The Fukushima nuclear disaster: 8 years on

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by Tilman Ruff

The ongoing nuclear reactor disaster at Fukushima began on March 11, 2011

Japanese translation

Eight years after the world's most complex nuclear disaster, the damaged Fukushima Daiichi nuclear power plants and spent fuel ponds are still leaking and dangerous, vast amounts of contaminated water continue to accumulate, 8000 odd clean-up workers labour daily and will need to for many decades, the needs of people exposed to radioactivity are still neglected, no one is in prison for a disaster fundamentally caused by the negligence of the operator and the government, and most of the lessons of Fukushima have yet to heeded.

Professor Kiyoshi Kurokawa, who chaired the Nuclear Accident Independent Investigation Commission, Japan's first ever independent parliamentary investigation commission, has written recently that since the Commission submitted its recommendations to the national Diet in 2012, "little progress of significance can be observed".**[1]** He describes the regulatory changes as "only amounting to cosmetic changes". This textbook case of regulatory capture, with Japanese nuclear regulatory agencies serving the interests of the nuclear power industry instead of protecting the safety of the people, has changed relatively little. Kurokawa describes the changes prompted by the Commission's report amongst governmental bodies "have been formalities at the minimum required level". He writes "that the structures of regulatory capture are still firmly maintained".

It is the people of Japan who not only suffer the impacts of the disaster, but largely bear the cost, such as through the US$119 billion interest-free loan TEPCO secured from the government, paid by citizens' taxes.

In light of the mainly indirect but strong evidence that radioactivity began leaking from Unit 1 as a result of the earthquake, before the tsunami hit, the Commission recommended that the implications should be seriously considered for all other nuclear power plants in Japan. This has not happened. Since 2011, 9 nuclear power reactors in Japan have been re-started. One can have little confidence, should things go wrong again in Fukushima or elsewhere, that crisis management would be much better than in the debacle that unfolded in Fukushima 8 years ago.

Tilman Ruff has monitored the health impacts of the Fukushima disaster closely during the eight years since the reactor meltdowns.

The Japanese government seems determined to present the Fukushima disaster as a past problem with things essentially back to normal and under control in the lead-up to the 2020 Olympics in Japan. The start of the Olympic torch relay, softball and baseball games are scheduled to take place in Fukushima. Grossly misleading claims by Prime Minister Abe in 2013 underpinned Japan's bid for the Olympics. He stated that "the situation in Fukushima is under control", that "it has never done nor will do any damage to Tokyo", and that "there have never been any health problems nor will there be".

There may have been more than misrepresentation about Fukushima involved in Japan securing the 2020 Olympics. On 10 Dec 2018, Tsunekazu Takeda, the president of the Japanese Olympic Committee, and chair of the International Olympic Committee's marketing commission, was indicted on corruption charges in France. France's financial crimes prosecutors contend that money was paid to African Olympic committee officials to vote for Japan's Olympic bid.**[2]**

The present situation in Fukushima

The 2018 edition of the World Nuclear Industry Status report provides a good overview.**[3]** Plans for spent fuel removal from the damaged reactors have slipped repeatedly into the future, and the methods for removal of fuel debris have yet to be determined. For all the reactors, melted fuel debris is present both inside the damaged containment vessels as well as on the pedestals outside them. Reactors 1 – 3 which suffered meltdowns still require continuous injection of 3 m^3 of water per hour per reactor, which runs out of the cracked containments and mixes with water which penetrates the damaged basements from an underground river. While the rate of contaminated water production has been reduced, there are over 1,000,000 m^3 of contaminated water, and growing, held on site, which although decontaminated of many radioactive elements, still contains very high levels of tritium (> 500,000 Bq/l), with continuing local objections to its release into the sea. The multi-billion dollar frozen soil wall commissioned in 2016 has been of limited effectiveness.

By 2017, a total of 40,000 workers had been involved in the extensive decommissioning work which will be required for many decades. About 8000 work at any one time. Over 90% of these are subcontractors, who have poorer training and conditions and receive on average more than twice the radiation exposure compared with TEPCO employees. Maximum exposures for subcontractors in Jan 2018 were documented at over 10 mSv/month. Thus far 5 cases of cancer among clean-up workers have been officially recognised as occupationally-related – including 3 cases of leukemia, one thyroid cancer, and 1 case of lung cancer.

The Japanese government has been aggressively pushing the lifting of restrictions orders for contaminated municipalities in Fukushima. This artificially reduces the number of officially recognised evacuees. While attempting to create a misleading illusion of return to normality, the government is still now, 8 years after the disaster, applying an allowable radiation annual dose limit for the public of 20 mSv. It is the only government worldwide

to accept such a high level so many years after a nuclear disaster. It has even established 4 reconstruction sites in areas where residents would accumulate more than 50 mSv/y, and scheduled returns to these areas by 2023. People who have relocated from areas where restriction orders have been lifted are under significant pressure to return to an unacceptably hazardous environment, or lose all financial support. Despite these pressures, only 3-29% of citizens have returned to 5 municipalities where restriction orders have been lifted, and up to half of former residents have decided not to return, with many undecided.

Consistent with its failure to prioritise the safety and health of its citizens, the government of Japan still continues to promote the scientifically fraudulent position that less than 100 mSv of radiation is not associated with proven health harm.

Important data on population radiation exposures have emerged regarding external gamma exposure measurements from extensive glass badge individual monitors undertaken from 2012 among more than 50,000 residents of Date City. Just northeast of Fukushima City, most of Date is more than 50 km from the Fukushima Daiichi plant, and it is not one of the most contaminated municipalities. Two published papers yield some important findings:

- External radiation exposure measured by glass badge individual monitors correlated well with airborne survey data; **[4]**
- No effect of exposure reduction was observed related to decontamination activities;
- Allowing for a 3-fold underestimate of estimated lifetime doses in the published paper **[5]** recently acknowledged by the senior author,**[6]** the estimated lifetime average doses for residents in different zones in Date range from 33 to 54 mSv, while the 99th centile doses range from 60 to 105 mSv. These are significant doses based on actual exposure measurements; much greater than those typically estimated for people outside the most contaminated areas.

Regrettably very serious ethical and integrity issues have been raised in relation to the conduct of this research.**[7]**

By Sep 2018, the Japan Reconstruction Agency identified 2202 deaths as related to the nuclear disaster – principally through suicide and interrupted or diminished medical care. However comprehensive long-term prospective mechanisms linked to radiation exposure have not been established to monitor population health impacts of the nuclear disaster. If you don't look, you won't find. Given the fragmented and incomplete nature of cancer registries in Japan, it is quite possible that health effects would not be detected.

The one area that promised to be an exception was monitoring for thyroid cancer through regular ultrasound screening among those in Fukushima aged under 18 years at the time of the disaster. By Dec 2018, 166 surgically confirmed thyroid cancer had been identified among 207 cytologically suspected cancers. Independent analysis has strongly indicated that while a screening effect is also present, the incidence is much higher than nationally, with a gradient mirroring contamination levels in Fukushima Prefecture, **[8]** and no indication that cases identified tend to be benign, with 92% of operated cases reported as having evidence of metastases and/or extrathyroidal extension.**[9]** However, the screening program is being curtailed, timely and transparent release of data is lacking, cases diagnosed or treated outside Fukushima Medical University are excluded, and participation rates in successive surveys are falling, likely reflecting declining public confidence in the program. Participation rates in the 3rd round survey, both initial and confirmatory examinations, have declined to around 60%, and only 16% among those aged over 18. **[10]**

Effects in other animals and plants

Evidence continues to accumulate of harmful biological effects in direct proportion to the degree of radioactive contamination, without any apparent threshold, in virtually every species and ecological community studied – soil bacteria and fungi through trees, various

insects, spiders, diverse birds, and large and small mammals – in the contaminated regions of both Chernobyl and Fukushima. In the intertidal zone along the Fukushima coast, there are much lower numbers of species and populations of molluscs within 30 km of the nuclear plant. Most effects are apparent across the range of 1–10 mGy/y. Like for human radiation health effects, the more we know, the worse it looks.

Much of this important work has been by Timothy Mousseau and Anders Møller.**[11]** They have documented effects at every biological level, including increased genetic mutations; adverse developmental effects, including albinism, asymmetry, reduced brain size, cataracts, reduced fertility and sperm number with increases in abnormal and immotile sperm; increased tumours; behavioural abnormalities such as in bird calls; reduced abundances and biodiversity. Their findings indicate that populations living under the full range of natural stressors (biotic and abiotic) are almost 10 times more sensitive to ionising radiation than predicted by conventional laboratory-based approaches.

It is biologically implausible that humans would be somehow immune to similar effects.

Human rights considerations

In 2012, the UN Special Rapporteur on the Realisation of the Right to Health, Anand Grover visited Fukushima and made multiple recommendations in a report to the UN Human Rights Council. They included independent monitoring and regulation of the nuclear industry; accurate information for the public and evacuations driven by radiation exposure level dose (including hot spots), not simply distance; public provision of unbiased radiation risk information; a timeline for achievement of 1mSv maximum additional radiation exposure; comprehensive long-term health studies in all affected areas; patients having better access to their medical results and documentation; long-term monitoring and treatment for nuclear workers; financial support for those in contaminated areas who chose to evacuate or to stay; TEPCO and not taxpayers should pay for the costs of the disaster; and public participation in all aspects of post-disaster management, such as design of shelters and health surveys, and decontamination implementation. The Japanese government was hostile to Human Rights Council attention and these landmark recommendations, and has implemented very few (eg an epidemiological study of worker health is currently underway). The government was also hostile to and sought to weaken an important 2013 WHO Health risk Assessment report on the nuclear accident.

In 2017 in a periodic review of Japan, a number of delegations made recommendations to Japan in the UN Human Rights Council: **[12]**

– Austria urged provision of continued support for voluntary evacuees from the high-radiation areas of Fukushima, with housing, financial and other life-assisting means and with periodic health monitoring of those affected, in particular those who were children at the time of the accident;

– Portugal called for the application of the UN Guiding Principles on Internal Displacement to all those impacted by the Fukushima Daiichi nuclear disaster, in order to ensure full and equal participation for both women and men in decision-making processes regarding their resettlement (forcible return of evacuees is contrary to these principles);

– Germany advocated respect for the rights of persons living in the area of Fukushima, in particular of pregnant women and children, to the highest level of physical and mental health, notably by restoring the allowable dose of radiation to the 1 mSv/year limit, and by a continuing support to the evacuees and residents;

– Mexico recommended guarantee of access to health services for those affected by the Fukushima nuclear accident, as well as for the generations of survivors of the use of nuclear weapons.

While Japan responded that it was or would implement these recommendations (but not any particular provisions for second and subsequent generation survivors), no corresponding measures have yet been taken.

It is important that the international public health and medical communities monitor continuing health needs related to the disaster and advocate for the policies, resources and other measures to address them, and support the efforts of those in Japan working for public and environmental health. We should utilise the 2020 Olympics in Japan to shine a light on the lessons of the Fukushima nuclear disaster, the impacts and needs from the disaster, and ensure that they are not swept under the carpet.

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