10 YEARS SINCE THE FUKUSHIMA NUCLEAR DISASTER

By Philip White
February 2021

Philip White was international liaison officer for the Tokyo-based Citizens' Nuclear Information Center at the time of the Fukushima nuclear accident. In 2014 he completed a PhD on public participation in Japan's nuclear energy policy-forming process.

1. Remembering the Fukushima Nuclear Disaster

Ten years ago, three of the nuclear reactors at the Fukushima Daiichi Nuclear Power Station suffered melt downs in the days following a Magnitude 9 earthquake that struck off the northeast coast of Japan on 11 March 2011. Along with the 1986 nuclear accident at the Chernobyl Nuclear Power Station in the former Soviet Union, it was one of the two worst nuclear power accidents in history.

On the tenth anniversary, it is important that we remember what happened then and what has happened since. It is in the interests of those who caused the accident that we forget. We must refuse to do so, for the sake of the victims and to prevent more disasters in future.

The most important take-home message is that the disaster is far from over. In order to win the bid for the (now postponed) 2020 Olympics, then Prime Minister Abe asserted that the nuclear accident was 'under control'. The government now calls the games (if they are ever held) 'the recovery Olympics', with the torch relay route running through Fukushima Prefecture. But despite the efforts of the Japanese Government and the nuclear industry to lull the Japanese public and the world into a false sense of security, the fact is that radioactive contamination remains and many people continue to suffer. Even where compensation is available, nothing can undo the damage done to people's lives and to the environment.

It is also important to understand that the Fukushima Daichi nuclear accident was by no means the worst-case scenario for nuclear power. But for a few remarkable pieces of good fortune, the disaster could have been far worse.

This paper summarises some of the key issues. In brief:

- thousands of people are still classified as evacuees;
- they have not been adequately compensated;
- the radioactive fallout is still a major problem;
- decommissioning of the nuclear reactors will take decades and has barely begun;

- the total cost of decommissioning, decontamination and compensation is astronomical;
- the culprits have not been punished; and
- nuclear vested interests are back in charge of Japan's energy policy.

If you want to find out more, you might find the following links interesting:

Voices of the People: Fukushima Mieruka Project ('Mieruka' means 'to make visible')
By Friends of the Earth Japan
https://311mieruka.jp/index_en

Video testimonies of people from Fukushima
(from the Fukushima Mieruka Project)
https://311mieruka.jp/info/en/category/testimonials/

Citizens' Nuclear Information Center's latest English newsletter
Nuke Info Tokyo No. 200 (January/February 2021)
https://cnic.jp/english/?p=5345

Australia's uranium fuels global insecurity
By David Noonan
https://nuclear.foe.org.au/wp-content/uploads/Aust-U-sales-fuel-insecurity-Noonan-2021.pdf

2. How the disaster unfolded

The Great East Japan Earthquake and the 15.5-metre-high tsunami that followed overcame the grossly inadequate safety measures taken by Tokyo Electric Power Company (TEPCO), the owner and operator of the station. TEPCO had been warned of the danger of a much bigger tsunami than it had planned for. The science ministry's Headquarters for Earthquake Research Promotion had predicted in 2002 that a huge tsunami could strike Fukushima and in March 2008 a report commissioned by TEPCO itself suggested a tsunami as high as 15.7 meters was possible. Despite these warnings, in July 2008 TEPCO abruptly ended preparations to build a seawall to protect the nuclear power station.

Units 1, 2 and 3 suffered meltdowns of the reactor core, while by sheer luck Unit 4, which was not operating at the time of the accident, averted a meltdown of its spent fuel pool. It was only because of a delay during maintenance work that water was available to flow from the reactor well into the spent fuel storage pool and prevent it from boiling dry. Had that happened, many times more radioactive material would have been released than was released from reactors 1, 2 and 3 combined. Kondo Shunsuke, then head of the Japan Atomic Energy Commission, estimated that if that happened the capital Tokyo would have to be evacuated.

Over the days following the accident, an extensive area around the nuclear power station was compulsorily evacuated. About 71,000 people were officially registered as residents of areas that were ordered to evacuate. That doesn't include people who evacuated of their own volition to escape the radiation. Counting so-called 'voluntary evacuees' the figure rises to 160,000 people, though the true number is probably much higher. The Citizens' Commission on Nuclear Energy states that there were 'at one time over 200,000 people exiled from their home' (CCNE 2019).

Although rarely mentioned these days, it should not be forgotten that Fukushima Daiichi was not the only nuclear power station at risk of a major nuclear accident after the March 11, 2011 earthquake. Fukushima Daini Nuclear Power Station, just 11.5 kilometres away, barely averted a catastrophe of its own. The Tokai No 2 Nuclear Power Station, located a bit over 100km to the south, was also very lucky to escape, as was Onagawa Nuclear Power Station, a similar distance to the north.

In the case of Tokai 2:

> 'it turns out that one of three pumps installed for cooling the reactor was inundated by a tsunami that reached 5.4 meters. If it had risen another 70 cm, it would have knocked out the other two pumps as well. It was simply good luck that work to raise the height of the sea wall to 6.1 meters was completed on March 9' [2 days before the earthquake and tsunami] (Pulvers 2012).

So, terrible though it was, the disaster could have been far worse.

3. What's the situation now?

Evacuees

Evacuation orders have been lifted for much of the region and housing support has been withdrawn. This has the effect of putting pressure on nuclear evacuees to return (OHCHR 2018), but despite this pressure the majority have not returned. Based on the official classification system, there are still about 37,000 evacuees living within and outside of Fukushima Prefecture. Again, the true number is probably higher than this and many evacuees have settled down elsewhere. Only about 11,000 people now live in the official evacuation zones, compared to over 70,000 before the accident. Surveys show that 65 percent of the people who evacuated from Fukushima Prefecture have no intention of returning.

Health issues

Thanks to the evacuation and the restrictions placed on the consumption of food from radioactively contaminated areas, plus the fortuitous wind direction that caused most of the radioactivity to be blown out to sea, cancer incidence does not seem to have increased as much as it did after the Chernobyl accident. An exceptionally high number of cases of thyroid cancer have been recorded in children exposed to radiation (186 cases confirmed as of 13 February 2020), but experts differ as to whether or not there is a causal relationship between this and the children's radiation exposure. The failure to conduct adequate screening immediately after the accident and the lack of reliable baseline data for comparison make definitive conclusions impossible.

On the other hand, the evacuation itself has had a devastating impact on the lives of thousands of people.

The total number of deaths and missing people from the triple disaster (earthquake, tsunami, nuclear) exceeded 18,000. Most of these were directly caused by the tsunami, falling buildings, etc., but many deaths were indirectly caused by the disaster. These indirect deaths occurred in the weeks, months and years after the disaster. Of these deaths, Fukushima Prefecture suffered the largest number compared to the other prefectures most affected by the earthquake. According to the Reconstruction Agency, as of 31 March 2019, nationally there

were 3,723 deaths indirectly related to the disaster, of which 2,272 were in Fukushima, including more than 100 suicides.

Reasons why people from Fukushima Prefecture, where the nuclear accident occurred, were so badly affected include deteriorating health due to the prolonged evacuation, the loss of connection with their hometown, the loss of livelihood, and the loss of and separation from families and friends.

Liability and compensation

The total amount of compensation paid by TEPCO is substantial. As of April 2018, the amount paid to individuals and businesses exceeded 8 trillion yen (US$76 billion), of which about half had been paid to over 2 million individuals and the rest to businesses, but many evacuees believe the payments they have received are much too low considering the loss and hardship they have suffered. This is especially true in the case of so-called 'voluntary evacuees'.

TEPCO has fought tooth and nail to minimise its liabilities. A Nuclear Damage Reconciliation Center (NDRC) was established as an alternative dispute resolution (ADR) mechanism, but the NDRC's settlement proposals are not binding and TEPCO has rejected many of its recommendations. Victims have had to resort to legal action to gain better compensation, but even then, the payments ordered by the courts have been quite low.

Meanwhile, a class action lawsuit has charged three former TEPCO executives with professional negligence. In September 2019, to the dismay of victims, their supporters and many media commentators, the Tokyo District Court found the executives not guilty. Citizens have appealed the verdict to the Tokyo High Court.

Decontamination of the environment and agriculture

Huge amounts of soil and debris have been removed in an effort to decontaminate the vast areas of land contaminated with radioactivity. In a 2020 report, the International Atomic Energy Agency (IAEA) identified the following decontamination activities conducted after the Fukushima nuclear accident:

- Houses: removal of deposits from the roof, gutters and any decking, wiping roofs and walls, vacuum sanding, high pressure washing;
- Gardens, parks, school yards: removal of topsoil and grass;
- Roads: high pressure washing and cleaning of ditches
- Gardens and trees: removal of topsoil and fallen leaves, mowing, high pressure washing, removal thin layers of surfaces in inhabited areas;
- Farmland: removal of weed grass and topsoil, enhanced application of potassium fertilizer, ploughing/deep ploughing;
- Animal husbandry: monitoring of animal feed and live animals;
- Forests: removal of fallen leaves and lower twigs and pruning on forest boundaries. (IAEA-TECDOC-1927, 2020, p. 26)

As a result, Fukushima Prefecture now has 721 temporary sites holding bags filled with contaminated waste from the decontamination effort. These sites contain thousands of cubic meters of waste and some sites face the risk of runoff. For example, in October 2019 a typhoon swept hundreds of bags containing contaminated soil into a river.

From the perspective of radiation reduction, the success of the decontamination has been mixed. Radiation levels in areas where people are living have fallen, but there are still hot spots with quite high levels of radiation. In its eagerness to return to 'normal' after decontamination work has been undertaken, the Japanese government has rushed to lift evacuation orders, including in locations where radiation levels are still well above pre-accident standards. In so doing, it has effectively abandoned the international target for additional radiation exposure for the general public of less than 1 millisievert per year. On 25 October 2018, Bascut Tuncak, UN Special Rapporteur on hazardous substances and wastes, criticised the Japanese Government because it had 'raised the acceptable level of radiation for residents in Fukushima from 1 mSv/year to 20 mSv/year' (OHCHR 2018).

Meanwhile, forests remain significantly contaminated. Decontamination of forests has mainly been limited to the borders of woodlands where there is a higher danger of radiation exposure to humans. It is still considered dangerous to eat some food traditionally gathered from forests – so-called 'mountain vegetables', including wild mushrooms and ferns, and game meat, such as deer and wild boar.

Agricultural restrictions have been lifted for much of Fukushima. Farmers in these areas are able to grow and sell agricultural produce. Other areas are running trials, closely monitoring crops to see if they comply with radiation standards and also to reassure sceptical consumers. However, as of March 2020, farming had restarted in only 30% of the areas covered by evacuation orders issued after the nuclear disaster.

Radioactive water and fishing

Water that is used to cool the melted spent nuclear fuel mixes with groundwater that leaks into the damaged reactor buildings. As of September 2020, 1.23 million tons of radioactively contaminated water, filling 1,044 tanks, was stored on the site of the Fukushima Nuclear Power Station. With contaminated water increasing by about 170 tons per day, TEPCO says that it will run out of space by mid 2022.

On 13 February 2021, another big earthquake (M7.3) struck in the same area as the 2011 earthquake. In fact, it is believed to have been an aftershock from the 2011 quake. Initially, TEPCO said that there were no abnormalities arising from the recent earthquake, but it now seems that it caused more problems for water accumulation. The level of the cooling water in Units 1 and 3 has dropped 70cm and 30cm respectively, suggesting that even more water is leaking out than before. If that is the case, even more water will have to be pumped into the reactors to cool them and more contaminated water will accumulate.

The stored water has been treated using a so-called advanced liquid processing system (ALPS). This is supposed to remove all radioactive contaminants other than tritium (an isotope of hydrogen), but it was revealed in August 2018 that other radioactive substances remain. The concentration of the 62 radionuclides other than tritium exceeds the effluent standard in about 72% of the water currently stored in tanks.

The Japanese government wants to release the water into the sea, but in the face of strong opposition, in particular from the local fishery industry, it has not yet made a final decision. Besides any direct effects that the release of radioactively contaminated water may have on fishing, the industry is concerned about reputational damage.

According to *Mainichi Japan*,

> 'Fishing activities along the Fukushima coast were voluntarily halted immediately after the nuclear accident. To ensure product safety and allay consumer concerns, trial operations started in June 2012, with stringent restrictions over fishing zones, types of catch and fishing dates.' (Mainichi, October 16, 2020)

It is planned that full-scale fishing will resume in April 2021, but producers are still struggling to find buyers and prices haven't recovered. Occasionally highly contaminated fish are still caught and this further sets back the fishing industry.

Neighbouring countries, including China and South Korea, have also voiced concern over the plan to discharge the water into the environment. Both countries are among a few which still restrict imports of fishing and agricultural products from Japan.

Rather than releasing the water to sea, critics are calling on the Japanese government to keep the contaminated water stored in the tanks until the level of radioactivity is significantly reduced. Another suggestion is that the government could solidify the waste water by using it to make mortar.

Decommissioning of nuclear power plants

Decommissioning will be a painstaking task that will take decades, or even hundreds of years. Based on the Fukushima Prefectural Government's request that the site be free of radioactive contamination within 30 to 40 years, TEPCO and the Japanese Government have set an official target to decommission the plant within that time frame. On the other hand, based on a July 2020 report by the Atomic Energy Society of Japan (AESJ), site restoration would be expected to take as long as 100 years, or if the contaminated material cannot be removed from the site it will take 300 years. Bear in mind that cesium-137 (the main contributor to the remaining radioactive contamination) has a half-life of around 30 years, it will take 300 years for the level of radioactivity to fall to one-thousandth of its original value.

The biggest immediate obstacle is the highly radioactive melted nuclear fuel debris in the core of reactors 1, 2 and 3. As recently as December 2020, TEPCO and the government announced a two-year delay until 2022 of the proposed start date to begin removing melted fuel debris. Dangerously high levels of radioactive contamination were detected in locations within the reactor core that will make melted fuel removal even more difficult than expected. Further down the track, storage and removal of the large volumes of radioactive material generated in the decommissioning process are likely to cause problems leading to further delays.

Cost

In a report released 7 March 2019, the Japan Center for Economic Research estimated that the total cost of the accident, including compensation, decontamination and decommissioning, could reach between Yen 35 trillion and 81 trillion yen (US$315 billion and US$728 billion) depending on the decommissioning scenario, compared with the government's estimate of about 22 trillion yen.

Japanese legislation covering liability for nuclear accidents provides no-fault unlimited liability, under which only the nuclear operator is liable for the damage resulting from nuclear accidents. However, it is ambiguous because the nuclear operator is exonerated in the case of grave natural disasters of an exceptional character, or in the case of an insurrection. In the event, a system was established whereby the government and the other electric power companies are sharing the costs of the disaster with TEPCO. Ultimately, however, costs will be passed on to consumers and taxpayers.

4. Post-Fukushima energy policy

Public opinion polls continue to show that the Japanese population remains firmly opposed to nuclear energy. A year after the accident, largely as a result of a genuine public participation process, the Democratic Party (DPJ) government of the time adopted a policy of phasing out nuclear power. However, the DPJ became unpopular for reasons unrelated to energy policy (though probably not unrelated to its poor disaster management). It lost the December 2012 national election to a government led by the Liberal Democratic Party (LDP), the party that for the previous five decades had fostered the growth of the nuclear industry. The LDP has remained in power ever since and nuclear vested interests are back in charge of energy policy. Policy committees are stacked with nuclear proponents and only lip service is paid to public participation.

Several obstacles have been placed in the way of renewable energy, including prioritising nuclear energy over renewables when there is surplus generation, introduction of a capacity market, restrictions and high charges for grid connection and use, and making alternative energy producers help pay for the Fukushima disaster. Nevertheless, despite strong government support for nuclear energy, most of Japan's nuclear reactors remain offline. Ten years after the Fukushima nuclear accident, Japan's nuclear power plants are only operating at about 10% of capacity.

5. Putting it in perspective

On the morning of 11 March 2011 people living in north east Japan were going about their lives more or less peacefully and happily. Until 2.46 in the afternoon, when a massive earthquake and tsunami upended everything. As a direct result of the earthquake and tsunami, thousands lost their lives and many thousands more had to evacuate. The third component of the triple disaster was the nuclear component. The first two components created a natural disaster, but the third was a man-made disaster. The man-made component had more insidious and long-lasting consequences.

It would be a mistake to diminish the suffering of the victims and survivors from areas less affected by the nuclear disaster, or to suggest that the earthquake and tsunami components of the triple disaster did not have massive long-term consequences in their own right. That part of the story is not the focus of this paper, but the suffering and loss of life from the natural disaster should not be discounted or forgotten. Nor should we assume that everyone from Fukushima Prefecture has fallen into a state of deep gloom and depression. Some parts of the prefecture were less severely affected than others. There are also many stories of courage and resilience. Nor does everyone wish to dwell on the past.

Nevertheless, it can be said that people most directly affected by the nuclear accident have found it more difficult to return to their home towns and livelihoods. Agriculture and fishing

suffered greatly in the three prefectures worst affected by the triple disaster – Iwate, Miyagi and Fukushima – but the recovery has been slower in Fukushima Prefecture. There are specific reasons why people have found it difficult to return to the peaceful lives they lived before. Those who have returned are continuously worried about whether it is safe for their children to play outside, or whether their food and water is safe. Incredible though it may sound, nuclear refugees have even suffered discrimination because of where they are from.

But probably the best way to get an insight into both the suffering and the resilience of the survivors is to listen to the video testimonies compiled by the Fukushima Mieruka project: https://311mieruka.jp/info/en/category/testimonials/

Two questions inevitably occur to people who hear the story of the Fukushima nuclear disaster. 'What kind of hubris was it that led decision makers to think they could build nuclear power stations in earthquake prone Japan?' and 'What stubbornness is it that makes them refuse to give up nuclear power now after experiencing such a disaster?' This is a great mystery to anyone of good sense. Before the disaster, electric power companies and the government repeated endlessly the claim that nuclear power was completely safe. Even when, after other less serious accidents and scandals, they were forced to qualify this claim, they continued to assert that their nuclear power plants were safe. Many people believed them. Originally, maybe nuclear proponents believed their own rhetoric. But now it can only be vested interests that makes them cling to nuclear energy. The challenge for the rest of us is to expose and resist these vested interests. In Australia, we already have vested interests tied up in the uranium mining industry. We must not let the vested interests of nuclear power gain a foothold.

References

(Note that some links, especially for *The Japan Times* articles, might have to be typed into your browser.)

How the disaster unfolded

Accident timeline
Kyodo, 'Key events in Fukushima crisis', *The Japan Times*, March 12, 2013
https://www.japantimes.co.jp/news/2013/03/12/national/key-events-in-fukushima-crisis/
Forewarnings
'TEPCO worker: Boss scrapped tsunami wall for Fukushima plant', *The Asahi Shimbun*, April 11, 2018
https://nuclear-news.net/tag/tsunami-wall/
Fukushima Daiichi reactor 4 spent fuel pool
Toshihiro Okuyama, 'Fukushima No. 4 reactor saved by upgrade mishap', *The Asahi Shimbun*, March 08, 2012
https://www.democraticunderground.com/11278958
Tokai No 2
Roger Pulvers, 'So, fat cats and a blue caterpillar will save Japan from nuclear hell. OK', *The Japan Times*, Oct. 21, 2012
https://www.japantimes.co.jp/opinion/2012/10/21/commentary/so-fat-cats-and-a-blue-caterpillar-will-save-japan-from-nuclear-hell-ok/

What's the situation now?

Evacuees
"Abe pushing idea that Fukushima nuclear disaster is 'under control'", *The Asahi Shimbun*, June 11, 2019
https://nuclear-news.net/2019/06/17/abe-pushing-idea-that-fukushima-nuclear-disaster-is-under-control/
'65% of Fukushima evacuees have no intention of returning home: survey', *Mainichi Japan*, November 28, 2020
https://mainichi.jp/english/articles/20201128/p2g/00m/0na/013000c
Citizens' Commission on Nuclear Energy, 'Statement on the proposed update of ICRP Publications 109 and 111', 24 October 2019
http://eng.ccnejapan.com/?p=146
http://www.ccnejapan.com/20191024_CCNE_a.pdf

Health
Fukushima Mieruka Project, 'Many cases of thyroid cancer',
https://311mieruka.jp/info/en/reports/thyroid-cancer/
Beyond Nuclear, '"Oops": Manipulated childhood cancer data hides radiation impact, harms public health protection', July 19, 2019
http://www.beyondnuclear.org/radiation-health-whats-new/2019/7/19/oops-manipulated-childhood-cancer-data-hides-radiation-impac.html
H. Toki, T. Wada, Y. Manabe, S. Hirota, T. Higuchi, I. Tanihata1, K. Satoh & M. Bando, 2020, 'Relationship between environmental radiation and radioactivity and childhood thyroid cancer found in Fukushima health management survey', *Nature*, Scientific Reports, 10:4074
https://doi.org/10.1038/s41598-020-60999-z
Reconstruction Agency, 復興関係基礎データ集（29.2.1 現在）(Recovery basic data as at 1 Feb 2017)
https://fpcj.jp/wp/wp-content/uploads/2017/02/f3d18ad01be2c3a1ae60b13850b28de41.pdf
Reconstruction Agency, 東日本大震災における震災関連死の死者数（平成 31 年 3 月 31 日現在調査結果) (Number of deaths related to the Great East Japan Earthquake), 28 June 2019
https://www.reconstruction.go.jp/topics/main-cat2/sub-cat2-6/20190628_kanrenshi.pdf
Jiji, '10 years on, 3/11-linked suicides still occurring', *The Japan Times*, Feb 24, 2021
https://www.japantimes.co.jp/news/2021/02/24/national/3-11-linked-suicides/
Ministry of Health, Labour and Welfare of Japan and National Police Agency, 平成 30 年中における自殺の状況（Suicide situation in 2018), 28 March 2019
https://www.mhlw.go.jp/content/H30kakutei-01.pdf

Liability and compensation
Philip Brasor and Masako Tsubuku, 'Tepco's compensation for 3/11 victims has made matters worse for many', *The Japan Times*, April 13, 2018
https://www.japantimes.co.jp/news/2018/04/13/national/tepcos-compensation-3-11-victims-made-matters-worse-many/
Osaka, Eri, 'Current Status and Challenges in the Fukushima Nuclear Disaster Compensation Scheme: An Example of Institutional Failure?' January 19, 2019, Available at SSRN
https://ssrn.com/abstract=3318877 or http://dx.doi.org/10.2139/ssrn.3318877
'EDITORIAL: Flawed acquittal of TEPCO execs demands high court review', *The Asahi Shimbun*, October 7, 2019
http://www.asahi.com/ajw/articles/AJ201910070017.html

Decontamination of the environment and agriculture

IAEA, 2020, 'Environmental Transferof Radionuclidesin Japan following the Accident at the Fukushima Daiichi Nuclear Power Plant', TECDOC No. 1927
https://www.iaea.org/publications/14751/environmental-transfer-of-radionuclides-in-japan-following-the-accident-at-the-fukushima-daiichi-nuclear-power-plant
Ichiro Matsuo, 'Contaminated waste bags still at risk of loss in Fukushima', *The Asahi Shimbun*, March 18, 2020
http://www.asahi.com/ajw/articles/13225077
Hiroshim Ishizuka, 'Typhoons cut Fukushima radiation, likely created hotspots', *The Asahi Shimbun,* March 11, 2020
http://www.asahi.com/ajw/articles/13205646
'Editorial: Lifting Fukushima evacuation orders without decontamination should be limited', *Mainichi Japan*, September 16, 2020
https://mainichi.jp/english/articles/20200916/p2a/00m/0na/013000c
OHCHR (UN Office of the High Commissioner for Human Rights), 'Report of the Special Rapporteur on the implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes', 25 October 2018
https://www.ohchr.org/EN/NewsEvents/Pages/DisplayNews.aspx?NewsID=23772&LangID=E
'5 years after Fukushima meltdowns, wild game animals still show cesium contamination', *Mainichi Japan*, March 31, 2016
http://mainichi.jp/english/articles/20160331/p2a/00m/0na/016000c
Tatsushi Inui, 'Evacuated Fukushima town begins efforts to have produce restrictions lifted', *Mainichi Japan*, September 9, 2019
https://mainichi.jp/english/articles/20190909/p2a/00m/0na/002000c
Masahito Iinuma, Morikazu Kogen, and Shinichi Sekine, 'Fukushima food declared safe, but still concern over reduced testing', *The Asahi Shimbun*, March 11, 2020 at 17:50 JST
http://www.asahi.com/ajw/articles/13205630
Jiji, 'Farm and fishery production in parts of Tohoku back to predisaster levels', *The Japan Times*, Feb 23, 2021
https://www.japantimes.co.jp/news/2021/02/23/national/tohoku-farming-fisheries/

Radioactive water and fishing
'Japan to release treated water from crippled Fukushima plant into sea', *Kyodo News*, October 16, 2020
https://english.kyodonews.net/news/2020/10/fe0fae3622a5-urgent-japan-to-release-treated-water-from-fukushima-plant-into-sea.html
'PM Suga vows swift decision on release of Fukushima radioactive water', *Japan Today*, October 21, 2020
https://powerlinks.news/tokyo-electric-power/news/suga-vows-swift-decision-release-fukushima-radioactive-water
'Water leaks indicate new damage at Fukushima nuclear plant', *Mainichi Japan*, February 20, 2021
https://mainichi.jp/english/articles/20210220/p2g/00m/0na/011000c
Citizens' Commission on Nuclear Energy, 東電福島第一原発の処理汚染水に関する声明～合意なき環境放出は将来に禍根を残す～ (Statement re treated contaminated water from TEPCO's Fukushima Daichi Nuclear Power Station – Release into the environment without agreement will become a curse), 24 April 2020
http://www.ccnejapan.com/?p=11167
Fukushima Mieruka Project, 'Ocean release of ALPS processed contaminated water'
https://311mieruka.jp/info/en/reports/discharge-of-treated-water/

Fukushima Mieruka Project, 'Fishermen from Fukushima'
https://311mieruka.jp/info/en/testimonials/v3/
Reuters, 'Fishers and farmers fear impact of Fukushima water release', *Fukushima Minpo* published in *The Japan Times*, Oct 30, 2020
https://www.japantimes.co.jp/news/2020/10/30/national/fishers-farmers-fukushima-radioactive-water/
'Fishermen worry over plan to release Fukushima nuke plant's water', *Kyodo News*, October 16, 2020
https://english.kyodonews.net/news/2020/10/b8be9bba5e9b-fishermen-worry-over-plan-to-release-fukushima-plants-water.html
'Fish contaminated with radiation caught off northeastern Fukushima Prefecture', *Mainichi Japan*, February 24, 2021
https://mainichi.jp/english/articles/20210224/p2a/00m/0na/014000c
Hyonhee Shin, 'South Korea expresses 'serious concern' over any radioactive water dump', Reuters, published in *The Japan Times*, Oct 29, 2020
https://www.japantimes.co.jp/news/2020/10/29/national/s-korea-expresses-serious-concern-radioactive-water-dump/
Reuters, 'China urges Japan to cautiously consider nuclear plant water release', *The Japan Times*, Oct 19, 2020
https://www.japantimes.co.jp/news/2020/10/19/national/china-urges-japan-cautiously-consider-nuclear-plant-water-release/
Da Zhigang, 'Japan dumping nuclear contaminated water into ocean sparks global outrage', *Global Times*, 2020/10/18
https://www.globaltimes.cn/content/1203850.shtml
'Lifting of the Import Restrictions on Japanese Foods　Following the Accident of Fukushima Daiichi Nuclear Power Plant (54 Countries and Regions)', Food Industry Affairs Bureau, Ministry of Agriculture, Forestry and Fisheries, January 2021
https://www.maff.go.jp/j/export/e_info/pdf/thrm_en.pdf
'Citizens' Committee on Nuclear Energy proposes long-term storage for treated water from damaged Fukushima Daichi plant', FoE Japan, 5th October 2019
https://www.foejapan.org/en/energy/doc/191005.html

Decommissioning
Kyodo, 'Removal of spent nuclear fuel at Fukushima No. 1 delayed up to five years' *The Japan Times*, Dec 27, 2019
https://www.japantimes.co.jp/news/2019/12/27/national/spent-nuclear-fuel-fukushima-daiichi-delay/#.XgZpMS3L2g
Ban Hideyuki, 'Fukushima Daiichi: Contaminated water should not be dumped in the ocean and radioactive debris should not be removed without debate on the end state', *Nuke Info Tokyo*, No 200, February 11, 2021, Citizens' Nuclear Information Center
https://cnic.jp/english/?p=5276
Atomic Energy Society of Japan, 国際標準からみた廃棄物管理ー廃棄物検討分科会中間報告 (Waste management from the perspective of international standards – Interim report of Waste Investigation Subcommittee), July 2020
https://www.aesj.net/aesj_fukushima/fukushima-decommissioning
https://www.aesj.net/permalink/国際標準からみた廃棄物管理-廃棄物検討分科会中/
Norihiko Kuwabara, 'Radiation levels at Fukushima plant far worse than was thought', *The Asahi Shimbun*, December 30, 2020
http://www.asahi.com/ajw/articles/14071742

Cost

Japan Center for Economic Research, "Accident Cleanup Costs Rising to 35-80 Trillion Yen in 40 Years", 7 March 2019
https://www.jcer.or.jp/english/accident-cleanup-costs-rising-to-35-80-trillion-yen-in-40-years
"8 trillion yen in public funds sought for post-Fukushima disaster costs", *Mainichi Japan*, October 4, 2016
http://mainichi.jp/english/articles/20161004/p2a/00m/0na/017000c

Post-Fukushima energy policy

Noriyoshi Ohtsuki, 'Fukushima poll: 74% say nuclear disaster work not promising', *The Asahi Shimbun*, February 24, 2021
http://www.asahi.com/ajw/articles/14216668
Philip White, 2015, 'Public participation in Japan's nuclear energy policy-forming process : comparison of pre- and post-Fukushima processes', PhD Thesis, The University of Adelaide
https://digital.library.adelaide.edu.au/dspace/handle/2440/98559
http://hdl.handle.net/2440/98559
Philip White, 2015, Japan's 2012 National Debate on Energy and Environment Policy, *electronic journal of contemporary japanese studies*, Volume 15, Issue 2
http://www.japanesestudies.org.uk/ejcjs/vol15/iss2/white.html
Atsushi Komori, 'Energy group seeks to annul 'far-fetched' logic on Fukushima fee', *The Asahi Shimbun*, September 4, 2019
http://www.asahi.com/ajw/articles/AJ201909040059.html
Reuters, 'Energy transfer between regions offers hope as Japan's utilities struggle to balance renewable supplies', *The Japan Times*, Oct. 17, 2018
https://www.japantimes.co.jp/news/2018/10/17/business/energy-transfer-regions-offers-hope-japans-utilities-struggle-balance-renewable-supplies/
Tsuneo Sasai, 'Ministry eyes subsidy plan for nuclear energy generation', *The Asahi Shimbun*, March 23, 2019
(link removed)
Kyodo, 'Renewable energy push blunted as ad-hoc rules stymie private upstarts, *The Japan Times*, Sep. 15, 2013
https://www.japantimes.co.jp/news/2013/09/15/national/renewable-energy-push-blunted-as-ad-hoc-rules-stymie-private-upstarts/
'Japan's nuclear fleet generated 2.69 TWh in January, 47% decline year-to-year', *Platts Nuclear News Flashes*, 8 February 2021