released by the damaged plant; iodine-131, for instance, has a half-life of eight

days.

The international team of scientists started with a particle-dispersion model and plugged in weather data based on actual events since the March 11 quake and tsunami. Weather and geography directly affect where radioactive material lands: Wind carries it to other areas, and mountain ranges block its path. Rain washes it out of the air and into the ground, which becomes its final resting place.

The scientists found that parts of western and northwestern Japan were largely sheltered from contamination by mountains that run like a spine up the main island of Honshu.

But in the eastern part of Fukushima prefecture, close to the epicenter of the quake offshore, soil levels of cesium-137 exceeded 2,500 becquerels per kilogram, which would leave food production in the area "severely impaired," according to the study. Farming would be "partially impacted" in the nearby prefectures of Iwate, Miyagi, Yamagata, Niigata, Tochigi, Ibaraki and Chiba, where radioactivity levels exceeded 250 becquerels per kilogram of soil.

"But one of the main products of the Fukushima area is rice, and so far the levels of rice contamination are lower than I personally expected," said study coauthor Ryugo Hayano, a nuclear physicist at the University of Tokyo. "Most of the rice-growing areas are now declared to be OK: not completely free of contamination, but edible."

Another study published by the journal measured the gamma radiation emitted by soil samples collected from east-central Japan. The readings helped researchers determine the degree to which the samples were contaminated by isotopes of cesium, iodine and tellurium. Then they matched that with observed weather patterns.

The researchers found that two major downpours washed significant amounts of radiation into the soil — on March 15-16 in Fukushima and on March 21-23 in Tochigi, Ibaraki, Saitama and Chiba prefectures.

In an area north of the Fukushima nuclear plant, cesium-137 rates were 200 times normal, said study leader Norikazu Kinoshita, a nuclear physicist at the University of Tsukuba. In eastern Fukushima and parts of neighboring prefectures, cesium-137 levels were about 0.5 microsieverts per hour, or about 10 times the normal rate of 0.05 microsieverts per hour, he said.

"It's not huge amounts of radiation," said Gerry Thomas, a molecular pathologist at Imperial College London and director of the Chernobyl Tissue Bank, an international coalition that collects and stores tissue samples from people who were exposed to radioactive iodine as children by the Chernobyl nuclear disaster in 1986.

A third study, which appeared last week in the journal PLoS ONE, surveyed more than 5,000 people over a three-month period after the disaster and found that radiation levels in people were lower than had been predicted. Only 10 people had exceptionally high doses of radiation in their systems.

"The Japanese took proper precautions," said Thomas, who was not involved in any of the studies. "An awful lot of [the radiation] went into the ocean rather than the atmosphere. ... The levels they're talking about are not going to damage people's health at all. But it's sensible to be precautionary."

[amina.khan@latimes.com](mailto:amina.khan@latimes.com)

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