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Radioactive water from Japan nuclear plant leaks in sea



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Japan's PM Naoto Kan made his first ground visit to the disaster zone - courtesy TV Tokyo

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Radioactive water is leaking into the sea from a 20-centimetre (8-inch) crack in a containment pit at Japan's quake-hit Fukushima nuclear plant, its operator Tepco has said.

The crack under reactor 2 may be the source of recent radiation in coastal waters, Tepco officials said.

Tepco is preparing to pour concrete into the pit to try to stop the leak.

Japanese PM Naoto Kan has been visiting the area of north-eastern Japan worst affected by last month's tsunami.

Hidehiko Nishiyama, deputy director-general of the Nuclear and Industrial Safety Agency, told a news conference Tepco was planning to pour concrete into the pit to seal the crack.

"With radiation levels rising in the seawater near the plant, we have been trying to confirm the reason why, and in that context, this could be one source," Mr Nishiyama said.

"There could be other similar cracks in the area, and we must find them as quickly as possible."

Tepco (Tokyo Electric Power Co) had earlier said it suspected radioactive material was escaping continuously from the plant, but they had not until now found the leak.

Measurements showed the air above the radioactive water in the pit contained 1,000 millisieverts of radioactivity.

Finding the source of the leak is a positive development, the BBC's Rachel Harvey in Tokyo says.

The challenge now though is to seal the opening, check there are no more elsewhere and remove the contaminated liquid, she adds.

On Friday, US Energy Secretary Steven Chu said about 70% of one reactor core was severely damaged as was about 30% of another. He said those figures were estimates because high radiation levels prevented workers from getting a close look at the damaged units.

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Fukushima update (1 April)

- **Reactor 1:** Damage to the core from cooling problems. Building holed by gas explosion. Radioactive water detected in reactor and basement, and groundwater
- **Reactor 2:** Damage to the core from cooling problems. Building holed by gas blast; containment damage suspected. Highly radioactive water detected in reactor and

adjoining tunnel

- **Reactor 3:** Damage to the core from cooling problems. Building holed by gas blast; containment damage possible. Spent fuel pond partly refilled with water after running low. Radioactive water detected in reactor and basement
- **Reactor 4:** Reactor shut down prior to quake. Fires and explosion in spent fuel pond; water level partly restored
- **Reactors 5 & 6:** Reactors shut down. Temperature of spent fuel pools now lowered after rising high
- [Q&A: Health effects of radiation](#)
- [Q&A: Fukushima radiation alert](#)

Officials at Tepco and the nuclear safety agency would not confirm that assessment, AP said.

Kan visit

Saturday's visit was Mr Kan's first ground visit to the disaster zone, although he had flown over tsunami-hit areas the day after the earthquake.

Mr Kan assured people affected by the disaster in Rikuzentakata that the Japanese government would do all it could to help them.

"I spoke with local officials how to rebuild fishing industry, including how we can rebuild farms for fish and shellfish. The Japanese government will do its best to support their efforts," he said.

Mr Kan visited an evacuee shelter and then told reporters: "A person who had a house along the coastline asked 'Where could I build a house in the future? I said the government will do its best to support you until the end.'"

But a 60-year-old refugee, Ryoko Otsubo, said the visit was ill-timed.

"The timing of his visit is too late. I wish he had visited this place earlier. I wanted him to see the piles of debris where there were no roads through - now the roads are cleaned."

Mr Kan, who flew into Rikuzentakata on a military helicopter from Tokyo, also visited the base camp for workers trying to stabilise the plant, just inside the 20-km exclusion zone around the plant.

Mr Kan had flown over the nuclear plant on 12 March, the day after the quake.

Bodies' search

A massive search began on Friday to find the remains of those missing since the devastating tsunami hit.

More than 11,500 people are confirmed dead, but nearly 16,500 remain unaccounted for.

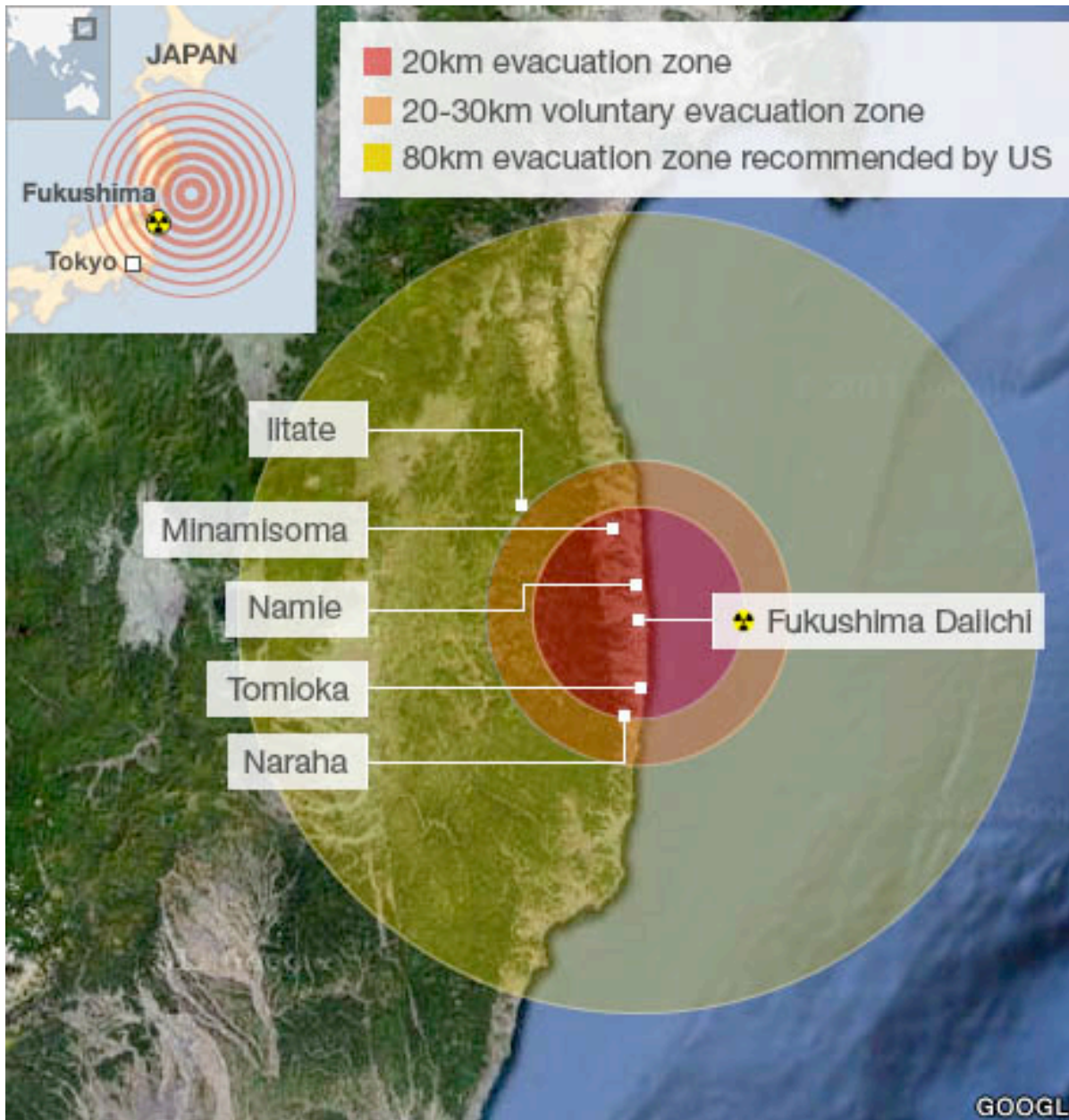
Three weeks after the 9.0-magnitude earthquake and subsequent tsunami, the true number of those who died is still not known.

More than 100 Japanese and US military planes and 65 ships along with 24,000 military personnel are scouring the country's north-eastern coast to locate any remaining bodies for three days.

Many coastal areas remain inaccessible to rescuers trying enter by road or foot, blocked by the

mangled remains of houses, ships, cars and trains.

Because of radiation concerns, the search does not include the 20km (12-mile) evacuation zone around the Fukushima Daiichi plant, where there are believed to be 1,000 bodies.



Fukushima radioactive fallout nears Chernobyl levels



- 17:14 24 March 2011 by [Debora MacKenzie](#)
- For similar stories, visit the [The Nuclear Age](#) Topic Guide

Japan's damaged nuclear plant in Fukushima has been emitting radioactive iodine and caesium at levels approaching those seen in the aftermath of the [Chernobyl accident](#) in 1986. Austrian researchers have used a worldwide network of radiation detectors – designed to spot clandestine nuclear bomb tests – to show that iodine-131 is being released at daily levels 73 per cent of those seen after the 1986 disaster. The daily amount of caesium-137 released from Fukushima Daiichi is around 60 per cent of the amount released from Chernobyl.

The [difference between this accident and Chernobyl](#), they say, is that at Chernobyl a huge fire released large amounts of many radioactive materials, including fuel particles, in smoke. At Fukushima Daiichi, only the volatile elements, such as iodine and caesium, are bubbling off the damaged fuel. But these substances could nevertheless pose a significant [health risk outside the plant](#).

The organisation set up to verify the [Comprehensive Nuclear-Test-Ban Treaty](#) (CTBT) has a global network of air samplers that monitor and trace the origin of around a dozen radionuclides, the radioactive elements released by atomic bomb blasts – and nuclear accidents. These measurements can be combined with wind observations to track where the radionuclides come from, and how much was released.

The level of radionuclides leaking from Fukushima Daiichi has been unclear, but the CTBT air samplers can shed some light, says [Gerhard Wotawa](#) of [Austria's Central Institute for Meteorology and Geodynamics](#) in Vienna.

Ill wind

For the first two days after the accident, the wind blew east from Fukushima towards monitoring stations on the US west coast; on the third day it blew south-west over the Japanese monitoring station at Takasaki, then swung east again. Each day, readings for iodine-131 at Sacramento in California, or at Takasaki, both suggested the same amount of iodine was coming out of Fukushima, says Wotawa: 1.2 to 1.3×10^{17} becquerels per day.

The agreement between the two "makes us confident that this is accurate", he says. So do similar readings at CTBT stations in Alaska, Hawaii and [Montreal, Canada – readings at the latter, at least, show that the emissions have continued](#).

In the 10 days it burned, Chernobyl put out 1.76×10^{18} becquerels of iodine-131, which amounts to only 50 per cent more per day than has been calculated for Fukushima Daiichi. It is not yet clear how long emissions from the Japanese plant will continue.

Similarly, says Wotawa, caesium-137 emissions are on the same order of magnitude as at Chernobyl. The Sacramento readings suggest it has emitted 5×10^{15} becquerels of caesium-137 per day; Chernobyl put out 8.5×10^{16} in total – around 70 per cent more per day.

"This is not surprising," says Wotawa. "When the fuel is damaged there is no reason for the volatile elements not to escape," and the measured caesium and iodine are in the right ratios for the fuel used by the Fukushima Daiichi reactors. Also, the Fukushima plant has around [1760 tonnes of fresh and used nuclear fuel on site](#), and an unknown amount has been damaged. The Chernobyl reactor had only 180 tonnes.

The amounts being released, he says, are "entirely consistent" with the relatively low amounts of caesium and iodine being measured in soil, plants and water in Japan, because so much has blown out to sea. The amounts crossing the Pacific to places like Sacramento are vanishingly small – they were detected there because the CTBT network is designed to sniff out the tiniest traces.

Dangerous isotopes

The Chernobyl accident emitted much more radioactivity and a wider diversity of radioactive elements than Fukushima Daiichi has so far, but it was iodine and caesium that caused most of the health risk – especially outside the immediate area of the Chernobyl plant, says Malcolm Crick, secretary of a United Nations body that has [just reviewed](#) the health effects of Chernobyl. Unlike other elements, he says, they were carried far and wide by the wind.

Moreover the human body absorbs iodine and caesium readily. "Essentially all the iodine or caesium inhaled or swallowed crosses into the blood," says [Keith Baverstock](#), former head of radiation protection for the World Health Organization's European office, who has studied Chernobyl's health effects.

Iodine is rapidly absorbed by the thyroid, and leaves only as it decays radioactively, with a half-life of eight days. Caesium is absorbed by muscles, where its half-life of 30 years means that it remains until it is excreted by the body. It takes between 10 and 100 days to excrete half of what has been consumed.

While in the body the isotopes' radioactive emissions can do significant damage, mainly to DNA. Children who ingest iodine-131 can develop thyroid cancer 10 or more years later; adults seem relatively resistant. [A study published in the US last week](#) found that iodine-131 from Chernobyl is still causing new cases of thyroid cancer to appear at an undiminished rate in the most heavily affected regions of Ukraine, Belarus and Russia.

Caesium-137 lingers in the environment because of its long half-life. [Researchers are divided](#) over how much damage environmental exposure to low doses has done since Chernobyl. Some

researchers think it could still cause thousands of new cases of cancer across Europe.

15 March 2011 Last updated at 04:06 GMT

Radiation fears after Japan blast



As radiation levels near the plant rise, people are being checked for exposure

Explosions at a Japanese quake-stricken nuclear plant have led to radiation levels that can affect human health, a senior Japanese official has said.

Prime Minister Naoto Kan has urged those living within 30km (18 miles) of the plant to stay indoors.

Earlier, reactor 2 at the Fukushima Daiichi plant was hit by a blast - the third reactor to explode in four days - leading to fears of a meltdown.

The crisis was sparked by a 9.0-magnitude quake and tsunami on Friday.

Thousands of people are believed to have died.

Exclusion zone

A fresh explosion rocked reactor 2 at the Fukushima Daiichi plant - 250km (155 miles) north-east of Tokyo - in the early hours of Tuesday.

Chief Cabinet Secretary Yukio Edano said, "Now we are talking about levels that can impact human health."

JAPAN NUCLEAR EMERGENCY

- Explosions in three reactors at Fukushima plant
- Fourth reactor on fire
- Containment chamber damaged at reactor 2

- Radiation levels at plant rise more than four fold
- 20km (12 mile) exclusion zone
- People living within 30km to stay indoors
- [US asks nuclear questions](#)

He stressed that such levels were recorded at the plant and that the "further away you get from the power plant or reactor, the value should go down".

In his televised address, Prime Minister Kan said: "There is still a very high risk of more radiation coming out."

He added that the last remaining people within a 20km (12 mile) exclusion zone around the plant had to leave, and that those living between 20km and 30km from the site should remain indoors.

Radiation levels around Fukushima for one hour's exposure rose to eight times the legal limit for exposure in one year, said the plant's operator, the Tokyo Electric Power Co (Tepco).

The radiation reading at 0831 local time (2331 GMT) climbed to 8,217 microsieverts an hour from 1,941 about 40 minutes earlier, Tepco said. The annual legal limit is 1,000 microsieverts.



Japan's PM says there is a 'very high' risk of further radiation leaks

Higher radiation levels were recorded on Tuesday south of Fukushima, Kyodo news agency reported.

The French embassy said low-level radioactive wind could reach Tokyo within hours.

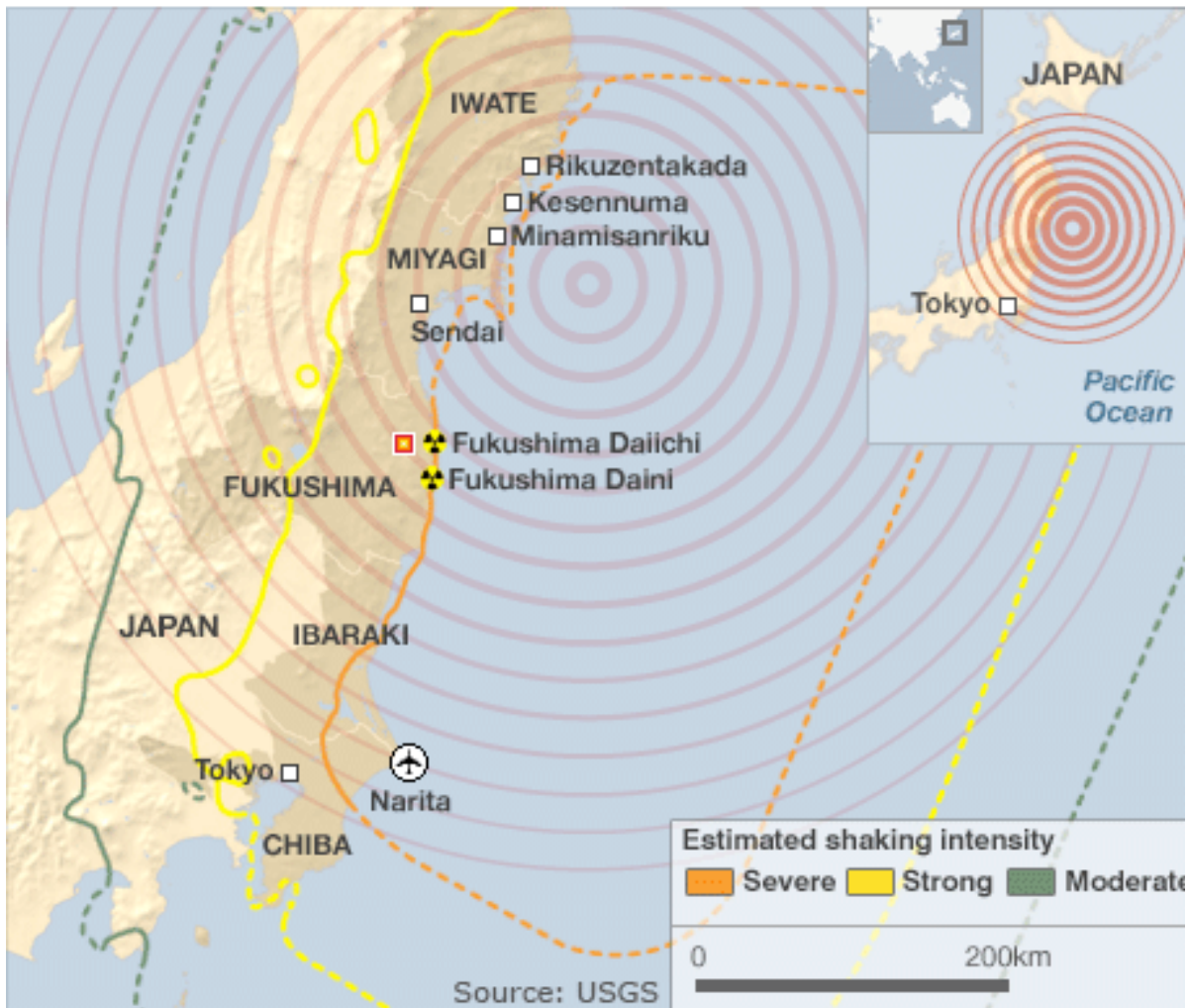
Mr Kan also said a fire had broken out at the plant's reactor 4. It now appears to have been put out.

The high radiation levels prompted the BBC and a number of other international news organisations to withdraw staff from the quake area.

Shares on the Tokyo stock exchange have fallen more than 12%.

On Monday, a hydrogen blast at the Fukushima plant's reactor 3 was felt 40km (25 miles) away. It followed a blast at reactor 1 on Saturday.

Areas affected by the quake



All explosions have been preceded by cooling system breakdowns. Engineers are trying to prevent meltdowns by flooding the chambers of the nuclear reactors with sea water.

After the third explosion, officials said the containment vessel around reactor 2 had been damaged.

Complete devastation

Meanwhile, five days after the tsunami triggered by the earthquake, the relief operation is continuing.

The latest official death toll stands at about 2,400 - but some estimates suggest 10,000 may have been killed.

One of the worst-hit towns, Minamisanriku, is now just a scene of complete devastation, says

the BBC's Rachel Harvey.

Everything was flattened by the force of the tsunami, with only the town's hospital and a government building remaining, our correspondent says.

Thousands are still unaccounted for - including hundreds of tourists - while many remote towns and villages have not been reached.

The government has deployed 100,000 troops to lead the aid effort.

The UK Foreign Office has updated its travel advice to warn against all non-essential travel to Tokyo and north-eastern Japan. British nationals and friends and relatives of those in Japan can contact the Foreign Office on +44(0) 20 7008 0000.