Q3: Analyze the impact of Fukushima’s wastewater to the environment, the social perception of the company/country. What are the alternatives?

What causes Fukushima’s wastewater?

11th March 2011, at 14.26 the magnitude 9.0-9.1 undersea megathrust earthquake[[1]](#footnote-1) hit the pacific coast of Honshu, the main island of Japan. Within less than an hour after the earthquake, a tsunami with waves that went all the way up to ten kilometers inland and swept over the coast, resulting in over 20 000 people dead, destroying towns and affecting the nuclear power plants, Fukushima Daiichi.

Fukushima Daiichi has six reactors, each reactor successively commissioned during the 1970s. While the tsunami impacted, units 1, 2 &3 were operating at full power, unit 4 was unloaded and 5 & 6 were in cold shutdown. Since the tsunami swept over the power plant and caused malfunction of electricity and emergency electricity and hence shut down the cooling system of the nuclear reactant core. Which resulted in three of the cores meltdowns in units 1,2&3. The melted core mixed with the materials from the structure to form a magma called Corium, which is capable to penetrate through concrete and leaking out to the soil and the sea, harming the environment[[2]](#footnote-2). The reaction in the core released a lot of hydrogen and air pressure which caused the explosion of the three containers. To prevent total meltdown, like the Chernobyl accident, and to stabilize the reactor core, the operator had to inject a lot of water into it. However, this water was then becoming radioactive since it in contact with the reactor core, and this is what we have known as the Fukushima’s wastewater.

Today there are over 1 million tons of radioactive wastewater waiting to be discharged in Fukushima Daiichi.

How dangerous the wastewater is?

According to the Japanese government, there are 62 radioactive isotopes in the wastewater, including carbon 14, which is dangerous if ingested and can concentrate in the food chain. Casesium-137, which causes soft tissue cancer. Strontium-90, which causes bone cancer and leukemia[[3]](#footnote-3). And the tritium. Jim Smith, a professor of environmental science at the University of Portsmouth conducted that[[4]](#footnote-4), the vast majority of the wastewater can be removed. But Tritium is very difficult to separate from the water in the chemical aspect. As a result, after the decontamination process, tritium will still leave in the water, which removed almost other elements.

The plan is to release this Tritium water into the Pacific Ocean which has provoked outrage not only in Japan but also in neighboring countries such as Taiwan, South Korea and China, and environmental groups around the world.

How dangerous Tritium is?

Tritium has considered being one of the least harmful radionuclides occurring naturally in water and air and commonly found in the body. Therefore, the plan put forward is to dilute Tritium in the water to a radioactivity level below that of drinking water, which is below one Microsievert per year. In the UK, people receive about 2 200 microsieverts of radiation every year[[5]](#footnote-5). So, compare the sort of release of Fukushima’s wastewater, which is radiologically insignificant.

Social panic

Although the claim from TEPCO and Japan government said the wastewater is insignificant and even use a mascot to represent tritium is friendly, and harmless to humans, still people are in fear of the consequences that “nuclear” and “radioactive” can cause, it is very hard to earn people trust in nuclear emission. According to Carsten AL, etc.[[6]](#footnote-6), they had an experiment with mice that long term ingestion of chronic tritium can cause internal exposure to radioactivity which led to cancer and tissue mutation. With the historical event, the Chernobyl accident in 1986[[7]](#footnote-7), there were people died immediately, but the invisible radioactive elements that leaked into the atmosphere and slowly killed and destroy the DNA sequence of all the living things within its 1600 square miles was the issue people fear the most. As the Japanese government has rated the Fukushima Daiichi accident level 7 on the international Nuclear and Radiological Event Scale, the same rating as the Chernobyl accident. As the shadow of Chernobyl people around the world is afraid of the radioactive water pouring into the Pacific Ocean, the unknown consequences threatened lives in nearby countries and cause social panic.

Fishing industry

The rejection of Japanese and South Korean fishermen are staunch. As the Fukushima accident occurred, the rumor of contamination had already destroyed the fishing trade. The specter of Fukushima still haunts the industry even without the addition of radioactive wastewater. South Korea had an import ban on seafood from the Fukushima affected area since 2011[[8]](#footnote-8). With the addition of the wastewater, the Japanese fishermen could lose more market, and destroy their livelihoods.

Marine ecosystems

The impact on marine life will be unknown and had possibilities that could damage the ecosystem. A study[[9]](#footnote-9) conducted that tritium water can lead to genetic damage to mussels. If the tritium water pours into the ocean, it may then change the mussel and lead to impact of the eater of the mussel and consequently the entire ecosystem. The paper also suggested that the safety limit set by the International Atomic Energy Agency does not apply to all aquatic organisms. In order words, there have not been enough studies to indicate the impact on marine life if the tritium water is discharged into the Pacific Ocean, it may destroy our marine life or it may not. But the consequences if it does, the risk is too much to bury for the Japanese government and the entire human being.

Suggestion

One of the great challenges is hard to earn public trust that the wastewater is safe to discharge into the ocean. The analysis of treated water is conducted by the company itself, TEPCO[[10]](#footnote-10). In order to earn public trust, Hiroshi Tauchi, Professor of Ibaraki University suggested that information disclosure and monitoring are especially important and should take charged by third parties, therefore the monitoring will be impartial, and public for everyone.

An alternative, other than discharging the wastewater into the Pacific Ocean is to expand the storage of radioactive wastewater. As the power plant was explored, the area where been evacuated was quite large, as shown in the figure below, which included Namie Town, Futaba Town and Okuma Town, towns within 20 kilometers radius apart from Fukushima Daiichi. The contaminated area is uninhabitable. Furthermore, the half-life of Tritium is 12.3 years[[11]](#footnote-11), which means after 12.3 years tritium will be more stable and less reactive, compared to uranium has a 4.5 billion years half-life[[12]](#footnote-12), the main contamination at Chernobyl is way shorter. Therefore, we could expand the storage room around the no-men zone, to store more Tritium water for a longer time, maybe 24 years after, let the Tritium become less reactive then discharge it to the ocean.

The Japanese government had already spent 12.1 trillion yen on the event, built more storage rooms maybe not be practical for Japan government from economic aspect. In this case, set-up fundraising is a way to solve it. Environmental groups and countries nearby are willing to pay for saving marine life and care about the Earth. Also, the expansion of storage can create more job opportunities in Japan. Beneficial for society[[13]](#footnote-13).

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自動產生的描述

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