SAFECAST SPECIAL REPORT:

NO TRUST WITHOUT TRANSPARENCY:
WHY THE FUKUSHIMA DAIICHI WATER DISCHARGE DECISION SETS A BAD PRECEDENT

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SPECIAL REPORT

FUKUSHIMA DAIICHI WATER DECISION: A FAILURE OF TRANSPARENCY

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INTRODUCTION:

The following report presents Safecast's analysis of the technical, legal, and social issues surrounding the planned release of water currently being stored onsite at the Fukushima Daiichi NPP. Also, our recommendations for increasing trust and transparency through fully inclusive environmental monitoring. This is an annotated version of a text which previously appeared as an op-ed in the Japan Times:

Plan to discharge Fukushima plant water into sea sets a dangerous precedent
https://www.japantimes.co.jp/opinion/2021/04/24/commentary/japan-commentary/fukushima-radiation-3-11-nuclear-energy-radioactive-water-iaea/

The English-language version of this annotated report was published on the Safecast Blog on May 6, 2021:

Fukushima Daiichi Water: The World is Watching... or Should Be
https://safecast.org/2021/05/fukushima-daiichi-water-the-world-is-watching-or-should-be/

Safecast is a global volunteer-based organization started in March 2011 in order to crowdsource information about the spread of radiation from the Fukushima Daiichi NPP accident. Our mission is to further transparency and trust. Safecast develops and distributes innovative open-source hardware for monitoring radiation and air quality. Our open database contains easily accessible monitoring data from over 100 countries.

More information at： www.safecast.org https://safecast.jp

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(Cover image by Joe Moross)

(Image by Joe Moross)

POLICY ANALYSIS:

On April 13, the Japanese government announced that it had approved a plan by Tokyo Electric Power Co. Holdings Inc. (Tepco) to discharge treated water currently being stored in tanks at the Fukushima No. 1 nuclear power plant into the Pacific Ocean. [1]

Safecast considers it important to highlight our specific concerns in regard to this decision and offer recommendations to help ensure that the interests of all stakeholders are protected. Our unease centers primarily on how this unilateral decision may set a dangerous international precedent.

Tepco, the power utility managing the damaged plant, has shown a lack of transparency and good faith around the water issue. We believe that fully transparent independent monitoring and oversight of the environment must be done prior to, during and after any such release to ensure that the process is acceptable to the global community.

The 2011 accident at the Fukushima No. 1 nuclear power plant caused tremendous environmental, economic and societal hardship. Many of these problems have been addressed creatively and industriously, but, 10 years later, many huge challenges still remain and will continue to remain for decades to come.

The cleanup of the accumulated contaminated water being stored on site is both a technical and socioeconomic challenge. At present, approximately 1.2 million tons of this water is stored in more than 1,000 large tanks at the plant, and the amount increases daily. [2]

Tepco proposes that once treated to remove all radionuclides besides tritium (a radioactive form of hydrogen, which is considered one of the least dangerous to health), it can be diluted with seawater to very small concentrations and gradually released into the Pacific Ocean. The dilution and discharge option, recommended by both the International Atomic Energy Agency and the Japan Nuclear Regulation Authority as far back as 2013, was one of several evaluated by official committees in Japan, and was selected on the basis of technical feasibility, time, cost and safety. [3]

The release would begin in two years' time and will require approximately 30 years to complete. It is possible that this approach is the least objectionable of several problematic options, but it has been justified on a number of bases that could be considered questionable. [4]

The IAEA and the United States have expressed support for the release plan. But even at this late date, no clear technical plan or environmental impact study has been made public, and the proposal has been developed without any significant consultation with neighboring countries, the international community or even stakeholders in Japan. [5]

Because of this, several nations, notably South Korea and China, have expressed their opposition. [6] The Japanese fishing industry, which fears that the global market for all Japanese seafood products, not just those from Fukushima, will suffer irreparable harm, has also expressed firm opposition. [7] The discharge proposal should be considered a transboundary release of radioactive material, and existing IAEA agreements, among others, stipulate that concerned nations and other stakeholders should be consulted in such cases.

In particular, IAEA guidelines stipulate that special provisions are needed when a release can conceivably have radiological impacts outside the territory or jurisdiction of the country in which it originates. No one has credibly argued that the proposed discharge from the Fukushima No. 1 power plant will not impact, be detectable in or cause concern to other countries. [8]

On the contrary, countries around the Pacific rim in particular are justified in demanding to be consulted even if the impacts are estimated to be small. Others have cogently argued that the proposed release may be a violation of obligations under marine environment treaties such as the 1974 London Convention of the International Maritime Organization.[9]

The merits of those arguments may well be tested in the courts. It is beyond doubt that such unilateral action is unethical. In such a controversial and highly visible case, Tepco and the Japanese government should be actively seeking fuller participation

and input from stakeholders, including those in other nations, and demonstrate clearly that their concerns are being conscientiously addressed.

Allowing the release to proceed unilaterally without genuine international consultation and engagement would set a dangerous precedent and further damage the international rules-based agreement system. If Japan insists upon making such large long-term discharges based only on its own assurances, it would lose standing to oppose similar releases by others.

The international community should be alarmed as well. Quite a few nuclear power nations could be tempted to defy opposition from their neighbors and release radioactive material to the ocean freely, using the Fukushima example as a precedent. What is to prevent the Russian Federation from unilaterally releasing radioactive liquid waste into the Arctic Ocean or the Sea of Japan? Or China into the Sea of Japan or the South China Sea? Or the United Arab Emirates to the Persian Gulf? [10]

Unlike nuclear arms nonproliferation, the international system for monitoring radiation releases under the umbrella of the IAEA essentially works on the honor system and it is easily abused. Nations cannot be compelled to do the right thing. Even diplomatic pressure and the pressure of public opinion sometimes prove insufficient, but they remain the best tools. The provision of transparent international verification in relation to such a discharge is an important part of that.

Official Japanese talking points stress the purported safety of the planned discharge by claiming that similar releases from nuclear facilities are “common” or “normal.” [11] This is disingenuous and deceptive. Tepco assures us that, after a lengthy and expensive process of treatment using its ALPS radionuclide removal system, the radioactive concentrations in the water will be similar to those of other controlled releases and should be considered similarly routine and require minimal regulation.

But during normal nuclear power generation and fuel processing, tritium is generated in relatively predictable quantities and released on a designed basis as part of normal operation. In the case of the Fukushima No. 1 nuclear power plant, the release is an emergency stopgap intended to prevent possibly more catastrophic consequences that might occur from burst tanks or overburdened pipes, as well as being a convenient solution to the lack of space to build more tanks. Nothing about it is “normal,” and as such it demands closer scrutiny and oversight and a more thorough regulatory regime.

The ALPS system does, in fact, appear capable of removing all radionuclides of concern except tritium and carbon-14 when operating at top condition, but it is dangerous to assume that all 1.2 million tons of water currently being stored, as well as the similarly large additional quantity expected to be generated, will be effectively treated to the required rigorous standard without fail over the course of decades.[12]

The many potential failure points are both technical and human: pumps wear out, filters clog, gaskets deteriorate, wrong levers are pulled and workers get disgruntled. Would Tepco be adequately transparent about such incidents and their consequences? Would we be informed, for instance, if 10% of the strontium 90 had somehow escaped into the Pacific?[13] Unfortunately, the international community cannot make that assumption. The company's prior lack of transparency and their bad faith, particularly on the water issue, is well-documented.

From the beginning of testing and implementation of the ALPS system in late 2012, Tepco assured the world that the only radionuclide of concern that remained in the water after treatment was tritium. The dilution and release plan was heavily promoted to the public on that basis.[14]

In late 2018, however, the company admitted that roughly 80% of the water —890,000 of the 1.1 million tons of treated water then in storage— still contained above-limit levels of strontium 90, cobalt 60, ruthenium 106 and many other radionuclides that the system had failed to adequately remove. [15] Upon learning that this fact had been intentionally concealed by Tepco, the public was outraged. Those supporting the release plan seem to hope that this massive betrayal of trust has been forgotten.

For all of these reasons, even if experts were unanimous that the planned release theoretically posed no risk to the ocean ecosystem or to human health, it should not be allowed to proceed without a robust impact assessment and verification process in place. The public needs to know now what kind of monitoring and transparency efforts will be implemented, and by whom. [16]

Because of the transnational implications, the monitoring regime should be international and cooperative in scope. It should be a participatory process developed in consultation with all stakeholders, in Japan and internationally.Tepco's untrustworthy track record further necessitates that the verification be provided by independent third parties. [17]

Tepco has never provided the public with a detailed inventory of the mix of radionuclides currently present in each tank and their levels; this should be done immediately and independently verified. The radionuclide content of the water should similarly be independently verified after treatment and prior to release. [18]

The spread of the radiation through the ocean environment should be closely monitored, as well as its effects on marine life. A verification framework that includes qualified independent researchers should be quickly established and funded. It will have to remain in place for the 30 years or more that the releases will require, and for many years following their conclusion.

The IAEA can play a constructive coordinating role and has offered its technical support in monitoring the implementation of the plan. We fear, however, that the IAEA

will find itself overly dependent on the Japanese government for access, and that it will be overly conciliatory in its approach to the detriment of the global community. [19]

The vast majority of the effects of the Fukushima disaster have fallen upon the Japanese people, and most of the decisions about how to respond are theirs to make. However, this accident has also had many consequences beyond Japan's borders, and it should be clear that discharging this contaminated water into the Pacific Ocean concerns more than just the Japanese nation.

There is nothing normal about this water release plan and an enhanced and internationally coordinated response in monitoring and verification is justified, reasonable and proportionate.

SAFECAST has published extensive information and analyses about the Fukushima Daiichi water issue. This two-part series, written before it became known that the ALPS-treated treated water in water tanks onsite contained many other radionuclides of concern, discusses the scientific and health risk aspects of tritium, as well as policy and transparency issues in the context of the proposed release:

PART 1: Radioactive water at Fukushima Daiichi: What should be done?;
Azby Brown, June 5, 2018
https://safecast.org/2018/06/part-1-radioactive-water-at-fukushima-daiichi-what-should-be-done/

PART 2: Radioactive water at Fukushima Daiichi: What should be done?
Azby Brown, June 5, 2018
https://safecast.org/2018/06/part-2-radioactive-water-at-fukushima-daiichi-what-should-be-done/

Related op-ed at the Japan Times:

About that tritiated water: Who will decide and when?
Azby Brown, Japan Times, Jun 5, 2018
https://www.japantimes.co.jp/opinion/2018/06/05/commentary/japan-commentary/tritiated-water-will-decide/#.WxcTSlOFPGL

Followup in 2019:

Transparency, the olympics, and that damned water, Part 1
Azby Brown, November 26, 2019
https://safecast.org/2019/11/transparency-the-olympics-and-that-damned-water-part-1/

NOTES AND REFERENCES:

1. Japanese-language documents from the ministerial meeting of March 13, 2021, can be found here:

廃炉・汚染水・処理水対策関係閣僚等会議（第５回）配付資料一覧 *(Hai-ro osen mizu shori mizu taisaku kankei kakuryō-tō kaigi (dai 5-kai) haifu shiryō ichiran*/Conference of Ministers on Decommissioning, Contaminated Water, and Treated Water Measures (5th) List of handouts):
https://www.kantei.go.jp/jp/singi/hairo_osensui/dai5/index.html

Primary English-language source:

METI: Basic Policy on handling of ALPS treated water at the Tokyo Electric Power Company Holdings' Fukushima Daiichi Nuclear Power Station: The Inter-Ministerial Council for Contaminated Water, Treated Water and Decommissioning issues, 13 April, 2021
https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/bp_alps.pdf

There was much international media coverage of the April 13, 2021 announcement, for example:

Government OKs discharge of Fukushima nuclear plant water into sea
Japan Times, April 13, 2021
https://www.japantimes.co.jp/news/2021/04/13/national/fukushima-water-release/

Fukushima Wastewater Will Be Released Into the Ocean, Japan Says
New York Times, April 13, 2021
https://www.nytimes.com/2021/04/13/world/asia/japan-fukushima-wastewater-ocean.html

2. TEPCO reports that as of April 1, 2021, approx. 1.25 million m3 of water was being stored onsite in 1,047 tanks. The average tritium concentration is approx. 620,000Bq/L; the total radioactivity in the tritium is approx. 780 trillion Bq.

New Definition of ALPS Treated Water and the Amount of Tritium in Water being stored in Tanks; TEPCO, April 27, 2021:
https://www4.tepco.co.jp/en/decommission/progress/watertreatment/images/20210427.pdf

What is the meaning of "contaminated"?

The current edition of the IAEA Safety Glossary defines "contaminated" as:

> "1. *Radioactive substances* on surfaces, or within solids, liquids or gases (including the human body), where their presence is unintended or undesirable, or the process giving rise to their presence in such places...The term *contamination* refers only to the presence of radioactivity, and gives no indication of the magnitude of the *hazard* involved." (italics original).

https://www.iaea.org/publications/11098/iaea-safety-glossary-2018-edition

The IAEA glossary further notes that while regulatory definitions may specify levels of radioactivity above which the term will apply, the above scientific definition applies regardless of the amount or concentration of radioactivity present. We recognize that the word can be used in order to highlight the suggestion of danger. Our intent is objective, however.

By TEPCO's own admission, upwards of 70% of the water which has been processed by the ALPS system to date remains contaminated with radionuclides of concern. Even if it proves possible to remove all radionuclides besides tritium, at the high initial concentrations typical at Fukushima Daiichi so far the tritiated water certainly meets the IAEA definition of "contaminated." We would argue that even if it proves possible to dilute the tritiated water to concentrations well below the regulation release limits, it would still meet the IAEA definition of "contaminated." This is separate from any evaluation of risk.

In a written response to UN Special Rapporteurs in June, 2020, the Government of Japan insisted that *"...ALPS treated water stored in the tanks is not contaminated water."* Concurrent with the March 13, 2021 decision to dilute and discharge the water being stored onsite at Fukushima Daiichi, including reprocessing over 70% of what had already been treated by the ALPS system, METI announced that it had actually changed the definition of "ALPS treated water." They state, *"In order to prevent reputational damage based on such misunderstandings, in the future, only 'water that meets the regulatory standards for discharge into the environment regarding nuclides other than tritium' will be termed 'ALPS treated water.'"*

This strikes us as an Orwellian attempt to change the public perception of the problem by limiting the language being used to discuss it.

Response to the Joint Communication from Special Procedures from the Government of Japan; Japan Ministry of Foreign Affairs, June 12, 2020: https://www.mofa.go.jp/files/100064087.pdf

Change to the Definition of ALPS Treated Water at TEPCO's Fukushima Daiichi Nuclear Power Station; METI, April 13, 2021: https://www.meti.go.jp/english/press/2021/0413_004.html

3. **IAEA: Tepco Should Consider Controlled Discharge**; Wall Street Journal, Mari Iwata, Dec 4, 2013:
https://www.wsj.com/articles/SB10001424052702303722104579237573776706970

WSJ : Fukushima Watch: Regulator Calls on Tepco to Discharge Tritium Water; Mari Iwata, Jan 21, 2015 :
https://www.wsj.com/articles/BL-JRTB-18991

In Feb., 2015, regarding the water issue, the IAEA stated:

> *"However, storage being a temporary measure TEPCO has to find a more sustainable solution. For this TEPCO should consider all options, including the possible resumption of controlled discharges of treated water to the sea as advised during the previous mission. In the opinion of the IAEA team, any decision to resume controlled discharges should be taken after carefully considering all relevant aspects including potential impact on the health of the public, protection of the environment and socioeconomic conditions –* ***all in consultation with relevant stakeholders****."* (emphasis ours)

IAEA International Peer Review Mission On Mid-And-Long-Term Roadmap Towards The Decommissioning of Tepco's Fukushima Daiichi Nuclear Power Station Units 1-4 (Third Mission) -- Preliminary Summary Report to The Government Of Japan, 9 – 17 February 2015:
https://www.iaea.org/sites/default/files/missionreport170215.pdf

4. **Basic Policy on handling of ALPS treated water at the Tokyo Electric Power Company Holdings' Fukushima Daiichi Nuclear Power Station;** METI: The Inter-Ministerial Council for Contaminated Water, Treated Water and Decommissioning issues, 13 April, 2021:
https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/bp_alps.pdf

[Digest version] : **TEPCO Holdings' Action in Response to the Government's Policy on the Handling of ALPS Treated Water;** TEPCO, April 16, 2021:
https://www.tepco.co.jp/en/hd/newsroom/press/archives/2021/pdf/210416e0102.pdf

5. The statements from the IAEA and the United States government are strongly supportive of Japan's decision. Both also highlight transparency on Japan's part as being central to their support. In characteristically diplomatic language, IAEA Director General Rafael Mariano Grossi is quoted as saying, *"I'm confident that the Government will continue* ***to interact with all parties in a transparent and open way*** *as it works to implement today's decision."* Experienced observers will recognize this

not as a compliment, but as an admonition urging transparency. Similarly, US State Dept. spokesman Ned Price, said, *"We look forward to the GOJ's* ***continued coordination and communication*** *as it monitors the effectiveness of this approach."* (emphasis ours) Again, couched in the language of support is a statement of expectations. It is difficult to argue that either Japan or TEPCO has been adequately transparent on the matter overall to date.

IAEA Ready to Support Japan on Fukushima Water Disposal, Director General Grossi Says; April 13, 2021:
https://www.iaea.org/newscenter/pressreleases/iaea-ready-to-support-japan-on-fukushima-water-disposal-director-general-grossi-says

Government of Japan's Announcement on Fukushima Treated Water Release Decision: PRESS STATEMENT; Ned Price, Department Spokesperson, April 12, 2021:
https://www.state.gov/government-of-japans-announcement-on-fukushima-treated-water-release-decision/

6. **China warns of action over Japan's decision to dump radioactive Fukushima water into the sea**; South China Morning Post, Catherine Wong, 13 Apr, 2021:
https://www.scmp.com/news/china/diplomacy/article/3129322/china-warns-action-over-japans-decision-dump-radioactive

7. Press reports often portray opposition to the release as coming only from local fisheries cooperatives in Fukushima, but in fact opposition is united among fisheries throughout the nation. They are one of the largest stakeholders in the issue, and stand to suffer the greatest damage. Nevertheless, their legitimate concerns are being disregarded. The nationwide Federation of Japan Fisheries Cooperatives chairman Hiroshi Kishi and other fisheries representatives met with Prime Minister Suga on April 7th, 2021, to urge him not to approve the release plan. According to the Asahi Shimbun, following the April 13th decision, Kishi issued a statement calling it:

> *"...extremely regrettable and totally unacceptable....The government reversed its earlier position that it would not go ahead with the water disposal without gaining an understanding from concerned parties....The decision tramples on the feelings of fishermen not only in Fukushima Prefecture but also in the rest of Japan."*

Outcry erupts in and out of Japan over Fukushima water decision; The Asahi Shimbun, April 13, 2021:
http://www.asahi.com/ajw/articles/14329903

8. We believe it is important that the IAEA officially answer the question of whether or not it considers the planned discharge from Fukushima Daiichi a transboundary release, and so subject to relevant guidelines that require notification and consultation. If it does not consider it so, the agency should clearly explain why not. IAEA guidelines stipulate that special provisions are needed when a release can conceivably have radiological impacts outside the territory or jurisdiction of the country in which it originates. In particular, the 1986 Convention on Nuclear Safety stipulates:

> *"The Early Notification Convention establishes a notification system for nuclear accidents that have the potential for an international transboundary release of radioactive material that could be of radiological safety significance for another state."*

IAEA: Convention on Nuclear Safety: Information page:
https://www.iaea.org/topics/nuclear-safety-conventions/convention-nuclear-safety

1994 Convention on Nuclear Safety, text in full:
https://www.iaea.org/sites/default/files/infcirc449.pdf

In addition, the IAEA International Basic Safety Standards, jointly sponsored by the EC, FAO, IAEA, ILO, OECD/NEA, PAHO, UNEP, and WHO, stipulates in its section on transboundary impacts:

> *"3.18. Paragraph 3.124 of GSR Part 3 [3] establishes requirements for the assessment of radiological impacts and the control of discharges when a source within a practice could cause public exposure outside the territory or other area under the jurisdiction of the or control of the State in which the source is located, the government or the regulatory body:*
>
> > *a) Shall ensure that the assessment for radiological impacts includes those impacts outside the territory or other area under the jurisdiction of the or control of the State;*
> >
> > *b) Shall, to the extent possible, establish requirements for the control of discharges;*
> >
> > *c) Shall arrange with the affected State the means for the exchange of information and consultations, as appropriate."*

IAEA: Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards: General Safety Requirements Part 3:
https://www-pub.iaea.org/MTCD/publications/PDF/Pub1578_web-57265295.pdf

9. The South Korean Ministry of Oceans and Fisheries (MOF) raised the issue of Fukushima Daiichi water releases at a meeting of the London Convention in 2019. South Korean ministry representative Song Myeong-dal is quoted as saying:

> *"If [Japan] does release contaminated water from the plant into the ocean, this could have an impact on the global oceanic environment and be in violation of the aims of the London Protocol…In order to find a method of contaminated nuclear power plant water handling that the international community can be confident is safe, I think this matter should be discussed on an ongoing basis by the consultative meeting of contracted parties to the London Convention and Protocol."*

South Korea Brings Fukushima Wastewater Issue to London Convention Meeting; Cristina Tuser, Water and Wastes Digest, Oct. 11, 2019:
https://www.wwdmag.com/waste-treatment-disposal-services/south-korea-brings-fukushima-wastewater-issue-london-convention

Following the April 2021 release decision, South Korea again raised the issue to the London Convention and Protocol Scientific Group meeting. They asserted that *"Japan made the decision unilaterally without prior consultation with its closest neighbor South Korea,"* further stressing, *"…that it is an important issue posing a threat to the safety of neighboring countries and the maritime environment."*

S. Korea Raises Japan's Fukushima Water Release at Int'l Conference
KBS WORLD, April 19, 2021:
https://world.kbs.co.kr/service/news_view.htm?lang=e&Seq_Code=160925

See also:

Japan's plan for radioactive water defies international law
By Duncan E. J. Currie and Shaun Burnie, Korea Times, March 3, 2020:
https://www.koreatimes.co.kr/www/nation/2020/07/371_285553.html

On April 19, 20211, after meeting with the visiting US special presidential envoy for climate, John Kerry, South Korean Foreign Minister Chung Eui-yong listed three specific conditions that he is requesting Tokyo to meet in order satisfy the nation's concerns:

> *"First, he requested that Tokyo provide scientific evidence that the measure is safe; second, he urged in-depth prior consultations; and third, he called for the inclusion of South Korean experts in the verification process by the International Atomic Energy Agency. He said if Japan follows the due processes under the standards of the IAEA, Seoul has no particular reason to object."*

Minister Chung added that South Korea "is waiting to see whether Japan will meet these obligations."

According to JIJI Press, the Minister, *"...indicated that South Korea could initiate an international dispute settlement process if Japan is judged to have failed to take sufficient action."* A lawsuit with the International Tribunal for the Law of the Sea over the matter is reportedly still under consideration.

S.Korea shows some understanding to treated water; NHK World, April 19, 2021: https://www3.nhk.or.jp/nhkworld/en/news/20210419_29/

Korea May Accept Fukushima Water Release under IAEA Standards; JIJI Press, April 19, 2021: *https://jen.jiji.com/jc/eng?g=eco&k=2021041900900*

Much of the legal discussion regarding Japan's international obligations examines the precedent set when TEPCO released 11,500 tons of untreated water into the Pacific Ocean in April 2011 as an emergency measure to free up storage space, and another 300,000 tons the following month. The precedent Japan set at the time is at the heart of many concerns regarding the planned dilution and discharge. Takamura (2014) helpfully enumerates the many treaties and agreements intended to prevent environmental damage from ocean dumping, specifically including radioactive material. These include the United Nations Convention on the Law of the Sea (UNCLOS), 1972 London Convention, Montreal Guidelines for the Protection of the Marine Environment Against Pollution from Land-based Sources, the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA), in addition to applicable provisions in the IAEA Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency and the Convention on Early Notification of a Nuclear Accident (Early Notification Convention). Takamura notes that although in spirit and intent many of these agreements can be seen to apply to ocean releases of radioactive material from land like that from Fukushima Daiichi, many of the agreements are non-binding and lack explicit provisions specifically prohibiting such releases.

Takamura further notes that in 2011, *"Japan argues that it did not violate these obligations to notify because the release in question had not caused and was not likely to cause transboundary adverse effects to the environment of other states or to the marine environment of areas beyond the limits of national jurisdiction."* We agree with Takamura's observation that:

> *"...even in the middle of dispute, states have an obligation to cooperate and consult in order to exchange relevant information, to undertake monitoring and risk assessment even when states in a dispute have a different assessment about the existence and gravity of potential risk of marine pollution... in line with the concept of precaution, which requires*

states to continually reevaluate potential risk of an activity in light of scientific developments in order to implement the obligation to prevent transboundary damage to the environment."

Release of Radioactive Substances into the Sea and International Law: The Japanese Experience in the Course of Nuclear Disaster;
Yukari Takamura: The International Law of Disaster Relief: from Part II - The Law of International Disaster Relief: From Local to Global, August 2014
https://www.cambridge.org/core/books/international-law-of-disaster-relief/release-of-radioactive-substances-into-the-sea-and-international-law-the-japanese-experience-in-the-course-of-nuclear-disaster/0C2592E5B75BE69D841EDD722E31A3C0

There's Something in the Water: The Inadequacy of International Anti-Dumping Laws as Applied to the Fukushima Daiichi Radioactive Water Discharge; Darian Ghorb: American University International Law Review, Volume 27 | Issue 2 Article 7, 2012
https://core.ac.uk/download/pdf/235407887.pdf

Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, aka London Convention 1972; 1992 London Protocol:
International Maritime Organization
https://www.imo.org/en/OurWork/Environment/Pages/London-Convention-Protocol.aspx

10. Data provided by the World Association of Nuclear Operators (WANO) indicates that approximately one fourth of the 460 working commercial nuclear reactors worldwide are situated on ocean coastlines, including about 20 nations in all. Over 25 nuclear facilities, both operational and those under construction, are sited on the ocean coastlines of East Asian nations facing Japan.

WANO online interactive map:
https://www.wano.info/members/wano-world-map?lang=en-GB

WANO nuclear facility information sheet:
https://www.wano.info/Web/files/f2/f20d3d7c-7580-4586-809f-8a14a83486b3.pdf

Carbon Brief: Mapped: The world's nuclear power plants:
https://www.carbonbrief.org/mapped-the-worlds-nuclear-power-plants

11. For example, in "The Outline of the Handling of ALPS Treated Water at Fukushima Daiichi NPS (FDNPS)" METI states:

> *"NPPs in Japan and overseas have been discharging water containing tritium for more than 40 years.*
>
> *— Concentration of tritium in sea water near NPPs are significantly lower than that of drinking water standards in the world.*
>
> *—It has not been found that tritium from NPPs have an impact on health."*

The Outline of the Handling of ALPS Treated Water at Fukushima Daiichi NPS (FDNPS); METI, February 2020
https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/20200203_current_status.pdf

Similarly, in the "Basic Policy on handling of ALPS treated water at the Tokyo Electric Power Company Holdings' Fukushima Daiichi Nuclear Power Station," 13 April, 2021, METI states:

> *"Tritium is discharged from nuclear facilities in each operating country. Though there are some facilities from which the annual amount of tritium is discharged exceeds the total amount of tritium stored in Fukushima Daiichi NPS, no examples of impact attributable to tritium have been commonly seen among nuclear power facilities".*

Basic Policy on handling of ALPS treated water at the Tokyo Electric Power Company Holdings' Fukushima Daiichi Nuclear Power Station
METI: The Inter-Ministerial Council for Contaminated Water, Treated Water and Decommissioning issues, 13 April:
https://www.ca.emb-japan.go.jp/2021_shared_images/Basic_Policy_on_Handling_of_ALPS_treated_water.PDF

In its "Response to the Joint Communication from Special Procedures from the Government of Japan," June 12, 2020, the Japan Ministry of Foreign Affairs states:

> *"...the IAEA Review Team considers the two options (namely, controlled vapor release and controlled discharges into the sea, the latter of which is routinely used by operating nuclear power plants and fuel cycle facilities in Japan and worldwide) selected out of the initial five options are technically feasible and would allow the timeline objective to be achieved."*

Response to the Joint Communication from Special Procedures from the Government of Japan, MOFA, June 12, 2020:
https://www.mofa.go.jp/files/100064087.pdf

The IAEA's repeated statements that Japan's planned method is in line with routine practice worldwide have been essential to Japan's continued claim that the Fukushima release will be "normal." The IAEA, however often implies conditions that remain to be met, such as full environmental impact assessments:

> *"Japan's chosen water disposal method is both technically feasible and in line with international practice, IAEA Director General Grossi said. Controlled water discharges into the sea are routinely used by operating nuclear power plants in the world and in the region under specific regulatory authorisations based on safety and environmental impact assessments."*

IAEA Ready to Support Japan on Fukushima Water Disposal, Director General Grossi Says; IAEA, April 13, 2021
https://www.iaea.org/newscenter/pressreleases/iaea-ready-to-support-japan-on-fukushima-water-disposal-director-general-grossi-says

12. Between Sept-Dec 2020, TEPCO conducted performance confirmation tests of the ALPS (Advanced Liquid Processing System) re-treatment process. A total of 2000m3 of previously treated water which exceeds the legally required concentrations for the primary seven nuclides was re-processed. The results reported by TEPCO are encouraging, but should not be accepted as fact without independent verification. It is important to keep in mind that in addition to its inability to remove tritium, ALPS is not designed to remove Carbon-14, so that nuclide will also remain regardless of the effectiveness of re-treatment.

Results from secondary treatment performance confirmation tests on water treated with multi-nuclide removal equipment (final report); TEPCO, Dec. 24, 2020:
https://www4.tepco.co.jp/en/decommission/progress/watertreatment/images/201224.pdf

13. Based on TEPCO data for 200 tanks (roughly 1/5 of the total) reported in Dec. 2019, Buesseler (2020) notes that the tanks currently contain Strontium-90 at concentrations up to 600,000 Bq/liter, which is 20,000 times the release limit for Japanese nuclear operators (30 Bq/liter). The mean Sr-90 concentration in these tanks is approximately 1 Bq/Liter, and ~50% is below 10 Bq/liter. In all, about 65,000 tons of treated water onsite contain strontium-90 at levels that are more than 100 times the Japanese regulatory limit for environmental release.

Opening the floodgates at Fukushima; Ken O. Buesseler: Science, Aug. 7, 2020:
https://science.sciencemag.org/content/369/6504/621.full

14. A Feb. 2012 TEPCO report provided early test results for the ALPS system, indicating that 54 radionuclides would be reduced to non-detectable (ND) levels. Tritium is not mentioned.

Multi-nuclide Removal Equipment; TEPCO, Feb. 27, 2012
https://www.tepco.co.jp/en/wp-content/uploads/hd03-02-03-001-m120227_03-e.pdf

Based on information from TEPCO, NEI Nuclear Engineering International reported in August, 2012, that the ALPS system would remove 62 radionuclides of concern to undetectable (ND) levels, leaving only tritium.

The ultimate water treatment system; NEI Nuclear Engineering International, August 1, 2012
http://www.neimagazine.com/features/featurethe-ultimate-water-treatment-system/

The Oct., 2014, TEPCO report *"Multi-nuclide Removal Equipment ("ALPS") (Existing/ Improved/ High-performance)"* states that every version of the ALPS system would remove 62 nuclides to the non-detectable (ND) levels, leaving only tritium.

Multi-nuclide Removal Equipment ("ALPS") (Existing/ Improved/ High-performance); TEPCO, Oct. 21, 2014:
https://www.tepco.co.jp/en/decommision/planaction/images/141021_01.pdf

A Sept., 2014, METI report stipulates, however, that the ALPS system simply *"...aims to reduce the levels of 62 nuclides in contaminated water to the legal release limit or lower (tritium cannot be removed),"* indicating that no attempt would be made to reduce the nuclides to the non-detectable (ND) level. This apparent policy change was made quietly. No mention was made of Carbon-14.

Summary of Decommissioning and Contaminated Water Management;
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment, September 25, 2014:
https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/20140925_e.pdf

15. TEPCO currently states that 72% of the water, or 780,000 tons, is above limit, reflecting an increase in the overall quantity of water produced since 2018 as well as continuing inefficiencies in the ALPS treatment.

TEPCO Draft Study Responding to the Subcommittee Report on Handling ALPS Treated Water; TEPCO, March 24, 2020:
https://www.tepco.co.jp/en/decommission/progress/watertreatment/images/200324.pdf

TEPCO test results were available as early as June 2014 which showed that in its initial configuration ALPS had failed to remove Co-60, Ru-106, Sb-125 and I-129, which were detected at comparatively high levels (but not Sr-90, which was shown as "ND"). Solutions to improve performance were suggested in the report, but the findings were not publicized. The findings were likely to be interpreted by outside observers as indicating a minor problem that would be quickly rectified.

Status of Contaminated Water Treatment and Tritium at Fukushima Daiichi Nuclear Power Station; TEPCO: Noboru.Ishizawa, Project Planning Department, June 2, 2014:

https://fukushima.jaea.go.jp/fukushima/result/pdf/pdf1410/4a-1_Ishizawa.pdf

The earliest public account that the ALPS system had failed to remove other radionuclides of concern emerged in August, 2018:

ALPS system at Fukushima No. 1 plant failing to remove more than tritium from toxic cooling water; Kyodo/Japan Times Aug 19, 2018:
https://www.japantimes.co.jp/news/2018/08/19/national/alps-system-fukushima-no-1-plant-failing-remove-tritium-toxic-cooling-water/

In September, 2018, TEPCO admitted the scale of the problem publicly, and reported to METI on Oct. 1, 2018. According to Reuters:

> *"Documents on the government committee's website show that of 890,000 tonnes of water held at Fukushima, 750,000 tonnes, or 84 percent, contain higher concentrations of radioactive materials than legal limits allow.*
>
> *"In 65,000 tonnes of treated water, the levels of radioactive materials are more than 100 times government safety levels.*
>
> *"Radioactive readings of one of those isotopes, strontium-90, considered dangerous to human health, were detected at 600,000 becquerels per liter in some tanks, 20,000 times the legal limit.*
>
> *"Tepco has for years insisted that its purification processes remove strontium and 61 other radioactive elements from the contaminated water but leaves tritium, a mildly radioactive element that is difficult to separate from water."*

TEPCO apologizes for still-radioactive water at Fukushima plant; Reuters, Aaron Sheldrick and Osamu Tsukimori, Oct. 13, 2018:
https://www.reuters.com/article/us-japan-disaster-nuclear-water-idUSKCN1ML15N

16. A number of documents issued by the Japanese Government, TEPCO, and the IAEA have mentioned the need for effective monitoring before, during, and after these releases. Even at this late date, however, following years of planning and an

extremely short timeframe before the releases are due to begin, these statements lack any specifics regarding who would be allowed to participate, and who would be given decision-making power regarding the monitoring programs themselves. For instance, TEPCO has said that it:

> *"...will further expand and strengthen our sea area monitoring efforts to minimize the adverse impacts on reputation. Objectivity and transparency of monitoring will be secured by asking for the cooperation of experts and the people in the agricultural, forestry, and fishery industry."*

How will these individuals be selected? How will the effort be funded? How will such participation be organized and directed? This information should have been presented in detail before the decision to release was announced. Similarly, the same document states:

> *"Specifically, we will create an enhanced sea area monitoring plan with increased sampling points and sampling frequency, and will start sea area monitoring according to this plan a year before discharge is scheduled to start. The results of monitoring will be disclosed promptly and third parties will measure, assess and disclose results to secure transparency."*

Again, details of the plan and other specifics should have already been made available to the public. Importantly, how will these "third parties" be selected, and how will their credibility and impartiality be assured?

Attachment 1: TEPCO Holdings' Action in Response to the Government's Policy on the Handling of ALPS Treated Water; TEPCO, April 16, 2021: https://www.tepco.co.jp/en/hd/newsroom/press/archives/2021/pdf/210416e0101.pdf

In their *"Joint Communication From Special Procedures"* of April 20, 2020, UN Special Rapporteurs noted that local stakeholders reported widespread dissatisfaction with the consultation processes established so far by TEPCO and the Japanese Government regarding the water release issue. Because of this and other past history, stakeholders are unlikely to trust that their participation and input will be adequately prioritized.

Joint Communication from Special Procedures; April 20, 2020: https://www.mofa.go.jp/files/100064085.pdf

17. Due to the lack of preparation to date, it will be a great challenge to establish an appropriately independent, international, cooperative, and participatory monitoring regime in the short time remaining, but we consider it essential. We stress that this process should fully prioritize the interests of stakeholders, including those outside

of Japan. It should be independently funded and managed, and open to participation by all interested parties. We also believe the monitoring data itself should be published as fully open data.

The goal of participatory monitoring is not to allay fear or to "counter damaging rumors." It is to realize citizens' rights to access to information, participation in decision-making, and access to justice in environmental matters. These rights and their implications for what citizens should expect and demand are spelled out most clearly in the Aarhus Convention, which entered into force in October 2001. Full participation and decision-making power for citizens is not a "favor" or a "concession," it is a fundamental right. The environmental consequences of the Fukushima disaster, specifically the proposed release of the stored water from the Fukushima Daiichi site, are precisely the kind of contingencies for which the Aarhus Convention was drafted.

The Aarhus Convention
https://ec.europa.eu/environment/aarhus/

It would be helpful to encourage participation by laboratories which are part of the IAEA ALMERA network, which includes 193 highly qualified laboratories in 89 countries. Member laboratories share standardized methods and have well established information sharing. Five laboratories in Japan are currently members, and neighboring countries which have expressed concern, such as South Korea and China, each have several member laboratories as well. Their participation would strengthen the credibility of the monitoring process.

The ALMERA Network
https://nucleus.iaea.org/sites/ReferenceMaterials/Pages/ALMERA.aspx

Participation should not be limited to laboratories or other entities under the IAEA umbrella, however. Any qualified oceanographic or marine sciences institution or researcher should be welcome to participate. Additionally, the participation of citizen groups in Japan and abroad is essential. As Safecast has demonstrated, citizen science is now on par technically with formal institutional science, and credible citizen science participation will be essential for generating data that is trustworthy in the eyes of the public. Many such groups exist in Japan and overseas. In France, for instance, the citizen group ACRO is a central participant in monitoring programs for environmental tritium from nuclear facilities along the French coast and inland.

ACRO: Surveillance du littoral:
https://www.acro.eu.org/resultats/

Dr. Ken Buesseler of Woods Hole Oceanographic Institution wrote:

> *"Making data available is a good start (9) but not enough. Seafood and ocean monitoring should continue to involve local fisherman, and studies that involve public participation in sampling would be an effective tool to improve public education and build confidence in the result...If there is a release, supporting independent ocean study of multiple contaminants in seawater, marine biota, and seafloor sediments should occur before, during, and after. Although the operators have promised some of this, actions will matter more than words."*

Opening the floodgates at Fukushima; Ken O. Buesseler: Science, 07 Aug 2020: https://science.sciencemag.org/content/369/6504/621.full

18. Researchers in Japan and abroad have long called for access to water samples from the Daichi tanks, and for a fully detailed and open radionuclide inventory to be made public. Since 2019 TEPCO has provided summaries of radionuclide concentrations for each tank area along with sums of concentration ratios, as well as measurements taken at a single point, the ALPS system outlet. But no inventory detailing what is in each tank has yet been made public, if one exists.

Actual radiation concentration measurements for each tank group (except for repurposed tanks) (as of December 31, 2020); TEPCO, Dec 31, 2020: *https://www4.tepco.co.jp/en/sp/decommission/progress/watertreatment/images/tankarea_en.pdf*

Radiation concentrations measured at the multi-nuclide removal equipment (ALPS) outlet (as of December 31, 2020); TEPCO, Dec. 31, 2020: *https://www.tepco.co.jp/en/decommission/progress/watertreatment/images/exit_en.pdf*

19. We sincerely hope that the IAEA will establish truly transparent and effective oversight, and assist in building a genuinely independent, international, and inclusive monitoring regime. In both cases credibility and trustworthiness will hinge on the public's perception of non-interference on the part of TEPCO and the Japanese Government. For this reason, it will be of paramount importance that any IAEA oversight and advisory body be mandated to report directly to the IAEA directorate, without requiring approval from the Japanese Government, as has been the case for Fukushima-related IAEA peer missions to date.

For neighboring nations like South Korea which have protested Japan's decision, accommodation should in many cases be straightforward. As noted above, South Korean Foreign Minister Chung Eui-yong listed three conditions that his nation requests Tokyo to meet: 1) scientific evidence, i.e., credible data, that the measure is acceptably safe; 2) in-depth prior consultations, meaning two-way exchange in

which Japan is prepared to alter its plans based on justified requests from South Korea; and 3) the inclusion of South Korean experts in the IAEA's verification process, meaning those experts will have the right to reject data and findings. We believe that all of these clearly fall within the scope of inclusive stakeholder engagement, and should, in fact, have been proactively offered to neighboring countries by the Japanese Government during its years-long deliberation process. That they were not suggests the depth of the sincerity of Japanese government bodies regarding future inclusive gestures.

S.Korea shows some understanding to treated water; NHK World, April 19, 2021: *https://www3.nhk.or.jp/nhkworld/en/news/20210419_29/*

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