Committee: Environmental Sub-Commission 2

Issue: Assessing the environmental impact and health consequences of the Fukushima Daiichi nuclear disaster

Student Officer: Jason Patsatzis

Position: Deputy President

INTRODUCTION

On Friday, March 11, 2011 humans were subject to the second-worst nuclear power generation accident which was rated as a level 7 on the International Nuclear Events Scale (INES). The Fukushima Daiichi Nuclear Power Plant consists of 6 reactors with reactors number 5 and 6 being at cold shutdown, the fourth reactor's core being unloaded and reactors number 1,2 and 3 working at full power at the time.

On that same day, at 2:46 pm a magnitude 9 earthquake struck 130km offshore the city of Sendai. Even though the Fukushima Daiichi Nuclear Power Plant had an anti-seismic design and withstood the earthquake, it was not able to withstand the resulting 15m tsunami which disabled 12 out of the 13 diesel power generators, leading to the heat exchange and cooling systems malfunctioning and in the end insufficient reactor cooling. Thus, 3 of the 6 reactors reached a nuclear meltdown. This is relevant since the reactors themselves were boiling water reactors (BWR), which means that at all times power is mandatory and if there is no power, water that is being used for the purpose of cooling can reach a critical state in its temperature and pressure.

In the case of the Fukushima Daiichi Nuclear Power Plant Disaster, we not only see marine pollution, but also atmospheric pollution and soil contamination. What can be held responsible for the leakage is a mix of insufficient cooling systems, high pressure in the reactors and the need to cool the reactors before the cores and the fuel reach a critical state and meltdown which can cause any further leaks. The aftermath not only caused disturbance and international reactions, it also caused worldwide protests regarding the condemning of the use of Nuclear Power Plants, because of the detrimental effects they can have on human health and the environment; more specifically, radioactivity can wipe out ecosystems and make soil unusable.

DEFINITION OF KEY TERMS

Nuclear Power Plant

A plant that uses radioactive elements to produce energy. These plants do not produce any greenhouse emissions; however, in the aftermath of an accident, they run many risks of radioactive contamination.[1]

Boiling Water Reactor (BWR)

A Boiling Water Reactor is a cooling system used in nuclear reactors and it uses recycled water. Water is pumped into the core, and as the water is absorbing the heat, it boils, vaporizes and becomes steam. When the water reaches its gas phase, it is circulated and pumped into condensers, heat exchangers or wet wells which, in combination with cold water and low temperatures, is condensed back into water, then recycled and pumped back into the core.[1]

Nuclear/Core Meltdown

A Nuclear Meltdown is the worst-case scenario for any nuclear accident because it damages the reactor beyond repair. Additionally, it has detrimental effects on the environment and causes tremendous leaks of radioactive elements in the soil, atmosphere and sea. Nuclear Meltdowns[2] occur when the fuel is not adequately cooled, which leads to the overheating of the fuel, and eventually corium is formed (which is a type of radioactive magma combined with the molten core), which melts through the chamber floor releasing radiation.[2]

[1] "What Are Boiling Water Reactors." *Nrc*, www.nrc.gov/reactors/bwrs.html.

[2] "What Is a Nuclear Meltdown - Nuclear Power Info." *Nuclear Energy, Reactor and Radiation Facts*, www.fairewinds.org/what-is-a-meltdown.

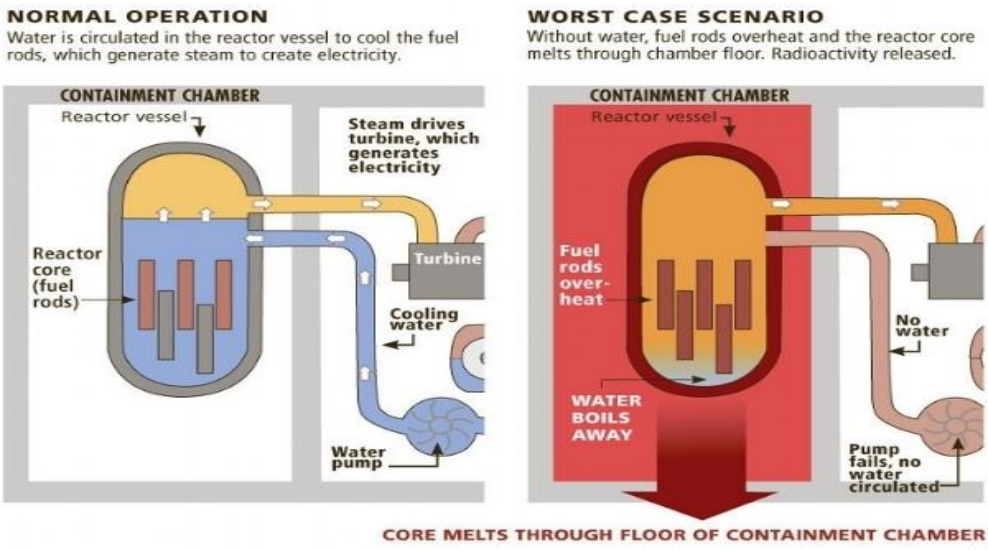

Figure 1: A model explaining what happens during a nuclear meltdown, source: "What Is a Nuclear Meltdown - Nuclear Power Info." *Nuclear Energy, Reactor and Radiation Facts*, www.fairewinds.org/what-is-a-meltdown .

Nuclear Disaster

As quoted by the International Atomic Energy Agency, a nuclear disaster is a nuclear accident that has significantly affected the people, the environment or even, the facility itself, and has had detrimental consequences regarding the lethal effects on people, large leaks into the environment or even reactor core melt.[3]

Radioactive Contamination

As stated by the Centre for Disease Control and Prevention (CDC), ''Radioactive contamination occurs when radioactive material is deposited on or in an object or a person. Radioactive materials released into the environment can cause air, water, soil, plants, buildings, people, or animals to become contaminated.''[4]

[3] Follow. "Nuclear Disasters." *LinkedIn SlideShare*, 30 Oct. 2014, www.slideshare.net/chetanm452/nuclear-disasters-40919060.

[4] "CDC Radiation Emergencies." *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, 4 Apr. 2018, www.cdc.gov/nceh/radiation/emergencies/contamination.htm.

Radioactivity

As the Advisory Committee on Human Radiation Experiments states, '' Radioactivity is the act of emitting radiation spontaneously. This is done by an atomic nucleus that, for some reason, is unstable; it needs to emit some energy in order to shift to a more stable configuration.''[5]

Fukushima Daiichi Nuclear Power Plant (FDNPP)

The Fukushima Daiichi Nuclear Power Plant is a Power Plant located in the town of Okuma. On March 11, 2011, after a tsunami struck the plant leading to the loss of power, the Fukushima Daiichi Nuclear Power Plant Reactors number 1,2,3 and 4 lost all of their cooling capacity leading to the nuclear/core meltdown of 3 reactors, resulting in massive spills of radiation into the sea, soil and atmosphere. The decontamination efforts of this plant are ongoing even today, with the general area around the facility itself not being safe.

Figure 2: This aerial photograph shows the Fukushima Daiichi Nuclear Power Plant (FDNPP). Source: "Fukushima Daiichi Nuclear Power Plant." *NS Energy*, www.nsenergybusiness.com/projects/fukushima-daiichi-nuclear-power-plant-japan/

[5] WPI, Environmental Information Services -- Shawn Denny. "Advisory Committee On Human Radiation Experiments Final Report." *EHSS Welcome*, ehss.energy.gov/ohre/roadmap/achre/intro_9_2.html.

BACKGROUND INFORMATION

The Fallout

After 3 cores reached a state of nuclear meltdown, the damage had already been done. Due to high concentrations of hydrogen in the reactors, during the next two days the roofs of reactor buildings number 1, 3 and 4 exploded. This was when the biggest release of radioactive elements into the atmosphere took place. What can be blamed for this is the fact that under the roofs of all reactor buildings was the spent fuel and contaminated water pools, which contained radioactive elements such as Cesium 137, Telluride, Xenon, Krypton and Iodine.

What led to the explosion is the fact that after the loss of power, the emergency diesel generators lost power and the operators of the plant faced a huge problem. The core of reactors 1, 2, 3 had melted, thus reaching nuclear meltdown, and the pressure inside the reactor chambers kept rising, so the operators opened the valves and gas went through the wet well. However, in reactors 1, 3 and 4, due to uncontrollable leaks, hydrogen was released to the roof of the reactor buildings, where, on reacting with the oxygen in the air, explosions took place which blew off the roofs.

As a result of the explosion, Cesium 137, Telluride, Xenon, Krypton and Iodine were exposed to the atmosphere. However, due to firefighters and operators constantly spraying the spent fuel pools with cold water, the worst-case scenario was averted and even though some elements were released into the atmosphere, the worst did not come.

The biggest source of radioactive material in the ocean and the soil was from reactor number 2. In the reactor building of reactor number 2, due to problems with the depressurizing of the reactor building, an internal explosion took place, breaking the wet well suppression pools, which contained water with a high presence of unfiltered radioactive elements, which ended up contaminating the ocean and the soil.

As a result of the nuclear accident, a 20km no-go zone was established around the Fukushima 1 Nuclear Power Plant. In addition to this, people living there were forced to relocate to shelters provided by the Japanese government.

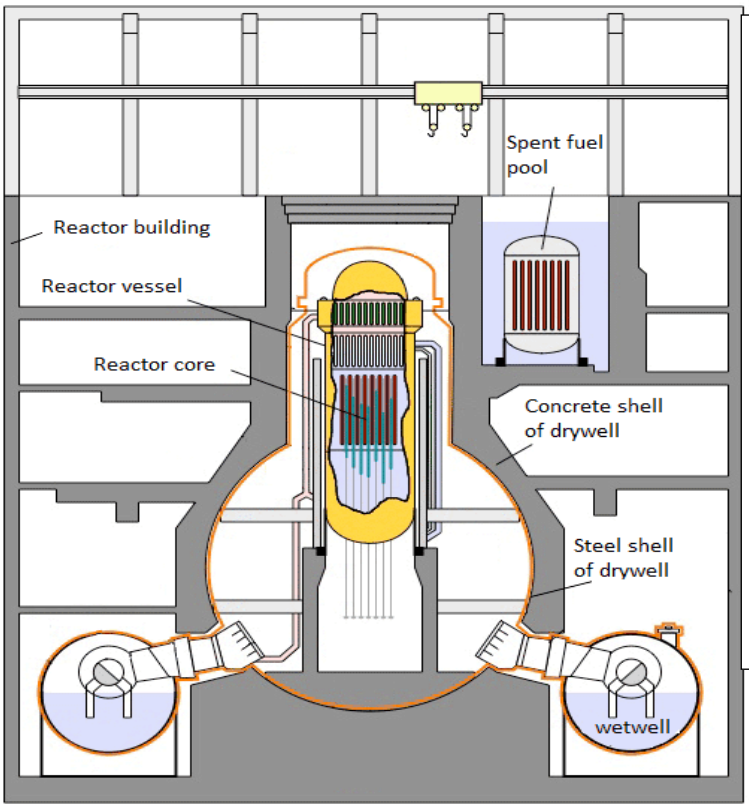

Figure 3: A model of a reactor building similar to the one at the Fukushima Daiichi Nuclear Power Plant. The reactor in this image is in perfect condition.

Connor, Nick. "What Is Drywell - Wetwell - BWR - Definition." *Reactor Physics*, 19 May 2019, www.reactor-physics.com/what-is-drywell-wetwell-bwr-definition/

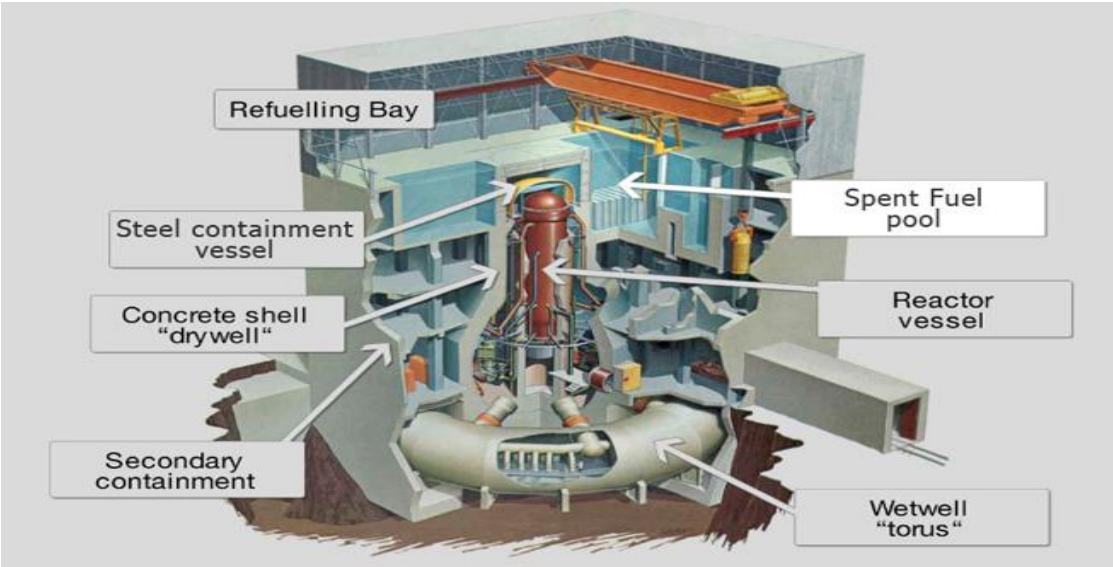

Figure 4: This sketch represents the Fukushima 1 Reactors after the explosions took place. We can clearly see the broken wet well and exposed Spent fuel pool, which emit huge sums of radiation and contaminate both the soil, marine and atmosphere.

"The Fukushima Daiichi Nuclear Disaster." *Yu Lung Yeung*, 8 Mar. 2013, sites.suffolk.edu/eelement/2013/03/08/the-fukushima-daiichi-nuclear-disaster/ .

Health Aftermath

The health effects of the Fukushima Daiichi Nuclear Disaster were not very clear in the beginning with many people believing that the residents of Fukushima will be subject to various types of cancer (e.g. thyroid cancer). However, since the evacuation was rapid, the residents of the general area around the power plant and Okama did not suffer from radiation poisoning.

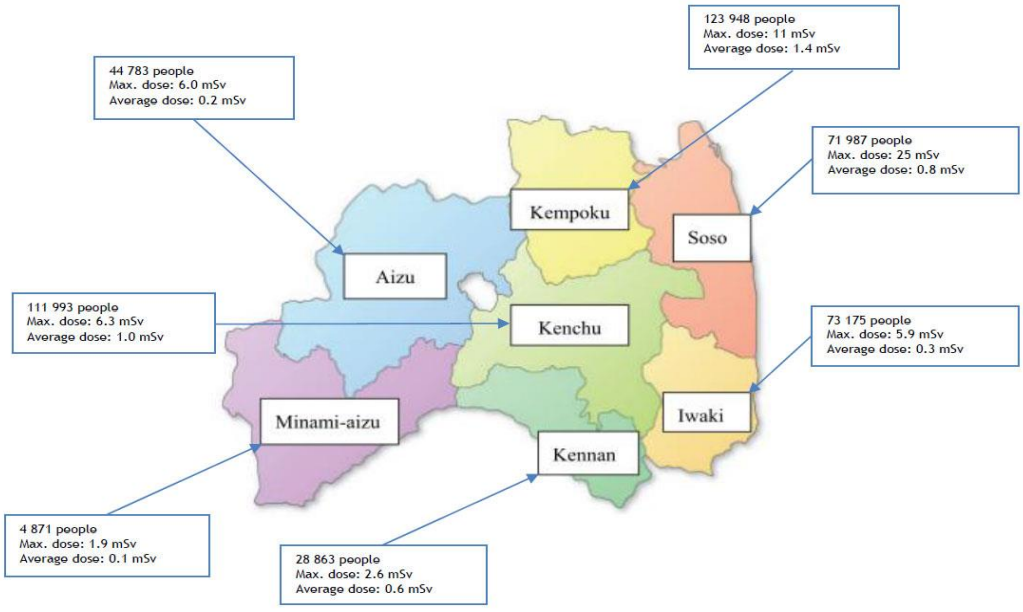

Figure 5: A map showing the distribution of the maximum external doses received during the first four months after the accident by the population residing in the Fukushima Prefecture. "Health Impact." *Health Impact in 2016 of the Fukushima Daiichi Accident*, www.irsn.fr/EN/publications/thematic-safety/fukushima/fukushima-2016/Pages/Fukushima-in-2016-Health-impact.aspx

The people that are still most at risk are the workers of the plant since they received high doses of radiation during the release of radioactive materials into the atmosphere and meltdown. However, as the years go by, we will be able to fully understand the health effects of Fukushima.

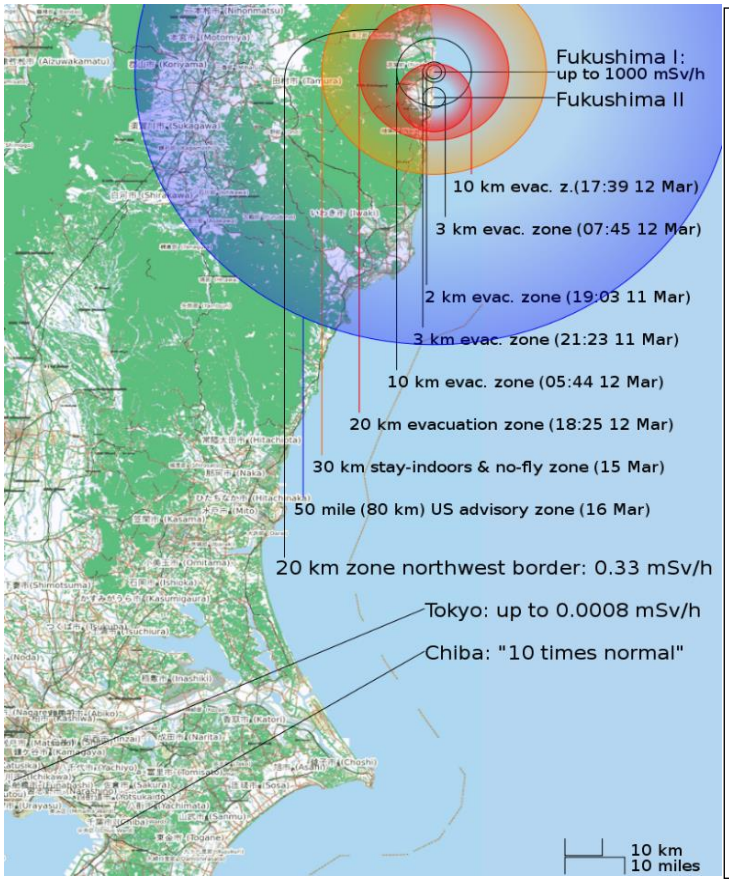

Figure 6: A map exhibiting the timeline of the evacuation and other zone progression and selected radiation levels zones established in the succession of the Fukushima Daiichi Nuclear Accident.

Source:"File:Fukushima Accidents Overview Map.svg." *File:Fukushima Accidents Overview Map.svg - Wikimedia Commons*, commons.wikimedia.

The doses that the people received ranged from 10 to 20 mSv with the highest dose being 35 mSv. These doses were received in the first weeks after the accident due to inhalation and external irradiation of radioactive substances in the air, and due to radionuclides, atoms with excess nuclear energy, contaminating the soil.

However, we need to take into consideration that the 2018 and 2013 findings of WHO's (World Health Organization) risk assessments have shown us the following. Firstly, the increased cases of thyroid cancer that were observed amongst children and young adults are probably not due to the radiation stemming from the accident. In addition to this, what has been noticed is the increase in mood disorders: Post Traumatic Stress Disorder (PTSD) and anxiety are both related to the accident even after five years, in comparison to the national average of Japan. More specifically, in the general area of Fukushima, the aforementioned mental illnesses are 2 and a half times more common. Additionally, we can see that due to people being relocated because of the nuclear accident, rates of depression and loneliness among these relocated people are way higher. The health aftermath is mostly with regard to the mental health of people, since they had to cut family ties, relocate,

abandon their hometowns and at worst, even have lost people themselves. Furthermore, it was found that in Fukushima, in comparison to the world average, there was no significant difference in preterm deliveries, low birth weight or even anomalies and mutations.

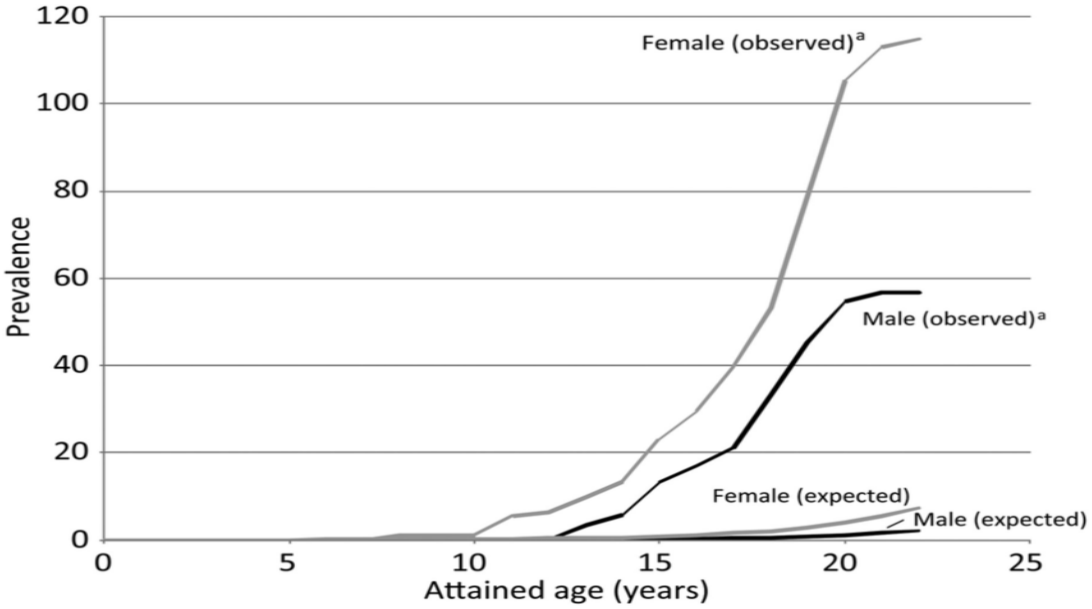

Figure 7: This graph depicts the increased thyroid cancer cases recorded in children and younger adults after the Fukushima Daiichi Nuclear Accident in 2015, in comparison to the ones expected in 2010.

Quantification of the Increase in Thyroid Cancer Prevalence in Fukushima after the Nuclear Disaster in 2011. www.researchgate.net/figure/Figure1-Age-specific-prevalence-of-thyroid-cancer-in-Fukushima-Prefecture-expectedin_fig2_290174380

There is still more to be said about these cases of thyroid cancer. Usually radiation mostly causes cancer in this area of the body. Despite that, international reactions were sparked after the accident regarding the supposed rise of thyroid cancer in the area due to the radiation. Opinions are divided over this topic and due to the intensity of the reactions, people living in Fukushima were screened at the time. The results, as clearly shown in the graphs above, showed a rise in comparison to the expected cases. However, we cannot determine exactly if radiation caused these cases and what their relationship with the accident was since we cannot exactly determine the exact dose of radiation that everyone received. Consequently, most theories are driven by speculation and the given graphs. Even though the public believes that the cancer cases are because of the accident, the WHO is of the opposite opinion. The UNSCEAR has also concluded that the radiation effects are too small to notice since people were well protected and the radiation doses were low or very

low. Yet again, since there is not much evidence all these views are driven by speculation. Other organizations such as the American Institute of Health deem that thyroid cancer is not always correlated to radiation and many times someone can have the seeds of such a disease, yet live a normal and healthy life or even developing it without a history of radiation exposure.

Results as of March 31, 2018

Screening round	Number of suspicious FNAC cases	Number of surgical cases	Number of confirmed cancer cases	Papillary thyroid cancer	Poorly differentiated thyroid cancer	Other type of thyroid cancer
1st	116*	102*	101	100	1	0
2nd	71	52	52	51	0	1
3rd	12	9	9	7	0	0
Total	199*	163*	162	160	1	1

*includes a case of benign nodule

Figure 9: This table shows the results of the second tests and screenings for thyroid cancer in the March of 2018.

Source: *Fukushima Thyroid Examination June 2018: 162 Surgically Confirmed as Thyroid Cancer Among 198 Cytology Suspected Cases*, 5 July 2018, fukushimavoice-eng2.blogspot.com/2018/07/fukushima-thyroid-examination-in-june.html

The Environmental Aftermath

From the moment the meltdown began, it was pretty clear to both the operators and the Japanese Government officials that the environmental impact would be evident and detrimental.

After the nuclear accident, radionuclides contaminated the environment. However, in the beginning the radioactive isotopes of tellurium and iodine were the issue, since they have a short lifespan, so for months and days after the accident, the focus was on these elements. Despite that, in the long-run, the elements that did the most damage due to their longer lifespan of 30 years were the radioactive elements caesium-134 and caesium-137.

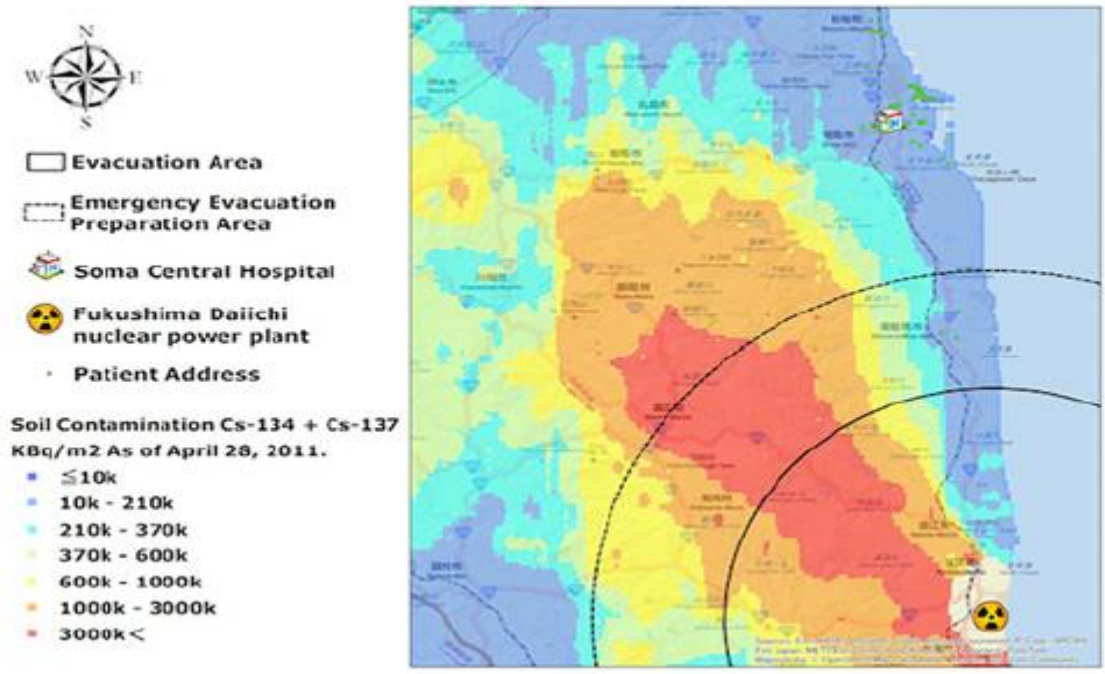

Figure 10: A map manifesting the disperse of cesium-134 and cesium-137 on the soil, roughly two and a half months after the accident. *Aftermath of the Great East Japan Earthquake Disaster: A Retrospective Case Series*. www.researchgate.net/figure/Map-of-north-coastal-area-of-Fukushima-prefecture-with-level-of-soil-contamination-in_fig1_276071140

The contamination of the soil enabled itself to eradicate Fukushima's soil and agriculture, with all products of the general area being affected by this contamination, having an abundance of caesium-134 and caesium-137 and being deemed not safe for human consumption came as no surprise.

The soil around Fukushima was contaminated with amounts exceeding 100,000 MBq per cubic kilometer. Whereas for food production the upper limit for cesium is 2.500 Bq kg^{-1}, so as we can understand that the agriculture especially in eastern Fukushima suffered a huge blow, even though most of the cesium absorbed by the soil did not get absorbed by the plants there.

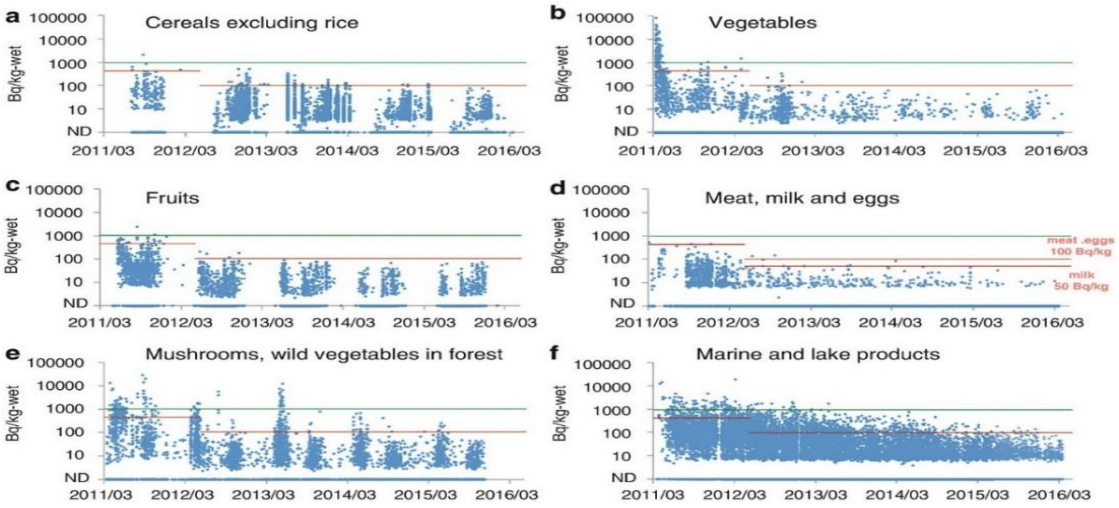

Figure 11: The presence of cesium in agricultural products made in Fukushima and the decline in the presence of cesium over the years.

Source: Tanoi, Keitaro, et al. "Agriculture in Fukushima: Radiocesium Contamination of Agricultural Products." *SpringerLink*, Springer, Singapore, 1 Jan. 1970, link.springer.com/chapter/10.1007/978-981-13-8327-4_12 .

The main radioactive element which has contaminated most of the soil in northeastern and eastern Japan is caesium-137, despite the fact that the other regions of Japan, due to their mountainous terrain, were sheltered. Even though the Fukushima Daiichi Nuclear Accident was the biggest source of accidental radionuclides released into the atmosphere and soil, the results ranged from the impairment of the agricultural scene to radiation exposure due to the atmospheric contamination. The soil there will take years to recover and for it to be deemed completely safe again. So, in order to help this agricultural sector recover, the Government of Japan has been constantly promoting the products of Fukushima as safe and has been encouraging their selling price to be lowered in order for them to gain a competitive advantage in the market. However, it is still a market which is far from recovery.

The radioactive leakage into the ocean was massive, since the reactors were cooled with seawater, the ocean water came in direct contact with fuel rod material, radioactive isotopes and other radionuclides. Again there was a huge presence of cesium. The spill was massive with Cs-134 and Cs-137 being found 600km offshore, and with other cesium isotopes being found in mesopelagic fish and zooplankton and even with some fish reaching US markets and shores. However, the risk for human consumption was not high and marine

life was not greatly affected, but the local fishery was. Similar to the agricultural decline of Fukushima, the local fishery followed that path as well. Still what needs to be taken into consideration is that even small amounts of cesium in fish can impose a health risk.

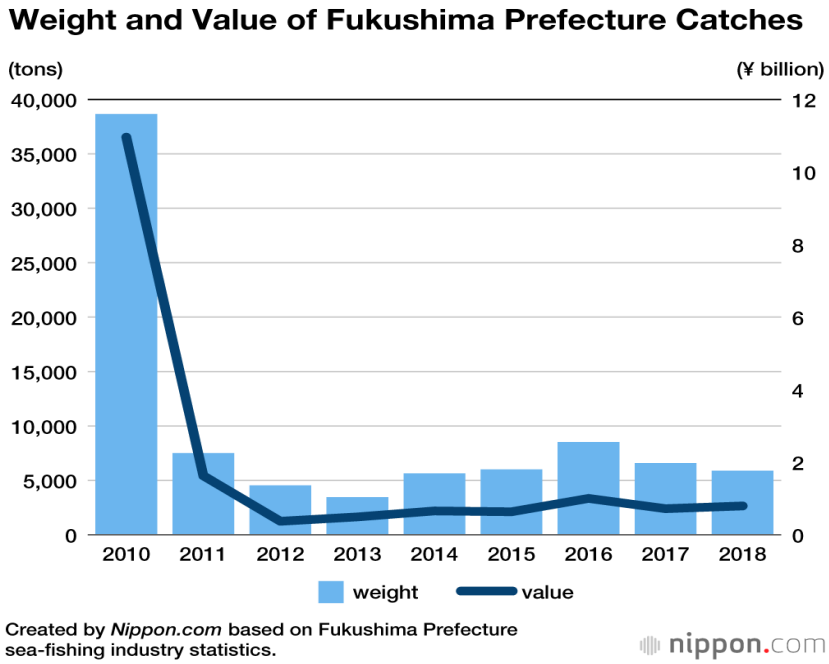

Figure 12: This graph shows the decline of the local fishery and how its value went dramatically down the years following the Fukushima Daiichi Nuclear Accident

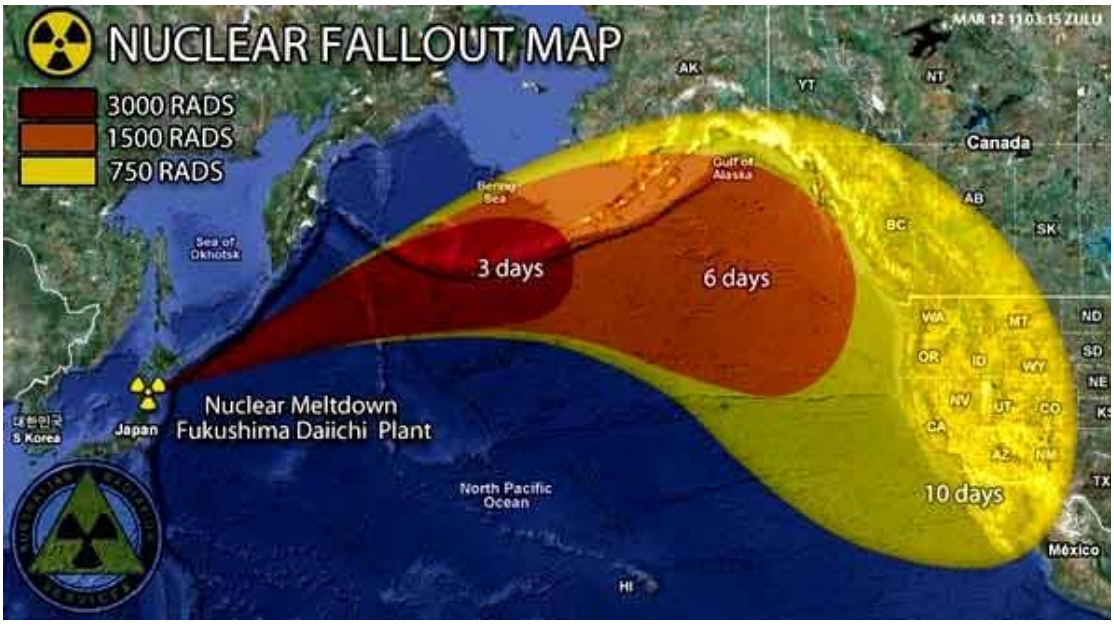

Figure 13: This map depicts how contaminated water spread in the North Pacific Ocean and reach US shores. Mikkelson, David. "Fukushima Nuclear Fallout Map." *Snopes.com*, www.snopes.com/fact-check/nuclear-fallout-map/

However, it was not only the ocean water that was contaminated. In June 2013, it was discovered that groundwater which happened to be under the FDNPP was contaminated because of leaks within the cooling system of the reactors; this was later confirmed by the International Atomic Energy Agency (IAEA). This affected the drinking water supply of Fukushima; however, the World Health Organization prevented further damage and contamination by applying a multi-layer and preventive approach. Even though many similar attempts took place in order to decontaminate Fukushima, recent accusations that the UN has made indicate exploitation of the decontamination workers and even non-adherence of safety guidelines, which has hindered efforts.

The environmental damage led to the economy of Fukushima being highly affected since two very important sectors in the area suddenly lost their value due to the soil and marine contamination. In addition to this, many people were forced to relocate, further hurting the economy. The environmental damage in the case of the Fukushima Daiichi Nuclear accident is of a magnitude bigger and more detrimental than the one of Chernobyl.

However, there is still one more aspect of the environmental aftermath which is not considered, this is the wildlife aspect. Before the nuclear accident, the wildlife of Fukushima was similar to that of any urban town. Despite that, in the wake of the accident, many theories speculated regarding how wildlife would be endangered due to radiation, which was true. Reports have shown that, after the accident, many mutant birds and insects were observed in Fukushima. However, a few years after the accident, despite these mutations, it has been observed that the wildlife in Fukushima is thriving. Since the area became devoid of human presence, the wildlife there could develop and now wildlife is abundant in Fukushima. However, mutations do not go away and, to be more precise, animals that mutate undergo changes in their genes and DNA, making them not functional and rather they run a high risk of passing these mutations to their offspring. However, as long as an animal species does not undergo these mutations, the species will not be entirely disturbed. To conclude, wildlife, even though some species were partially affected due to the absence of humans, it was able to thrive even under these conditions. This effect was also similarly observed in the Chernobyl Nuclear Accident whereas, even though some species were affected, the wildlife was able to develop and regain control of grounds they lost because of humans.

Figure 14: This picture shows a prime example of the effects of radiation on animals. This is a butterfly found in Fukushima with severe abnormalities. Crumpton, Nick. "'Severe Abnormalities' Found in Fukushima Butterflies." BBC News, BBC, 13 Aug. 2012, www.bbc.com/news/science-environment-19245818

MAJOR COUNTRIES AND ORGANISATIONS INVOLVED

Japan

Leading the decontamination efforts, it is responsible for the decontamination of the seas, soil and atmosphere. Japan plays an instrumental role in this area, because it is Japan's responsibility to ensure that Fukushima can be reoccupied, that contaminated food is not consumed and that the toxic waste following the fallout is dealt with. Even until today, though, the nuclear waste problem regarding the radioactive water remains a highly controversial topic, with Japan and the IAEA supporting the idea that dumping the water in the ocean will not cause any harm. However, South Korea, the Democratic People's Republic of Korea and Greenpeace highly condemn such an act.

United States of America

The United States Department of Energy (DOE) and the National Nuclear Security Administration sent emergency teams to Fukushima in the wake of the accident. Additionally, the USA sent 8.6 tons of equipment to assist Japan in its efforts to monitor radiation. The USA response teams and the radiation measurements they took proved to be very crucial in understanding the aftermath and the effects of the radiation leak. Besides that, the USA has been affected, with radioactive water reaching its shores and contaminating local marine life.

Figure 15: This aerial photograph shows Fukushima debris floating near the US West Coast.

"1 Million Tons of Fukushima Debris Floating near US West Coast?" *RT International*, www.rt.com/usa/fukushima-debris-island-texas-266/

South Korea

South Korea, as a neighboring country of Japan, plays a major role because the nuclear waste directly affects Korea. South Korea has been strongly against Japan's plans to dump 1 million tons of radioactive water, contaminated with tritium which is radioactive hydrogen. South Korean President Moon Jae-in has been raising awareness regarding how South Korea has been affected by the Fukushima 1 accident and how dumping radioactive water into the ocean will send radioactive water to the shores of South Korea, Japan and DPRK and disrupt fishery for the aforementioned countries. Even though South Korea has assisted Japan in monitoring radiation, it is strongly urging Japan to deal with nuclear waste without polluting the ocean.

International Atomic Energy Agency (IAEA)

The IAEA is an autonomous organization within the UN. It has played a crucial role in the decontamination efforts through carrying out reports and studies that indicate how the radiation levels have changed, but also guided the Japanese government officials on how

to deal with the ongoing crisis through their research. Their reports contain a lot of important details and offer a bigger picture regarding the leakage but also what is going on inside the damaged reactor buildings. In short, the Japanese government and the Japanese Ministry of the Environment have been cooperating by frequently providing the IAEA with reports regarding the monitoring of radiation contamination and leaks in both the ocean and other water sources.

Figure 16: Japanese Government and IAEA officials evaluating cleanup efforts. Source: "Japan Must Continue Efforts to Deactivate Fukushima Nuclear Plant – UN Agency | | UN News." *United Nations*, United Nations, news.un.org/en/story/2013/05/440482-japan-must-continue-efforts-deactivate-fukushima-nuclear-plant-un-agency.

TEPCO (Tokyo Electric Power Company)

TEPCO is the company running the Fukushima Daiichi Nuclear Power Plant (FDNPP). Even though it is partially owned by the Government of Japan, TEPCO is the 'middleman' between the Japanese Government and the IAEA. TEPCO is the one coordinating the cleanup efforts; however, many people including the Japanese public itself doubt not only TEPCO but the Japanese Government itself for their participation and compensation of the decontamination efforts.

Figure 17: TEPCO's decommissioning plan for the Fukushima Daiichi Nuclear Power Plant. "Decommissioning Plan of Fukushima Daiichi Nuclear Power." *TEPCO*, www.tepco.co.jp/en/decommision/index-e.html

Greenpeace

Greenpeace, like South Korea, strongly condemns the act of dumping nuclear waste and tritium contaminated water in the ocean. Greenpeace however has helped in the relief efforts, by measuring radiation levels in the general area of Fukushima and advising the government of Japan to have a 20km radius no-go zone around the Fukushima Daiichi Nuclear Power Plant (FDNPP).

TIMELINE OF EVENTS

Date	Description of Event
March 11, 2011	A magnitude 9 earthquake strikes, and an hour later a tsunami hits the FDNPP, disabling all backup generators and all its cooling capacity
March 12, 2011	As the situation in the 3 reactors becomes worse and harder to keep control of, the Japanese Government extends the evacuation zone to 10km and subsequently to 20km
March 15, 2011	Explosions take place both in reactors 3 and 4. Radiation measurements are equal to 400 mSv/s
April 2 2011	Water from the reactor 2 is found to be flowing into the ocean
April 4 2011	TEPCO dumps water contaminated with radionuclides into the ocean
April 5 2011	Iodine-131 levels in the general area of the plant are found to be 7.5 million times higher than the legal limit
April 19 2011	Robots inside reactors 1 and 3 measure the highest radiation to date, which was 1120mSv/h
10 August 2011	There is a new closed-circuit cooling system which uses recycled water; however, due to problems with the water decontamination system, it only operates at 66% of its capacity
October 8 2011	High levels of plutonium, caesium and other radioactive elements are found outside the 30km evacuation zone.

Date	Description of Event
November 17 2011	A shipment of rice made by a local farmer is banned due to high and illegal amounts of cesium.
December 15 2011	Decommissioning plans for the reactors are set to end in 2052
December 16 2011	Finally, it is announced that all reactors are at cold shutdown, however the temperatures inside and where the corium and fuel material has gone is unknown
February 22 2012	Concrete is poured on the ocean floor by TEPCO in order to abate contaminated sediment
November 18 2013	Workers begin to delicately remove spent fuel rods from the reactor 4 building
Throughout 2013	Evacuation orders in some villages are lifted
June 2014	American Company Kurion is contracted with dealing with the contaminated water
September 20 2014	TEPCO tests new water decontamination systems
October 1 2014	Further lifting of evacuation orders
3 February 2017	Measurements inside reactor 2 are taken, and the measurement being the highest recorded at 530Sv/h
26 September 2017	A new roadmap plans the removal of fuel rods from reactor 3 in 2018 but the removal of the rest of the fuel rods is delayed
15 February 2019	A robot for the first time makes contact with fuel debris in the reactor 2, and was able to loosen and move debris at 7 locations
March 4 2020	Evacuation orders for some town affected by the Fukushima Nuclear Accident are lifted in the wake of the Olympic Games

UN INVOLVEMENT: RELEVANT RESOLUTIONS, TREATIES AND EVENTS

The UN has had some involvement in the Fukushima Daiichi Nuclear Accident. This involvement was in the form of research and studies. Two major organizations have been involved in researching and monitoring radiation: The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and the United Nations Environmental Program (UNEP). UNSCEAR has released countless reports on both the health and environmental effects of the nuclear accident. UNEP has focused mostly on the environmental effects. All of these reports have reached the same conclusions and constitute a clear representation of the UN's view on the topic. Despite these reports, the UN's involvement has not been major. However, other organizations like the IAEA (International Atomic Energy Agency) and WHO (World Health Organization) have been more involved due to the nature of their organization. The IAEA coordinated decontamination efforts from the beginning, and WHO was one of the first organizations to report on the health effects.

PREVIOUS ATTEMPTS TO SOLVE THE ISSUE

Apart from the decontamination efforts, the only attempts to solve the issue have been carried out by the Japanese Government. With regards to the soil being highly contaminated with many radioactive elements, such as cesium 134/137, a lot of root foods from that soil have been deemed inappropriate for human consumption. The Japanese Government has introduced some limits when it comes to the Becquerels a product can have. This limit has been set to 100 becquerel with all products over that limit being deemed as inappropriate for human consumption and thus not sold. These limits have been also adopted by the European Union.

In addition, in order for the decontamination efforts of particular areas that had a value of external radiation above 0.23 mSv to be eased, the Japanese Ministry of the Environment published a roadmap. However, this value led to an additional dose of one millisievert yearly which affected over 100 municipalities in 8 prefectures. Lastly, in order to ease the international reactions and fallout following the nuclear accident in Fukushima 1, and in order to ensure that the health effects would be minimal, the Japanese Government carried out several tests and screenings of children.

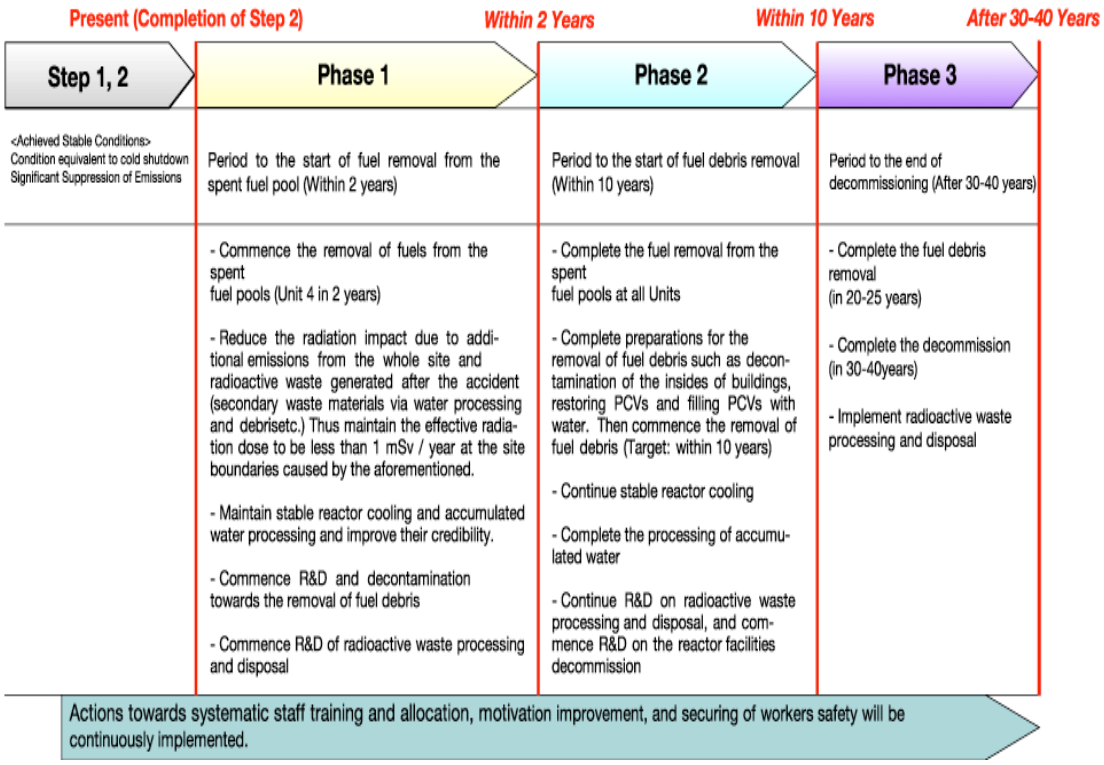

Figure 18: This model demonstrates how the decontamination procedures will take place and how long will each phase last and what will take place in each one. "3. The Future Action Plans." *TEPCO*, www.tepco.co.jp/en/nu/fukushima-np/review/review3_1-e.html

POSSIBLE SOLUTIONS

In the decontamination efforts of the Fukushima Daiichi Nuclear Power Plant, in order for procedures to run smoothly, it needs to be ensured that workers there are not exploited. Workers in Fukushima are of lower incomes, asylum seekers or even homeless. They are vulnerable since they need incomes and stable jobs. Based on UN reports safety guidelines are not being adhered to and there is possible exploitation based on workers' reports. These workers are the ones who have to decontaminate fuel rods and constantly work in a radioactive environment. Furthermore, there needs to be assurances that people are fully protected while working there in order for the decommissioning efforts to be as fruitful as possible.

Another reasonable solution would be ensuring that the people that were relocated do not suffer from PTSD and that they can reconnect with their families in order for the

improvement of their mental health. In addition to this, these people cannot live in portable houses forever; they could be permanently relocated to other bigger towns or villages where they have family members or friends in order to decrease loneliness and mood disorders.

The decontamination of Fukushima is a highly controversial issue especially with nuclear waste being highly debated upon due to the risks and hazards it carries. Thus, what has to be certainly done is the dealing with the nuclear waste. Nuclear fuel and contaminated water cannot just take more and more space everyday in the Fukushima Daiichi Power Plant. A good solution to the nuclear waste problem of Fukushima is the contracting of a company or organization that can store that waste without polluting the environment. The biggest problem of Fukushima is not the contamination, since radiation contamination goes away with time and the presence of radionuclides keeps getting relatively less throughout the years as they reach the end of their half-life. The problem is dealing with nuclear waste. The only way to handle the waste is to store it somewhere safe, away from humans, where it does not pollute the environment.

With the accident, Fukushima lost something very crucial. It lost its agriculture and fishery leading to huge financial damages and the local economy being hindered due to people evacuating the area. Consequently, what has to be kept in mind is ensuring the economical stability of these two sectors since they are a part of the environment and the only thing that people still living in Fukushima can use in order to survive.

Lastly, the Fukushima Nuclear Disaster as an event drew international attention advocating using renewable sources instead of nuclear energy. Since, as mentioned already, even though nuclear energy is very efficient, one accident can be tremendous and have detrimental effects on the economy and people's health. This is already starting to take place in Asia with nuclear energy being less and less used. In addition to this, in Japan nuclear energy is in decline and yearly protests take place on March 11 to advocate using other sources of energy. For a good resolution, delegates need to understand all the aspects of this topic. The financial, environmental and health aspects in order to come up with effective solutions. The rights of the workers need to be protected, the ocean has to be protected from contaminated water and relocated people need to be cared for, the same goes for Fukushima's failing economy.

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