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TEPCO's ALPS-treated Radioactive Water Dumping Plan Violates Essential Provisions of IAEA's General Safety Guide No. 8 (GSG-8) and Corresponding Requirements in Other IAEA Documents

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I. Introduction

In 2021, the Government of Japan asked the International Atomic Energy Agency (IAEA) to review its plans for dealing with more than 1.3 million metric tons of accumulated radioactive wastewater at the Fukushima Daiichi site. The 2021, plan announced by the Tokyo Electric Power Company, TEPCO, was to process the water using its Advanced Liquid Processing System (ALPS), extracting most of the inventory of the dozens of radionuclides in the tanks for separate storage, followed by dilution of the radioactive water, which would be dumped[2] into the Pacific Ocean. At that point the water would contain mainly tritium, but also small concentrations of other radionuclides like carbon-14, strontium-90, cesium-137, and iodine-129. The release point is to be about one kilometer offshore of the Fukushima Daiichi site; the dumping would continue for 30 years, possibly more.

The IAEA appointed a task force to review and advise Japan on TEPCO's plans, in particular for compliance of the plan with its safety and radiation protection requirements and guidelines. In its slide deck entitled "Overview of the IAEA" (February 2023), the IAEA specified seven "relevant standards for radioactive discharges to apply to this review" (Slide 48):

1. Fundamental Safety Principles (Safety Fundamentals No. SF-1); [3]
2. Radiation Protection and Safety of Radiation Sources (General Safety Requirements, Part 3, No. GSR Part 3);
3. Occupational Radiation Protection (General Safety Guide No. GSG-7);

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[2] The terms "dump" and "dumping" are used in this paper in the technical sense of the title of the 1972 treaty "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter". Japan is a party to the treaty.

[3] The IAEA documents in this list are available on the IAEA website (www.iaea.org) and are cited here by referencing their abbreviations, as noted in the list. Page numbers cited for these documents are those in the document and not the pdf page numbers. Reference numbers within quotes have been omitted.

4. Radiation Protection of the Public and the Environment (General Safety Guide No. GSG-8);
5. Regulatory Control of Radioactive Discharges to the Environment (General Safety Guide No. GSG-9);
6. Prospective Radiological Environmental Impact Assessment for Facilities and Activities (General Safety Guide No. GSG-10);
7. Environmental Source Monitoring for Purposes of Radiation Protection (Safety Guide No. RS-G-1.8)

These standards and guidance documents are linked. Specifically, GSG-8 notes that GSG-8, GSG-9, and GSG-10 (in the list above) "were prepared to provide generic guidance on meeting the requirements of GSR Part 3",[4] which lays out the general safety requirements and also re-states the fundamental safety principles in SF-1.

II. Justification

GSR Part 3, in citing fundamental safety principles, under the heading "Justification of facilities and activities", states that "Facilities and activities that give rise to radiation risks must yield an overall benefit." (p. 3). GSG-8 elaborates on and provides guidance on the meaning of justification, while stating that it "applies to all exposure situations".[5] For "planned exposure situations", which applies to the TEPCO proposal, justification is defined in GSG-8 as follows:

> For planned exposure situations, justification is the process of determining whether a practice is, overall, beneficial, i.e. whether the *expected benefits to individuals and to society from introducing or continuing the practice outweigh the harm (including radiation detriment)* resulting from the practice. The benefits apply to individuals and *society as a whole*, and include benefits to the environment. Radiation detriment may only be a small part of the total harm. *Justification thus goes far beyond the scope of radiation protection, and also involves the consideration of economic, societal and environmental factors*.[6]

Countries in the Pacific region, such as members of the Pacific Islands Forum, South Korea, China, and the Philippines, will receive no benefit from the proposed dumping of ALPS treated radioactive water into the Pacific Ocean. There will be some radiation dose, even if small. While the regulatory limit for public exposure is 1 millisievert per year (1 mSv/y), the Nuclear Regulation Authority has set a limit of 50 microsieverts per year (50 µSv/y), or 5% of the regulatory limit for this activity. TEPCO estimates that doses will be much lower than that; the main radiation exposure is estimated to come from ingestion of fish.[7]

Whatever the number, radiation doses will not be zero. According to generally accepted radiation protection principles, including in GSR Part 3, every increment of radiation dose produces an excess cancer risk with no threshold below which the risk is zero.[8] This is also the generally accepted science and the common regulatory basis for radiation protection of the public. This "no-threshold" approach was affirmed, for instance, by the International

[4] GSG-8 p. vii.
[5] GSG-8, p. 6.
[6] GSG-8 paragraph 2.11, p. 6, italics added.
[7] International Atomic Energy Agency, IAEA Review of Safety Related Aspects of Handling ALPS-Treated Water at TEPCO's Fukushima Daiichi Nuclear Power Station -- Report 1: Review Mission to TEPCO and METI, February 2022, p. 35, hereafter IAEA 2022.
[8] GSR Part 3, p. 2.

Commission on Radiological Protection (ICRP 99[9]), as it has been by other official scientific bodies.

Therefore, based on accepted science and the principles of radiation protection (including in GSR Part 3), countries and people in the Pacific region will suffer some radiation harm. Leaving aside the issue of Japan and the Japanese public for the moment, no other countries will experience any benefits, but they will experience non-zero radiation harm. Some of that harm will go on for decades (e.g., tritium), some for centuries (e.g., strontium-90 and cesium-137), and some essentially forever (iodine-129).[10] Radioactive pollution will be added to the Pacific Ocean even as the oceans of the world are already overburdened with pollutants and ecological destruction, which is being compounded by climate change.

Further, radiation, as GSG-8 notes, "may only be a small part of the total harm."[11] Fisheries and tourism may suffer reputational harm. Such harm has already been experienced by Japanese fishing communities, a reason they have opposed the TEPCO radioactive water dumping plan. South Korea is experiencing reputational harm even before the dumping starts. There has been panic buying of sea salt (used for making kimchi, among other dishes) because consumers fear that post-dumping salt may be contaminated by Fukushima water.[12]

The salt panic is an example of harm to societies where radiation may indeed be a small part of the harm compared to extensive and deep social, cultural, and economic harm. GSG-8 requires the consideration of "economic, societal, and environmental factors" when considering whether benefits outweigh the harm. As Tatsujiro Suzuki, former Vice-Chairman of Japan's Atomic Energy Commission, even in Japan most people in Japan have little trust in TEPCO or in the Japanese government, when it comes to Fukushima radioactive water dumping.[13] In that context, it is possible, and even likely, that societal and economic harm may considerably exceed radiation harm as assessed by normal scientific methods (such as the linear no-threshold regulatory approach to estimating cancer risk).

As a result of the above considerations, the harm to Pacific region countries will outweigh the benefits; indeed, there are no benefits to them. This means that, from a transboundary perspective, the proposed TEPCO dumping plan is not justified.

None of this has been considered by the IAEA; rather, it has simply stated that such considerations are Japan's responsibility. But Japan has not considered them either – a fact that became clear during the May 31/1 June 2023 virtual meeting between TEPCO, Japan's Nuclear

[9] International Commission on Radiological Protection, Low-Dose Extrapolation of Radiation-Related Cancer Risk, ICRP 99, October 2004, at https://journals.sagepub.com/doi/pdf/10.1177/ANIB_35_4

[10] The half-lives of these radioisotopes are as follows: tritium: 12.3 years; strontium-90: 28.9 years; cesium-137: 30.2 years; iodine-129: 15.7 million years. It is usual to attribute impacts for about several half-lives. They will have decayed to about 6% of the original value of radioactivity after four half-lives and under 1% (about 0.8%) of the original value after seven half-lives. One frequently used convention is to use 10 half-lives, by which the radioactivity would have decayed to less than 0.1% of the initial value.

[11] GSG-8, p. 6

[12] "Salt shelves at stores empty amid Fukushima water fears," *Korea JoongAng Daily*, June 19, 2023, at https://koreajoongangdaily.joins.com/2023/06/19/business/industry/Korea-Fukushima-salt/20230619183241480.html

[13] Tatsujiro Suzuki, "Why Japan's Plan for Fukushima Water Lacks Public Trust", Bulletin of the Atomic Scientists, 13 May 2021 at https://thebulletin.org/2021/05/whats-wrong-with-japans-anticipated-release-of-fukushimas-wastewater/

Regulation Authority (NRA), the Pacific Islands Forum, and the Expert Panel. The NRA, which sets the official terms for the dumping proposal, has not considered the justification aspect of GSG-8 for the countries of the Pacific region. Were the IAEA mindful of the justification requirements as they apply to TEPCO's dumping proposal, it could have made clear in its reports that the NRA should take those requirements into account. But it does not appear to have done so.

Even more shocking, the IAEA has unequivocally ruled out even considering the justification aspect. During the 8/9 June 2023 virtual meeting with the Pacific Islands Forum and its Expert Panel, at which this author was present, the IAEA explicitly stated that "we are not involved in the justification" and "we are not reviewing any justification".[14] As before, the IAEA stated that it was focused only on matters related to TEPCO's radioactive water dumping plan.

The IAEA also appears to be ignoring the GSR Part 3 on the matter of the linear no-threshold hypothesis for assessing radiation harm. During the 8/9 June meeting, the IAEA stated the following:

> …but today…we are using all the most prestigious knowledge that we have, and even more, be more conservative because the doses are…negligible, not low, negligible. Nobody can…attribute any effect for these values of doses.[15]

To say the doses are very small or even tiny is one thing. But to say that *nobody can attribute* any effect to these values of doses is to ignore IAEA's own GSR Part 3, ICRP 99, and the conclusions of some of the most prestigious bodies in the world. For example, the National Academies in the United States, in its most recent in-depth report on low level radiation, concluded as follows:

> The committee judged that the linear no-threshold model (LNT) provided the most reasonable description of the relation between low-dose exposure to ionizing radiation and the incidence of solid cancers that are induced by ionizing radiation.[16]

In its eagerness to justify that the proposed TEPCO radioactive water dumping plan will be safe, the IAEA even overstated the amount of natural tritium by orders of magnitude, saying that TEPCO releases over 30 years would be "negligible" by comparison:

> They [UNSCEAR scientists] …have experience on this, they know how many, how much tritium is produced in the world every day. And this *enormous* quantity of tritium, natural tritium, is produced. Now it's in the sea; and there is a kind of equilibrium in the sea, probably. And this tritium is producing every year, thousands of *kilos* of tritium, not 10 grams that is going to [be] released in 30 years in Fukushima. Therefore, if you compare the natural situation with this is negligible. Absolutely.[17]

Authoritative estimates of the amount of natural tritium vary somewhat, but they are all much smaller than the IAEA statement on 8/9 June 2023. The French radioprotection authority, IRSN,

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[14] Video recording of the IAEA's virtual meeting with the Expert Panel and the Pacific Islands Forum, 8/9 June 2023, starting time 0:22:17.
[15] 8/9 June video recording at 1:14:37.
[16] Committee to Assess Health Risks from Exposure to Low Levels of Ionizing Radiation, Board on Radiation Effects Research. *Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII – Phase 2*. National Research Council of the National Academies. Washington, DC: National Academies Press, 2006, p. 6.
[17] 8/9 June 2023 video recording at 1:12:13, the italicized words represent verbal emphasis evident in the recording.

estimates the amount of naturally produced tritium to be 0.15 to 0.2 kilograms each year.[18] Thus, if "thousands of kilos" is interpreted at the low end as 2,000 kilograms per year, the IAEA claim on 8/9 June 2023 is at least 10,000 times in error, according to the IRSN values. Argonne National Laboratory, a U.S. Department of Energy Laboratory, has estimated the "natural steady state global inventory" to be 7.3 kilograms.[19] Given that the half-life of tritium is 12.3 years, the inferred annual production would be about 0.4 kilograms.[20] The Argonne estimate means that the IAEA statement is at least 5,000 times wrong. Finally, the authoritative body that the IAEA was referring to above, the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) estimates a rate of tritium production that translated into an annual rate ranging from about 0.1 kilograms per year to 1.6 kilograms per year.[21] Thus, the IAEA citation of UNSCEAR's research was also seriously in error -- between about 1,000 times and 20,000 times (all values rounded).

It is hard not to conclude that the IAEA has narrowed its vision in advance to align with TEPCO's plan. This was illustrated by the video statement of Director General Grossi in April 2021, before the Task Force was even formed. He pronounced the plan as "both technically feasible and in line with international practice, even though the large amount of water makes it a unique and complex case."[22] *In the process, the IAEA has basically jettisoned the interests of Pacific region countries, including non-Japanese IAEA member countries, in favor of TEPCO and the Government of Japan.*

III. Optimization

The IAEA is also ignoring significant aspects of the optimization requirement of GSG-8. GSR Part 3 states requires that protection be "optimized"[23]; optimization generally follows justification in the sequence of requirements.[24] In fact, the document GSR Part 3 states flatly that "**The government or the regulatory body shall ensure that only justified practices are authorized."[25]**

GSG-8 provides specific guidance on what that means:

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[18] P. Calmon and J. Garnier-Laplace, Tritium and the Environment. Paris, France : Institut de Radioprotection et de Sûreté Nucléaire, 2010. On the Web at http://www.irsn.fr/EN/Research/publications-documentation/radionuclides-sheets/environment/Documents/Tritium_UK.pdf p. 4

[19] Argonne National Laboratory. *Radiological and Chemical Fact Sheets to Support Health Risk Analyses for Contaminated Areas*, 2007. On the Web at https://remm.hhs.gov/ANL_ContaminantFactSheets_All_070418.pdf, pdf p. 56.

[20] Annual production = (Steady-state inventory)*ln(2)/half-life = 7.3*0.693/12.3 = 0.41 kg/year.

[21] Calculated from the range of rates of 0.12 to 2 atoms/cm^2-sec of the Earth's surface in UNSCEAR, Sources, Effects, and Risks of Ionizing Radiation, 2016, p. 248, at https://www.unscear.org/unscear/uploads/documents/unscear-reports/UNSCEAR_2016_Report-CORR2.pdf using 3.15E7 seconds/year, Earth's area 5.1E18 cm^2, 6.02 atoms/mole tritium and 3 grams/mole.

[22] IAEA video, "Statement by IAEA Director General on Fukushima Water Disposal," 13 April 2021, at https://www.iaea.org/newscenter/multimedia/videos/statement-by-iaea-director-general-on-fukushima-water-disposal

[23] GRS Part 3, p. 4/

[24] See for instance GSR Part 3, pp. 35-37.

[25] GSR Part 3, p. 35, emphasis in the original.

> Optimization of protection and safety is defined as the process for determining what level of protection and safety would result in the magnitude of individual doses, the number of individuals (workers and members of the public) subject to exposure and the likelihood of *exposure being as low as reasonably achievable (ALARA), economic and social factors being taken into account*. This means that the level of protection would be the best possible under the prevailing circumstances, and will thus not necessarily be the option with the lowest risk or dose. Protection of the environment should also be considered in the process of optimization of protection and safety.[26]

The IAEA has considered optimization, including keeping doses as low as reasonably achievable, known as the "ALARA principle", but only in the context of the TEPCO dumping proposal.[27] The IAEA has not addressed and has refused to address optimization in the context of alternatives that are feasible and that would produce much lower doses and, at least as important, would avoid harm from wholesale ocean dumping of ALPS treated radioactive water.

Specifically, the Expert Panel has proposed that the water could be treated by ALPS, as now proposed by TEPCO, and then the radioactive water containing mainly tritium be used to make concrete with little potential for public contact, such as the concrete being used on the Fukushima site.[28] Tritium emits only relatively low energy beta particles, which will be almost completely blocked by the concrete. The IAEA has ruled this out as not being within its scope, even though a comparison of alternatives is normal in assessing compliance with ALARA. For instance, it is part of the guidance of the United States Nuclear Regulatory Commission:

> ALARA is the principle of reducing exposures to radiation when it is reasonable or practical to do so—that is, reducing radiation exposures to As Low As Reasonably Achievable, or ALARA.
>
> - ALARA evaluations usually address two aspects of what actions are reasonable: (1) typical good practices that are done to reduce exposures and (2) *comparison of costs and benefits of alternative actions* [29]

Compared to the Expert Panel concrete alternative, the TEPCO radioactive water ocean dumping plan would expose a much larger number of people, damage a much vaster environment, and produce much larger population doses, in addition to being unjustified for Pacific region countries. The Expert Panel noted in August 2022 that the options it proposed, including the concrete option, "*may have orders of*

[26] GSG-8, paragraph 2.16, p. 7, italics added.
[27] IAEA 2022, op. cit., Section II.5.
[28] The Expert Panel Concrete proposal is described in a recent paper: Arjun Makhijani, Ferenc Dalnoki-Veress, Robert Richmond, Antony Hooker, and Ken O. Buesseler, "Minimizing Harm: the concrete option for solving the accumulation of radioactively contaminated water at the Fukushima Daiichi Nuclear Power Plant site: A paper prepared by the Independent Expert Panel to the Pacific Islands Forum," June 2023,, at https://ieer.org/wp/wp-content/uploads/2023/06/Concrete-paper-Final-for-posting-with-affiliations-2023-06-12-v-2.pdf It is important to note that TEPCO's claim made during a meeting with the Pacific Islands Forum that it has considered the concrete plan is not correct. It considered a very different proposal that the Expert Panel would also have rejected, as discussed in the paper cited here.
[29] U.S. Nuclear Regulatory Commission, *Poster Title: ALARA Evaluation*, 16 September 2009, at https://www.nrc.gov/docs/ML0925/ML092530539.pdf , italics added.

magnitude lower impact than the proposed [TEPCO] course."[30] **As a result, the TEPCO dumping plan is not optimized for either the countries of the Pacific region or even for Japan.**

IV. Safety

There has been a great deal of discussion about safety. Japan has assured the public that the radioactive water dumping will not be done unless it is deemed to be safe. For instance, the Pacific Islands Forum Secretary General Henry Puna has written that he has been assured at the highest levels that the TEPCO plan will not be carried out until there is an agreement about its safety:

> I remain heartened by the assurance that Japan Prime Minister Fumio Kishida has given the Forum Chair and Leaders, in that Japan will not discharge the ALPS treated nuclear wastewater until such time that all parties agree that it is verifiably safe to do so and based on a relationship built of trust and in the spirit of friendship.[31]

A definition of safety is therefore essential. It is clear that there will be no absolute safety in the sense that risks and harm will not be zero. Radiation doses will not be zero; reputational and societal harms have already occurred. There will be some ecological damage, though the extent of it is unclear, because, as the Expert Panel noted in its August report to the Pacific Islands Forum, TEPCO has not "provide[d] a scientific basis for concluding that ecological harm will be minimal."[32] *Thus, safety must be defined here, as it generally is in such situations, within the requirements and guidance of radiation protection regulations when some harm will occur*. In the TEPCO radioactive water dumping plan, all the types of harm – radiation, environmental, and societal – will occur to some extent.

The IAEA set forth seven documents, enumerated above, for assessing safety including from the point of view of radiation harm and environmental harm. This framework must be viewed as a whole – indeed, GSG-8, GSG-9, and GSG-10 were designed as guidance for implementing the safety requirements in GSR Part 3. It is not appropriate to pick parts of the regulatory framework, such as the annual dose limit of 1 mSv, and examine optimization in that context by setting much lower dose constraints and proclaim safety. The IAEA documents include specific provisions for justification when there is harm (benefit must outweigh it), and optimization: radiation doses must be kept as low as reasonably achievable and, as quoted above, "Protection of the environment should also be considered in the process of optimization of protection and safety."

The IAEA is an advisory body, as it has pointed out to the Expert Panel. It was the Government of Japan that requested its involvement and oversight in regard to safety and protection of the public and the environment. The IAEA has announced a framework for evaluating the TEPCO plan and making its

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[30] Ken O. Buesseler, Arjun Makhijani, Antony Hooker, Ferenc Dalnoki-Veress, and Robert Richmond, Summary of Information and Data Gathered at Meetings and the Expert Panel's Views of the Scientific Status of the Planned Release of Radioactively Contaminated Cooling Water from the Fukushima Nuclear Power Plant Disaster, prepared for the Pacific Islands Forum, 11 August 2022, at https://ieer.org/wp/wp-content/uploads/2023/06/Expert-Panel-Memorandum-Summarizing-Our-Views-After-Meetings-with-Japan-and-Observation-of-PIF-meeeting-with-IAEA-2022-08-11.pdf, p. 9; italics in the original. Hereafter Expert Panel 2022.

[31] Secretary General Henry Puna, STATEMENT: Pacific Islands Forum Secretary General Henry Puna On the Fukushima Treated Nuclear Wastewater, Pacific Islands Forum, 26 June 2023, at https://www.forumsec.org/2023/06/26/statement-pacific-islands-forum-secretary-general-henry-puna-on-the-fukushima-treated-nuclear-wastewater/

[32] Expert Panel 2022, op. cit. pp. 7-8.

advisory conclusions, which everyone recognizes will carry great weight even if they are not binding in a regulatory sense. Japan could, in theory, go ahead and implement the dumping plan in the face of an IAEA declaration that it would violate some requirements and guidelines. Should it do that, the Government of Japan would incur the opprobrium of the international community while at the same time undermining the authority of the IAEA globally. Such an eventuality is extremely unlikely, a situation that places a special obligation on the IAEA to ensure that the full complement of requirements and guidelines is respected. The recommendations below are mindful of that context for the IAEA and for Japan. This is not just about the TEPCO dumping plan; it is about whether the IAEA accepts the responsibility for ensuring the integrity with which its requirements and guidelines are viewed by member governments and the global public.

By rejecting its responsibility for key parts of GSG-8, the IAEA is also rejecting the corresponding requirements in GSR Part 3 and the related fundamental safety principles in SF-1 (such as paragraph 3.18, which is part of Principle 4 on justification[33]). *The rejection means that the IAEA has effectively abandoned the safety and protection interests of the countries of the Pacific region, including the many IAEA member states in the region.*

The analysis above shows that for the countries of the Pacific region, the TEPCO dumping plan fails the justification test. Since it would have higher radiation doses and be vastly more polluting relative to the concrete plan suggested by the Expert Panel, is also fails the optimization test.[34]

It would be highly inappropriate for the IAEA to give an advisory green light to a plan that violates some of the basic provisions of IAEA requirements and guidance; options to limit the radiation, societal, and ecological harms to levels far below the TEPCO dumping plan are available. Therefore, the IAEA should declare officially that the TEPCO plan does not meet key protection and safety requirements and therefore cannot be declared safe. As a result, it should advise the NRA (i) to rescind its authorization for the TEPCO dumping plan and (ii) to ask TEPCO evaluate the Expert Panel's concrete proposal formally and in detail, as a stand-alone option or in combination with the other Expert Panel option of ALPS treatment followed by storage in seismically safe tanks. These analyses should be independently reviewed and publicly debated throughout the Pacific region so that the matter of safety can be taken up in a more credible way, in the context of fuller compliance with protection and safety requirements and guidance, including justification and optimization as defined in GSG-8.

As for Japan, the cost and benefit argument is more complex, requiring safety to be considered within the ALARA framework. It is nonetheless clear. While the IAEA has considered ALARA, it has done so in a very restricted way (as noted above). It has avoided considering, and avoided recommending that Japan consider, an option that would not only preclude harm to the countries of the Pacific region but also to the fishing communities of Japan. Since that option would have far lower public doses than the TEPCO plan, the ALARA part of the optimization

[33] SF-1, p. 10, Para 3.18 on justification requires that "all significant consequences of the operation of facilities and the conduct of activities have to be taken into account."

[34] Another of the options offered by the Expert Panel in August 2022 – ALPS treatment followed by storage in seismically safe tanks – until the tritium has almost completely decayed away should also be considered; the Expert Panel called it the "Safe storage" option and noted that it did not preclude the concrete option. Indeed, the combination of the two options should be considered as well. Expert Panel 2022, op. cit. pp. 8-9.

requirement has not been met for Japan. Since the concrete option would avoid ocean dumping, the TEPCO plan also fails the environmental protection aspect of optimization.

Thus, the TEPCO dumping plan also fails the optimization test for the public of Japan and for the environment. It is noteworthy that the Japanese fishing community is opposed to TEPCO's dumping plan even though financial compensation to the tune of 50 billion yen ($369 million) has been proposed.[35] Since the fishing community is opposed to the plan, despite the offer of compensation, the TEPCO plan also, arguably, fails the justification test in that the financial benefits for an economically and culturally important community do not appear to outweigh the costs as evidenced by its continued opposition.

The IAEA is an important United Nations institution. Like the rest of the Expert Panel, the author of this paper has been reluctant to criticize the IAEA. Yet, its outright refusal to apply its own guidance documents in full measure is stark. Its constricted view of the dumping plan has allowed it to evade its responsibilities to many countries. Its eagerness to assure the public that harm will be "negligible" has been carried to the point of grossly overstating well-known facts about tritium. The serious lapses of the IAEA in the Fukushima radioactive water matter have made criticism unavoidable.

The IAEA guidance documents cited in the IAEA's own Fukushima framework would, if fully applied, rule out dumping and the ecological damage resulting from a continuation of "dilution is the solution to pollution"; simply put, they would lead to a rejection of the TEPCO plan.

There is still time for the IAEA to limit harm to its own reputation, to the people and societies of the Pacific region, and to future generations. *To do so, it must fully implement the evaluation framework it set forth and not cherry-pick guidance in its own documents and misstate scientific facts in ways that make the dumping seem safe and acceptable.* Rather, the IAEA should, starting with Japan, provide guidance to nuclear power-possessing countries to stop dumping so that the oceans that have been much abused in so many ways for so long can at least have a chance to begin recovering.

[35] "Fishermen soften words but still blast Fukushima water-dump plan", The Asahi Shimbun, 23 June 2023, at https://www.asahi.com/ajw/articles/14939872.