10 Lessons from Fukushima

Reducing risks and protecting communities from nuclear disasters

Fukushima Booklet Publication Committee

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Introduction

Chair, Fukushima Booklet Publication Committee Masaaki Ohashi

This booklet is a message to people all around the world from us, the people of Japan, who were afflicted by and who continue to bear the brunt of the damage caused by the large-scale nuclear disaster at the Tokyo Electric Power Company (TEPCO) operated Fukushima Daiichi (Number One) Nuclear Power Plant, directly caused by the Great East Japan Earthquake and Tsunami of March 11, 2011. The intended beneficiaries of this booklet are the many people around the world concerned about the risk of a situation similar to Fukushima happening to them, especially those living in countries where nuclear plants are currently operating or where construction of nuclear facilities is planned. We also hope that this booklet will be utilized by non-governmental organizations (NGOs) and civil society organizations (CSOs) who work with such residents in these regions, and by the heads and staff members of local municipalities who are working to prevent nuclear disasters and to mitigate the damage when they do occur.

Since the nuclear disaster struck Fukushima, we have proactively shared the experiences of this region with people from all over the world who come to visit Fukushima, as well as on occasions throughout Japan and internationally. While this is still not yet sufficient, we have been able to communicate to many people the facts of this disaster, as well as its severity and the many complicated issues that have arisen from it. Many of these people have kindly shown a high level of concern and sympathy toward the painful plight of those affected.

However, an increasingly common voice from those people listening intently is the request for information about what to do to prevent a similar situation happening in their own countries. This helped us to understand that while it is very important to share the experiences of the disaster, people on the receiving end of this advice cannot take appropriate action unless they understand how to anticipate and prevent the actual disaster at the root of all these experiences, along with measures for how to mitigate the damage of nuclear accidents or disasters should they actually occur.

In March 2015, the government of Japan will host the 3rd World Conference on Disaster Risk Reduction in Sendai City, Miyagi Prefecture, some 90km north of the Fukushima nuclear plant, where they will adopt the "Post-Hyogo Framework of Action (HFA2)" which will constitute the world's disaster risk reduction framework for the coming decade. The Hyogo Framework for Action (HFA), which constitutes the current international action guidelines for disaster risk reduction, responds only to technological hazards such as nuclear disasters in the case that they occur in association with natural hazards. However, in reality, no existing international agencies specialize in prevention of or response to large-scale technological hazards such as nuclear disasters. Namely, they had not until now dealt sufficiently in an expert and institutionalized way with the clarification of risks associated with such hazards, or with necessary withdrawal or evacuation plans, emergency rescue, recovery, compensation and so on. We have been advocating for reform to the state of and insufficient experience of international frameworks in this regard. We are glad to hear that the draft of the HFA2 at the time of writing has changed to also independently address such disasters triggered by man-made hazards.

However, due to the increasingly global nature of the economy, production hubs around the world are more and more concentrated in places regarded as "developing countries". It is clear that there are moves afoot to export many nuclear power plants from "developed countries" in order to supply the energy that is required to underpin this production in developing countries. This is in spite of the fact that the new construction of nuclear power plants in developed countries is fraught with difficulties. The unthinkable but inevitable next nuclear power plant accident and nuclear disaster could easily take place in such an area hosting newly-build power plants, embroiling the surrounding region and neighboring countries.

At the time of the Fukushima nuclear disaster, not only did we lack basic knowledge regarding nuclear power and radioactivity, but also failed to sufficiently take onboard the experiences of Chernobyl and Three Mile Island. Unable to properly understand mitigation and preventative measures we were extremely confused and faced a lot of problems head on. We made this booklet in the hope that nobody else has to go through this same bitter experience ever again and also to respond to the question of "what should we do" posed by those people with whom we shared the experiences of Fukushima.

Oriented towards the nonexpert, this booklet is concerned with how to deal with nuclear power plants and nuclear accidents, based on the experiences of Fukushima and from the point of view of the residents of Fukushima. All of this booklet will be translated and published in various global languages; we sincerely hope that it will be read by a great many people and will become a benchmark for action related to nuclear power.

Chapter 1

What is nuclear power, what is radioactivity?

Hisako Sakiyama (Takagi School/Former Member, National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission (NAIIC))

Principles of power generation

You can generate power with a magnet and a coil. Turning the magnet with the rotations of the bicycle will create electricity (diagram 1.) If you put blades on the axis of rotation to improve the rotation efficiency, you have a turbine. While there are various ways of generating electricity, ultimately the only difference is what sort of force you use to power the turbine. Hydroelectric power generation uses a head of water to power a turbine, wind power generation uses wind,



Diagram 1 Bicycle Dynamo

geothermal/thermal power generation uses heat to create steam to power a turbine, and then there is nuclear power generation.

Nuclear power generation and atomic bombs

Nuclear power involves using the enormous amount of heat given off in nuclear fission to boil hot water, creating steam that rotates the turbine. Although the temperature in the middle of a nuclear reactor's fuel rods is approximately 2,800°C, since the steam used to rotate the turbines is about 400°C, some two thirds of the heat is jettisoned into oceans, rivers and lakes, further exacerbating global warming. Conventional fuel in nuclear reactors uses an atom called U_{235} , the same as that



Diagram 2 Nuclear fission in an atomic bomb

found in atomic bombs. The theory behind nuclear reactors and atomic bombs is the same in terms of bombarding these atoms with neutrons to cause nuclear fission.

The fuel in atomic bombs contains more than 95% U₂₃₅, which causes nuclear fission. The 2-3 neutrons that are generated from one round of nuclear fission strike U₂₃₅ one after another, after which all nuclear fission happens in an instant (diagram 2). Massive amounts of radiation and heat are released, as well as an enormous bomb blast, which obliterates living things instantaneously. Nuclear fission product is also called "lethal ash", due to the high amount of heat and radiation that it emits, which can result in death in the case of high exposure.

The fuel in nuclear power plants contains about 5% (U_{235}) the remainder being Uranium 238 (U_{238}) which does not cause nuclear fission. With nuclear power plants, control rods absorb some of the neutrons created in nuclear fission, regulating the process to ensure that a rapid chain reaction does not take place (diagram 3) while using the heat produced to boil water and generate electricity with the resulting steam. While nuclear power plants are large-scale and complicated, costing a large amount of money to construct, they are basically water-heating devices.



Diagram 3 The Principles of Nuclear Power Generation (revised diagram from Genshiryoku no Wakaru Jiten ("Encyclopedia of Nuclear Power")

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Some of the neutrons released in nuclear fission are absorbed by U_{238} , creating Plutonium 239, the raw material for atomic bombs. Operating a nuclear plant inevitably creates plutonium, the reason why countries who want nuclear weapons tend to build nuclear power plants.

Large amounts of "lethal ash" are also produced in nuclear power plants. Lethal ash that invariably accumulates during power generation will continue to emit radiation and heat for hundreds of thousands of years. There are no countries around the world, barring Finland, who have decided on a method for disposing of used fuel rods (lethal ash). This is the reason why nuclear plants are called "houses without toilets".

The accident at the Fukushima Daiichi Nuclear Power Plant is not over

The operators of the Fukushima Power Plant are circulating coolant water in order to cool the nuclear fuel that melted inside the nuclear reactors due to the accident. They are doing this because without cooling, the fuel will melt due to the decay heat emitted by lethal ash, risking a further release of radioactive materials. In the course of cooling the fuel, the coolant water flushes lethal ash from out of the reactor, becoming extremely contaminated in the process, and then leaks into the ground beneath the building housing the reactor. As 400 tons of groundwater are flowing in everyday, the whole site of Fukushima Daiichi has been completely packed with 1,000 ton capacity tanks for containing the contaminated water. The ground on which these tanks are placed is not at all sturdy, and given that the tanks could topple over anytime, since the accident this contaminated water has been continuously flushed into the ocean. It is not at all the case that the accident is under control.

At present, to stop the inflow of groundwater, the operators are trying to freeze the soil around the building housing the reactor, although success is not looking likely. Nuclear fuel, which is supposed to be contained within the nuclear reactors, has melted and is exposed to the environment. Furthermore, leakages of contaminated water within the site are occurring on a regular basis. The exposed dose of workers clearing up the accident reaches the limit in a short amount of time leading to a lack of experienced workers, further complicating the cleanup operation work.

Radiation and radioactive materials

Radiation emanates from radioactive material (also called radioactivity). This can be likened to the relationship between light (radiation) and light bulb (radioactive material). However, radiation differs from light as it possesses masses of energy and



Diagram 4 X-ray photography by Roentgen

can pass through the body. Roentgen was the first person to artificial radiation, which was dubbed the "X-Ray". A photo he took is shown in diagram 4.

Due to the capacity of being able to see through the body, X-rays were actively embraced in medical treatment. What was not known at the time, however, was that when X-rays permeate the human body they damage cells; thus, people were unwittingly bathed in X-Rays and many lives were lost to cancer and leukemia. Through these experiences, people learned the damaging side effects of radiation to the body.

Types of radiation and methods of exposure (external and internal exposure) Aside from x-rays as described above, there are various other types of radiation. As shown in diagram 2, during nuclear fission gamma rays and neutron rays are released. While gamma rays are electromagnetic waves like x-rays, neutron rays, beta rays and alpha rays are all particles of neutron, electron and helium nuclei respectively.

Being exposed to radiation from outside the body is called external exposure, while radioactive particles entering the body through respiration and food causing exposure inside the body, is known as internal exposure. With external exposure, it is possible to avoid exposure by ensuring that there is some kind of shield such as lead or concrete between the radioactive material and the body, or by keeping far away from the radioactive material. Furthermore, rays that only jump a distance of 1mm, like alpha rays, do not cause any harm. Once such rays are inside the body, however, even if they can only jump a short distance they are surrounded by cells, meaning that damage will definitely be sustained. The toxicity of alpha rays is approximately 20 times that of gamma and x-rays, even at the same dosage. Plutonium emits alpha rays, and due to the fact that it takes 24,000 years for it to decay to half its value (called half-life), is extremely difficult to get rid of and once inside the body will continue to expose that body to radiation for the rest of that person's life.



Diagram 5 Internal and External Exposure

Beta-ray emitting radioactive iodine and strontium build up in the thyroid gland and in bones respectively, causing cancers of the thyroid and bone. Tritium, which is problematic because it cannot be eliminated from contaminated water, emits beta rays but actually gets into human genes and is more highly toxic than other betaray emitting nuclides. Cesium 137 emits beta and gamma rays, and due to having the same properties as potassium, is distributed throughout the body including the muscles, causing damage. In this way, when it comes to internal exposure, the organ where accumulation takes place and the damage caused differs depending on the kind of nuclide.

The relationship between radiation dosage and damage to health

The impact that radiation has on the body depends on the dosage. In terms of units for measuring dosage, there is the Gray (Gy) which measures the energy absorbed by particles, and also the Sievert (Sv), which takes into consideration the impact on living organisms. 1Gy of x-rays, gamma rays and beta rays is proportionate to 1Sv.

The International Commission on Radiological Protection (ICRP) determines the annual dosage limit for the public to be 1 millisievert ("mSv"), a value that most countries have adopted. What does it mean to be exposed to 1 mSv? Diagram 6 shows how on average one ray of radiation permeates one cell nucleus. The adult body is made up of approximately 60 trillion cells; exposure to 1 mSv per year means that in one year, on average one ray of radiation passes through the nuclei



Diagram 6 What does it mean to be exposed to 1 mSv of radiation?

of every cell in the body.

Radiation contains a huge amount of energy, so even one ray can cause damage to numerous molecules in the body. It inflicts particularly serious damage to DNA, the blueprint of the body. Although cells can recover from damage done to DNA, damage done by radiation is complicated and can easily lead to faults, which subsequently could become the cause for cancers.

If a person is exposed to somewhere in the region of 7000 mSv throughout their whole body at once, their DNA will be ripped to shreds and they will certainly die. There is no way to save them. 50% would die from exposure to approximately 4000 mSv. Exposure to such large quantities of radiation will bring on nausea, vomiting, diarrhea, fever and in acute cases symptoms include bloody bowel discharge, hair loss, and purple spots, followed by death. Due to manifesting a short while after exposure, these symptoms are called acute disorder. Exposure to 100 mSv results in a temporary decrease in lymph corpuscles and sperm; dosages below this are considered to not result in acute disorder. This dosage is called the "threshold" of acute disorder, and anything under 100 mSv is considered to be low dosage.

Even people who have recovered from acute disorder, long after the event, experience delayed impairment of cancer and other illnesses depending on the dosage they were exposed to. With exposure to low doses also, there is an increased incidence of cancer in proportion to the dosage. There is no threshold beneath which the risk of cancer dissipates. Put another way, as there is no safe dosage of radiation, the ICRP chooses to adopt a linear non-threshold model (LNT) (Diagram 8). If 10,000 people are exposed to 1 mSv, 1 person will get cancer, this figure rising to 10 people in the case of exposure to 10 mSv. This calculation is based on an estimate of half of the risk derived from hibakusha, survivors of the atomic bombings of Hiroshima and Nagasaki, and as such has been criticized for underestimating the risk.



Diagram 7 Relationship between exposure dosage and health impairment



Diagram 8 Relationship between dosage and incidence of cancer

Sensitivity to radiation is highest among embryos that are undergoing rapid DNA synthesis and infants, getting lower as age increases. What is more, special care must be taken with children as they have many years ahead of them and could well be exposed to radiation or to many other chemical substances later on in life. Sensitivity to radiation differs according to gender, with women showing a greater sensitivity than men. (Diagram 9)

Although the exposure dosage limit for the general public is 1 mSv per year, this is not a safe amount, merely the product of a compromise that fails to balance the potential risks and cost to society. There is a limit in place for nuclear plant workers which dictates that exposure over 5 years must not exceed 100 mSv, with no single year exceeding 50 mSv. The Radiation Controlled Area where radiation work is carried out is a place with a dosage of more than 5.2 mSv per year, and is off limits to anyone under 18. Smoking and eating/drinking are not permitted in this zone.



Women are more easily impacted by effects of radiationThe lower the age, the higher the sensitivity to radiation

Diagram 9 Sensitivity to radiation by age, gender (no. of incidences of cancer among population of 100,000 people) (NAIIC Report)

In light of this, the current repatriation policy being promoted in Fukushima which dictates that up to 20 mSv per year is safe, and seeks to treat residents with high sensitivity to radiation (including pregnant women and infants) the same as professional radiation workers - is a highly reckless policy that is trying to get people to resume their daily lives within the radiation protection zone.

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Dilemma of a professor from a national university

Before the nuclear accident, the maximum permissible amount of radiation for citizens was 1 mSv per year. After the accident, the maximum limit was raised twenty times. Many people did not accept this high permissible level of radiation and chose to evacuate. Ms Junko Gonda (43, pseudonym) and her children, who are 16 and 13, used to live in a house near Fukushima University, but evacuated and now live in Tokyo. However, her husband Jiro (46, also a pseudonym) is an associate professor at Fukushima University. Because it is a national university, he does not have a choice but to obey the safety standards adopted by the government. Under these circumstances, Jiro carries on living on his own near the university against his will - just being estranged from his own family members is highly stressful. What makes Jiro feel even worse is that as an admissions and public relations member of staff, he has to promote Fukushima University to young high school students. Despite the fact that he has evacuated his own 16 year old child, he feels incredibly torn and a profound sense of guilt about trying to entice teenage children to apply to Fukushima.

Chapter 2 What happened at Fukushima, and 10 lessons learned

1 Do not be fooled by the "Nuclear Power is Safe" propaganda

Nuclear Power came to Japan, a country which already experienced nuclear bombings at the hands of the United States

In the 1950s, it was the United States that put forth the proposal to build nuclear plants in Japan, a country in which Hiroshima and Nagasaki were still reeling from nuclear bombing. The United States was bent on promulgating the "peaceful use of nuclear power" around the globe, in an aim to keep nuclear weapons development under the control of the USA during the Cold War Era. This is because nuclear materials produced in nuclear plants can alternatively be used in nuclear



Hiroshima A-Bomb Dome Photo: Takashi Kuroda

weapons. In Japan also, politicians and media on the "peaceful use" bandwagon firmly planted the awareness in Japanese society that nuclear weaponry including atom and hydrogen bombs are different entities altogether to the "peaceful use" of nuclear power.

During the mid 1960s, commercial nuclear power generation shifted into full swing, with nuclear plants built along the coastlines of economically disadvantaged, depopulated areas in order to meet the ballooning electricity demands of urban areas like Tokyo and Osaka.

Why were nuclear power plants built in Fukushima?

Like many other areas where nuclear power plants are located, Futaba County on the coast of Fukushima Prefecture did not have any prominent industries, and in most households one person would have to go to earn money in a city to support the family. Also, Fukushima Prefecture had long since had the role of supplying energy to Tokyo, including coal mining and hydroelectric power generation.

Electricity made in Fukushima was not consumed in Fukushima, but sent to Tokyo. The relationship between a major urban area consuming vast amounts of electricity and a region forced to depend on the power plants that generate this electricity was certainly intertwined with the problem of economic disparity between regions in Japan.

The situation of host municipalities, and negotiations with candidate sites

When the enticement policy for the Fukushima Daiichi Nuclear Power Plant was announced in 1960, municipalities were welcoming, in the hope that the building of nuclear plants would attract other factories and contribute to invigorating the local economy. Tokyo Electric Power Company (TEPCO) brought the local municipal leaders and employees to the bargaining table and set about negotiating the acquisition of land rights as well as compensation for fishing rights. Voices of concern and resisting opinions were met with the reassurance that "with radiation there is no danger, nor will there be any damage".

In the second half of the 1960s, a movement developed in Fukushima strongly opposed to the further constriction of nuclear power plants. In the backdrop to this were increasingly severe pollution problems nation-wide and continuing problems at the Fukushima Daiichi Nuclear Power Plant which had started operating. The Fukushima Daiin (Number Two) Nuclear Power Plant was built by keeping the protests of local citizens in check. Construction of another nuclear power plant was planned for Namie-Odaka, but these plans were cancelled following a deep-seated opposition movement from the farmer landowners in the wake of the Fukushima disaster in 2011.

Establishment of the electricity subsidy system

In 1974, a series of laws were passed called the Three Power Source Development Laws. As collateral for hosting dangerous nuclear power plants, municipalities were able to gain from subsidies and fixed assets taxes. Subsidies were used to build superb public facilities, and the region basked in newfound economic abundance. However, 20 years after the power plants were built, tax revenues and subsidies dropped sharply, casting the region into a kind of dependence whereby construction of a new power plant would be necessary to meet the maintenance fees for all the public facilities they had built.

The formation of the nuclear village, propagating the safety myth

Utilities companies, plant manufacturers, ministries such as those responsible for the economy, trade, science and technology, the mass media, mainstream researchers – this group of people who got rich from promoting nuclear power ended up with a huge amount of influence over the political and financial worlds, and over the academic community as well as the media. This exclusive club ended up with the moniker of "Nuclear Village".

During the 1960s when the Fukushima Daiichi Nuclear Power Plant was constructed, the government, TEPCO and the mass media were united in singing its praises, repeating the refrain "Nuclear power is safe, clean, dream energy". The utilities companies shelled out huge amounts of money in advertising fees, and through television, radio, newspapers,



Arch in deserted Futaba Town, that reads "Nuclear Power, Energy for a Brighter Future", March 2014, Photo provided by residents

magazines and school education pumped out their marketing campaign of "nuclear power is definitely safe". The local people, over decades, were led to believe this that nuclear power was safe through lectures and induction courses, pamphlets and school visits to the power plant facilities.

A complex disaster that was "unforeseen"

Following the Great East Japan earthquake in 2011, The Fukushima Daiichi Nuclear Power Plant had not only lost its coolant liquid due to its vulnerability to earthquakes -as well as losing its external electricity supply - but was also struck by a 14-15 meter tsunami which knocked out its emergency electricity supply, meaning that cooling could no longer occur, leading to a meltdown of its nuclear fuel. A major accident followed as the hydrogen, which had built up inside exploded, causing major damage to the reactor building and releasing massive amounts of radioactive material in the process. The government was woefully prepared for a combined earthquake and nuclear power plant disaster - a complex disaster with an earthquake and tsunami causing a nuclear accident. Unable to even get hold of information about the incident, the chain of command within the government was thrown into turmoil.

It was well known that major earthquakes with a hypocenter on the Pacific Ocean off the coast of the Tohoku region occurred periodically over the years, and it was also well known that this coastline has weathered enormous tsunami in the past. Despite this knowledge, power plants were built while underestimating the risk of earthquakes and tsunamis. Many people ended up living in the vicinity of the power plants. Regarding tsunamis, TEPCO only made provisions for a tsunami with a maximum height of 5.7 meters. Tokyo is only 200 kilometers away from

Fukushima – if the response to the accident and the direction of the wind had been slightly different, Tokyo and the entire East Japan area could easily have sustained devastating damage.

Lesson 1 Do not be fooled by the "safety myth"

The construction and operation of nuclear power plants are promoted as being "for the benefit of the local economy", alongside safety reassurances that "an accident could never happen". Yet in many cases, this "safety" is claimed based on selective data provided by experts who are retained by the government, manufacturers and utilities companies, who stand to gain from the construction of nuclear plants.

Once a serious accident happens, the local lives, industry and environment receive a blow that thoroughly destroys them, from which they may not be able to recover. At this stage, it is too late. People who peddled the safety myth, once a disaster actually occurs, defiantly claim that it was "unforeseen", and refuse to take any responsibility. Residents must cooperate with independent experts to carry out their own investigations in order to expose the plans of the government and corporations. If a severe accident happens, evacuation countermeasures spanning several generations as well as environmental countermeasures will be needed – prior preparation for such events is indispensable. Also, in order to prevent corruption and collusion between nuclear power affiliated companies and local municipalities, local residents must insist on full disclosure of information related to nuclear power projects and plans.

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A mother who evacuated outside of the prefecture with her daughter

Ms Tomoko Suzuki (29, pseudonym) evacuated to neighboring Yamagata Prefecture from Fukushima City soon after the accident, taking her 4-year-old daughter with her. She hardly had any knowledge about radiation and had never heard of this unit called "Sievert", but she evacuated as one of her best friends told her that it was "a hazardous situation in which she must not remain any longer". As her husband did not perceive that it was a dangerous situation, she had to go against his will and take the decision to evacuate. After that, she learnt more about radiation by reading books recommended by her best friend, and now thinks that what she did was not wrong. Her husband does not have any intention to quit his job and move to where they are, so they now carry on their lives in two houses, with her husband visiting on weekends. Tomoko sometimes cannot sleep, wracked with worry about how long this situation will continue.

2 During an emergency, the basic premise is to run away

Contamination spreads beyond the 30km radius

In Japan, the evacuation plan for nuclear accidents has, in its scope, residents who live within a 10km from the nuclear plant. However, the Fukushima disaster showed just how insufficient this plan was. Also of note is that having to concentrate on evacuation during the disaster meant that response to people afflicted by the tsunami who needed rescuing was delayed. Although the potency of radiation weakens as it travels over distance, dust and other small particles contaminated by radiation are transported by the wind. The direction of the wind and the features of the land largely influence the resulting radioactive dispersal and contamination. Also, in cases where it rains or snows while radioactive particles are being



Reactor 4 of the Fukushima Daiichi Nuclear Power Plant, destroyed in the Accident July 2011 Photo: JANIC

carried along by the wind, these particles stick to the rain or snow and create hot spots in the area on which they fall (places that are extremely highly contaminated). In the absence of snow or rain, the particles are carried yet further. After the 2011 incident at Fukushima, it was discovered that some particles travelled over 100km away from the nuclear plant. The impact of highly concentrated radioactive water being flushed into the sea after the accident has been detected as far away as the western seaboard of the United States.

Radioactive particles flowed northwest from the power plant

Despite confirmation of contamination throughout the whole of Eastern Japan, at the time of the accident the government did not issue any evacuation orders or evacuation directives to people living beyond the 30km radius. Beyond the 30km radius, the area that was strongly impacted (mainly due to the wind direction) was the area to the northwest direction of the nuclear plant. Unfortunately there was also heavy snow and rain at the time, which drove the radioactive particles downward. The affected areas were subjected to evacuation directives after the event. The aerial current, which had been flowing to the northwest, then changed direction and headed inland towards major cities like Fukushima and Koriyama.

The situation in Fukushima City, location of the prefectural government

What went on in Fukushima City, located some 60km away as the crow flies from the Fukushima nuclear plant? Approximately 300,000 people reside in the area where the Prefectural Government is located. Most people thought that everything was safe. But in actual fact, the wind had picked up a huge amount of radioactive particles, which were now raining down from above. Four days after the accident, on the night of March 15, 2011, the radiation dosage (as announced by Fukushima Prefecture on March 16) reached 23.88 microsieverts per hour (more than 100 times the general maximum permissible dose). On March 16, radioactive iodine and cesium were detected from tap water. The same circumstances prevailed in the commercial city of Koriyama, 45km to the south of Fukushima City. Until the last, neither city was issued with evacuation directives or advisories from the government or authorities. Serious contamination spread throughout the coastal area of the prefecture as well as in various cities, towns and villages, and beyond that into many prefectures in the vicinity.

Radioactive particles can, depending on the weather conditions, be dispersed to

Results of the 4th aerial monitoring by MEXT (total deposition amount of Cesium 134, 137 in earth's surface within 80km range of Fukushima Daichi Power Plant)



Total deposition amount of Cesium 134, 137 in earth's surface in the whole eastern Japan area, reflecting the 4th aerial monitoring data



Data: MEXT media presentation materials, December 16, 2011 (Monitoring Period: October 22-November 5, 2011)

locations so far away that it almost seems impossible. The spread of these particles does not necessarily occur in a concentric fashion.

Lesson 2 During an emergency, the basic premise is to run away

Depending on factors such as weather conditions, radioactive materials can be dispersed to places much further than might be expected. Such dispersion is also not limited to a concentric spread.

When an emergency situation occurs at a nuclear power plant, irrespective of whether there are evacuation orders or not, one must run away in the first instance; in other words, to safeguard your own life, get as far away as possible from the power plant as quickly as you can.

In some cases, nuclear accidents can escalate to a complex disaster if an earthquake/ tsunami is involved. Given this fact, it is indeed possible that due to traffic congestion and destroyed infrastructure, it will be physically impossible to evacuate. There are also people for whom evacuation is problematic, including the ill, elderly, and those with disabilities or who are hospitalized. In these cases, it is important to stay securely at home, insulate the house from radioactive particles in the external air, and to concentrate on gathering information. Even if you evacuate, the place where you have evacuated to may be in danger of exposure to radiation depending on the wind direction, so gathering information about this is indispensable. Sending out information using the Internet is a useful means for collecting/sharing information. However, power cuts for an extended period of time are a possibility, so a battery or hand-operated radio is a smart choice.

3 Access to information and leaving records is vital

Evacuation started with an absence of any detailed information

After the nuclear accident occurred, hardly any municipalities in the vicinity of the nuclear plant received direct evacuation orders from the government; in other municipalities, chiefs learned of evacuation orders through the television, or gave evacuation orders based on their own judgment, before receiving any official information.

The majority of residents could not obtain detailed information, with some residents evacuating unaware that a nuclear accident had taken place. Because the chief cabinet secretary appeared on television repeating that "there is no immediate effect on health" and that the evacuation directive was being issued just to be safe, many residents assumed that they would soon be able to return home and on that basis, evacuated with just the clothes they were wearing – leaving behind important personal items and documents, livestock and pets. In the end, they were unable to return for a long period of time.

Extremely problematic evacuation

After the disaster struck, some people could not evacuate due to not having enough gasoline. Many people formed long queues in an attempt to buy gasoline. Resultantly, the roads from the coastal to the inland part of Fukushima were thoroughly congested with people trying to evacuate in their cars.

Evacuation advisories from the government extended from a 2km radius to a 10 and then 20km radius, as the seriousness of the damage gradually become apparent. Many people had to re-evacuate over and over again, becoming ill due to this exhausting process. In terms of the environment inside evacuation centers, the conditions were extremely difficult for mothers with children, elderly people, and those with disabilities. The situation was worse still for hospitalized people and those in aged care homes; some could not endure the long transferal time, and many actually died while in the process of evacuating.

Neglecting to make use of SPEEDI

Despite having SPEEDI (System for Prediction of Environmental Emergency Dose Information) in Japan in order to predict how radioactive particles will spread out during a nuclear accident, it wasn't until March 23 that the prediction data was released, making it completely redundant as a tool for evacuation. Due to this, many residents ended up evacuating to areas with even higher radiation doses, and being exposed to radiation that could easily have been avoided.

Protracted evacuation in indoor shelters. High dosage areas outside the 30km radius, where evacuation advisories were issued late

On the evening of March 11, the day the earthquake and tsunami happened in Fukushima Prefecture, evacuation directives were issued for residents living within a 3km radius of the power plant, after which the directives were extended to 20km. Residents living within a 20-30km radius were issued with directives to "shelter indoors". "Shelter indoors" means not going outside in order to avoid radioactive particles, staying inside as much as possible. People were advised to seek shelter within highly airtight concrete buildings. In reality, most residents ended up in their own homes, turning off their fans and air-conditioning. Most Japanese houses, however, are made of wood and are simply not built for blocking out the external airflow.

In Minamisoma City, 20-30km to the immediate north of the nuclear plant, many people remained sheltered indoors and the flow of supplies into the city ceased, with shops, banks, and gasoline stations all closed. This left residents isolated in a town where their daily lifeline had ceased to function. The mayor at the time decided to post a video with English subtitles on an Internet video hosting site. His plea was



Minamisoma City Mayor Katsunobu Sakurai appealing for help on YouTube after the disaster. March 2011

this: We are facing the difficulty of even distributing necessary goods... the protection measure to stay indoors issued by the government restricted our logistics. We ask for your help, volunteers, we need help to transport supplies, but we must depend on volunteers who could act at their own risk, because of the measures to remain indoors issued by the government... the people are literally drying up as if they are under starvation tactics.

There were also areas such as Iitate Village, which were located outside of the 30km radius but still suffered extremely high amounts of radiation dosage due to wind direction and land features. Until it was designated as a planned evacuation zone in April, many residents were left for over a month in an area with a high radiation dosage, forcing them to be exposed to radiation. It wasn't until the middle of June that the majority of the villagers were fully evacuated.

Voluntary evacuation from outside the evacuation instruction zone

In cities including Fukushima and Koriyama that were not subject to evacuation directives, many people voluntarily evacuated in order to avoid health damage from radiation, mainly families with young children. People who voluntarily evacuate receive practically no support or compensation from TEPCO and the authorities, and end up being forced into a situation where they have to cover their losses due to evacuating out of their own pockets. There are many "mother and child evacuees", from families where the father stays behind to work – resulting in families that have to pay for the upkeep of two households.

More than 120,000 people are still living in evacuation

As of September 2014, three and a half years since the accident, approximately 126,000 people are still living in evacuation and cannot return to their homes. These are only the numbers that the authorities have for Fukushima Prefecture; in reality there are many people who evacuated away from other areas in Eastern Japan, most of whom evacuated due to the impact of the nuclear power plant accident.

In Fukushima Prefecture and in the surrounding areas, many families of two or even three generations lived together under one roof. After the accident, however, approximately half of all the households who evacuated ended up having to lives their daily lives separated from family members with whom they had previously co-habited. Many elderly people are living in isolation in temporary housing, and despite having been in good health prior to evacuation, cases of people suffering ill health and passing away are increasing.

Total number of evacuees = 126,327



(using data from Fukushima Prefecture Evacuee Support Section)

Increasing number of disaster-related deaths

Rather than direct damage due to the earthquake and tsunami, the number of "disaster-related deaths" indirectly caused by factors including deteriorating physical condition while in an evacuation center were as follows: Iwate Prefecture 441 deaths, Miyagi Prefecture 889 deaths, Fukushima Prefecture 1704 deaths (as of end of March 2014) – Fukushima Prefecture, which experienced the damage of the nuclear disaster, clearly has the highest number of "indirect deaths." These numbers include suicides by people who lost all hope about their future, having been forced to evacuate away from radioactive contamination in their hometowns.



Comparison of direct deaths/disaster-related deaths in 3 afflicted prefectures (using data from May 27 2014 report by Reconstruction Agency)

Government and municipalities are rushing citizens back to their homes

In contrast to the situation after Chernobyl, the Japanese government did not choose the option of group relocation way from contaminated regions. Two and half years after the accident, although the government endorsed a policy of rebuilding lives through relocation for citizens from "difficult to return zones" where the annual radioactive dosage exceeds 50 mSv, their policies for other evacuated areas are based on people returning home; many people who evacuated have been forced into severe uncertainty about their futures, unsure whether or not they will ever be able to return.

In areas with annual exposure dosage below 20 mSv, the government is hastening decontamination work, hoping to lift evacuation directives one by one. Annual exposure of 20 mSv is 20 times the annual dose limit of 1 mSv that normally applies; if you consider that after Chernobyl, areas with annual exposure of more than 5 mSv were designated as forced relocation zones and areas with more than 1 mSv were designated as zones with the right to evacuate, this baseline set in Fukushima is extremely high.

Lesson 3 Access to information and leaving records is vital

As learned from the experience of Fukushima, during an emergency there is the possibility that governments and utilities companies may not provide the appropriate information to residents. In areas housing nuclear plants and in the surrounding regions, residents must during normal times (before disasters strike) confirm how information will be provided during emergencies as well as ascertaining systems for disclosing information. They must, when evacuating, have facemasks, raincoats, long boots and any prescription medicines on hand.

Households in the vicinity of nuclear plants must have a stock of iodine preparation, and local schools and residents organizations absolutely must have their own radiation counters. Local hospitals and public facilities must secure a wholebody counter (a device for measuring internal exposure to radiation in the human body) and in order to be able to use it during an emergency, should implement the appropriate operation rules together with training and maintenance.

During normal times, residents must build a network of independent experts whom they can turn to during an emergency to provide advice when there is no public

information available, to verify public information or to provide a second opinion. Also, although there were many facilities near the power plant that could provide emergency radiation exposure medical care, the enormity of the incident meant that these facilities had to be used for evacuation purposes rather than their original intended purpose. The Fukushima accident showed the need for a fundamental re-think of the entire emergency radiation exposure medical treatment framework.

Furthermore, during an emergency, it is extremely important for individuals to keep records of what they did (time spent indoors/outdoors, how they moved around and where did they go, the construction of the facilities they stayed in, weather, what they ate etc.). In any case, records of actions/behavior of the time immediately an accident will have a huge bearing on the validity of health care in subsequent years and months.



Tourist area within Fukushima City with a high radiation dosage of 0.84 microsieverts p/hour. April 2013 Photo: JANIC

4 People affected by the disaster have the right to a comprehensive health survey and disclosure of information

The biggest concern – The impact on children's health

After it transpired that the nuclear accident had released a huge amount of radioactive materials, the most pressing concern not only for Fukushima but also for the whole of Eastern Japan was the effects of exposure to radiation on children's health. Compared to adults, children and children in vitro are more susceptible to the effects of radiation as they are undergoing rapid cell division and still growing. Following the 1986 Chernobyl accident, many children who were exposed to radiation developed thyroid cancer and other illnesses.

After nuclear accidents, the government and prefectural governors are supposed to advise that residents should be administered with iodine preparation to prevent illnesses such as thyroid cancer, which are caused by radiation exposure. However, in the case of the Fukushima disaster, the judgment made by the government (Nuclear Emergency Response Headquarters) did not actually reach the disaster countermeasures office in Fukushima, and the prefectural governor did not give the order to administer iodine preparation. What this meant was that among cities, towns and villages within the prefecture, there were municipalities who did administer iodine preparation or distributed it to residents, and there ware also municipalities who did not distribute it, waiting for instructions to do so. The end result of all this was that despite having stocks of iodine preparation, people who were actually administered it were limited to residents in several municipalities arbitrarily chosen by the town hall, and various individuals who were privately issued with the preparation by people affiliated with the Fukushima Medical University.

Problems with reopening schools

There were also problems associated with the criteria for reopening schools following the accident. In April 2011, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) decided on a yardstick for determining the usage of the school grounds. This was an annual limit of 20 mSv (hourly dose of 3.8 microsieverts), which is 20 times higher than the annual exposure dosage limit for the general public during normal times, 1 mSv. There was public outcry about this benchmark being far too high to guarantee the safety of children, and following a deep-seated opposition movement led by parents, there was no choice the government had to say that it would aim for a maximum dosage for school children of 1 milliseivert. However, an annual limit of 20 mSv remains the benchmark for

people returning home after evacuating.

Citizens willing to learn

Many residents from areas where there was no evacuation directive issued ended up staying in these areas, full of worries about the effects of radiation on their health. Such residents, in particular parents with children, sought to avoid unnecessary radiation exposure by stopping hanging washing outside, wearing face masks when going outside, and getting hold of uncontaminated foods. Because residents had never been taught any knowledge about such radiation protection measures before the incident occurred, most people had to use the Internet and books to study independently.

Although various experts visited the contaminated areas and spoke with residents about the effects of radiation, their opinions were at odds with each other, leaving residents unsure about what to believe. Among these experts, one doctor who was appointed as Advisor to Fukushima Prefecture on Radiation Health Risk Management made comments including: "As long as annual exposure does not exceed 100 mSv, there is no impact on health"; and also "go ahead and let your kids play outside". He was subsequently criticized by citizen groups for making people become exposed to radiation that they should have avoided.

Citizen-led radiation measurement posts

Citizens were filled with a sense of mistrust toward the government and authorities following their response after the accident. Thus, they got hold of instruments to measure the airborne radiation dosage by themselves, and set about measuring the radiation dosage around them. Instruments for measuring radiation dosage in food (Becquerel monitor) and devices for measuring radiation dosage inside the hu-

man body (whole-body counter) are expensive, so various citizen's groups received support from outside as well as gathering donations to purchase these instruments, enabling them to set up citizenled radiation measurement posts in various areas. A year after the accident, many such measurement posts were subsequently secured by municipalities.



CSO member involved in measuring radiation in food July 2012 Photo: JANIC

Recreation programs for children

No longer able to enjoy outdoor activities at school and other outside nature experiences was blocking the healthy growth and development of children. Of particular concern are the physical and mental risks facing infants and children who could no longer enjoy outdoor exercise. Action was needed for "spiritual development" which is directly linked to measurable impacts such as a decline in

exercise capacity, and obesity.

In order to maintain the health of children living in contaminated areas, citizens took the initiative in spreading activities called "recreation programs", under which children are taken for a certain period of time to a region where there are no concerns over radiation, where they can play to their heart's content and recuperate. Citizens' groups throughout Ja-



Children enjoy observing fauna in an area free from radioactive contamination, under a recreation program. May 2014 Photo: Shalom

pan continue to invite children from contaminated areas and hold camps or organized facilities where parents and children could stay together for a while.

These recreation programs were based on programs that were run in Ukraine and Belarus following the Chernobyl accident. In Ukraine, Belarus and Russia, there are still nationally funded programs of up to 3 weeks available with the aim of mitigating the effects of radiation on children's bodies, and in order to maintain their health. In Japan, however, there are no such moves afoot by the government or authorities to provide this sort of recuperation over the long term.

The absence of a government-run comprehensive health survey

After the Fukushima accident, it is indispensable that the government implements a comprehensive health survey, to protect residents who may have been exposed to radiation and the health of residents living in contaminated areas, to prevent health damage due to radiation before it manifests, and provide medical service to swiftly handle symptoms when they appear. Despite the fact that radioactive contamination crossed prefectural boundaries, the only government-funded health survey currently in place is the "Fukushima Health Management Survey", yet the diagnostic scope and items of this survey are limited. One of the items in this survey was a thyroid echo examination for prefectural citizens who were 18 years or younger at the time of the accident. Results of early examinations done in March 2014 were that 103 people examined were diagnosed with confirmed or suspected cancer. While expert opinions are divided, Fukushima Prefecture is taking the position that these figures are not significantly high, and they are not acknowledging any causal relationship between these diagnoses and the nuclear power plant accident. As the authorities continue to stress that "there are no effects from radiation", an atmosphere prevails where it is increasingly difficult to be voice anxieties about the health implications of radiation, leaving parents wracked with unimaginable levels of worry about their children's fate. Furthermore, these examinations are voluntary, yet it is important to increase the ratio of people checked.

Lesson 4 People affected by the disaster have the right to a comprehensive health survey and disclosure of information

With Fukushima and Chernobyl alike, organizations with vested interests in nuclear power such as governments and utilities companies, as well as the IAEA (International Atomic Energy Agency), attempt to play down the damage posed to health by radiation. Those who end up sustaining the damage are those afflicted by disasters, including children. It is vital that those people affected by a disaster insist on the right to a comprehensive health survey done by an independent entity that is not subject to any political influence.

The primary objective of health examinations is not to gather data, but to ensure that the information is returned in its entirety to the affected persons themselves. Opportunities for a second opinion and follow-up examinations must also be assured for affected persons full of anxiety about their condition.

In Fukushima, on the grounds of an emergency situation, the annual radiation dosage limit for ordinary citizens including pregnant women and children, was loosened to the same level as that of professional nuclear plant workers. Governments and business operators will stoop to such levels in order to reduce the scope of compensation payments, or other financial or political gain. This threatens the basic human rights of affected persons; extraordinary measures enacted on the grounds of an emergency situation must be removed at the earliest possible opportunity.

5 To ensure food safety and to protect agriculture, forestry and fishery industries, citizens must participate in measurement. Information disclosure is also vital

Contamination of soil and produce

Due to the spread of radioactive materials after the accident, agriculture in Fukushima Prefecture took a massive hit. Early spring vegetables cultivated at the time of the accident were found to be highly contaminated with radiation, and shipment was prohibited. Primary industry collapsed in most places subject to compulsory evacuation in Fukushima Prefecture. Contamination spread outside of evacuation districts, and Fukushima farmers went through a major ordeal related to the problems caused by contamination of their land and their produce.

In the wake of the nuclear accident, Japan set a tentative standard of 500 Bequerel (Bq) per kilogram for radioactive materials in foods (March 17, 2011), prohibiting the shipment of foods that exceed this standard. (Bq is the unit to represent the amount of radioactive substance, while Sv is the unit to measure the radiation that was released). Until this point, Japan only had the limit of 370 Bq/kg, which was the limit value for imported foods established after the Chernobyl accident. This caused great confusion as to how to apply different standards to foods depending whether they were produced in Japan or imported foods. (For example, would 400 bq/kg be acceptable because it is made in Japan, but unacceptable if imported?). Subsequently, on April 1, 2012, Japan established a new standard for radioactive materials in foods (see graph), based upon which all foods in Japan have been

Food Group	Tentative limit for imported foods (Bq/kg)*1	Tentative limit soon after accident(Bq/kg)*2	Current limit (Bq/kg)
Applicable Period	From November 1, 1986 to present	From March 17, 2011 to March 31, 2012	From April 1 2012 to present
Drinking Water	370*	200	10
Milk			50
Baby Foods		20*	50
General Foods		500	100

Base standard values for radioactive cesium (based on data from the Ministry of Health, Labour and Welfare)

*1 Only applies to imported foods

*2 Selected 4 radioactive materials of which consumption should be limited – radioactive iodine, radioactive cesium, uranium, plutonium. Uranium values are shown for baby foods. Was advised that radioactive iodine should not exceed 100 bq/kg for powdered milk for babies.

controlled since the accident. For imported foods, the existing standard of 370 Becquerel per kilogram remains in place.

Initiatives for monitoring done by farmers and citizens, and initiatives for information disclosure

Radioactive materials were detected in many vegetables harvested directly after the accident. Although the authorities did carry out some sampling surveys of the radiation dosage in agricultural produce, the number of samples was limited, and they were unable to specify which areas the specimens came from. Farmers were unable to determine whether it was OK to eat the produce from their own plots or not. The

government and authorities did not implement a sufficient investigation. Despite having no data, they stressed safety in an attempt to play down the damage caused by the accident. Most people ended up thinking that they could not trust the authorities or the government. Enlisting support from citizens' groups, private companies and universities outside of Fukushima and from overseas, citizens and farmers who had never dealt with radiation before began educating themselves and doing their own measurements. The citizens and farmers needed to ascertain whether the produce from within the prefecture was safe or not.

Farmers did not limit measurement of radioactive materials to their own produce, but also began measuring



Fukushima Organic Agricultural Network members measuring radiation on the land December 2011 Photo: JANIC

produce from around the region. They believed that careful and precise measurements of farmland would provide them with valuable hints about how contamination spreads, and how to prevent it from migrating into foods. Despite worries about harvested vegetables, most items were well below the benchmark levels set by the government. This really buoyed the morale of the farmers, and served to protect the community.

However, despite these initiatives, consumers and distributors concerned about

radioactive contamination stopped buying produce from Fukushima. This pattern continued in spite of the fact that produce was well below the government standards, in what became known as "damage caused by harmful rumors." To overcome this, farmers begun initiatives in tandem with municipalities and universities. Fukushima University, with whom cooperatives and agricultural coops were implementing measurement of agricultural land within the prefecture, made the following recommendations: 1) Distribution map of radioactive materials across agricultural land; 2) Database of migration coefficients by region/item and countermeasures to prevent absorption; 3) Improving monitoring at the producer level prior to shipment; 4) Improving monitoring by both distributors and in consumer areas together with information disclosure will win back the trust of consumers and help to prevent any harmful rumors.

In the same manner as decontamination of urban areas, for agricultural land also the government adopted the method of stripping off a few centimeters of topsoil. For farmers, however, the soil in their plots is extremely precious, built up over many years. For them it is simply unacceptable to hack off the topsoil and discard it. Roughly one month after the nuclear accident, Fukushima Prefecture made clear its "approach regarding cropping", as follows: "Due to soil mixing, most of the radioactive cesium has been adsorbed, meaning that it cannot be absorbed into produce…as far as possible, carry out measures including composting". Such an "approach" as this, which thins down radioactive cesium through soil mixing, keeping migration in check, is still recognized today among organic farmers and researchers both inside and outside of Fukushima as a starting point for study and investigation.

Just as important as preventing contamination of produce is the issue of farm workers being exposed to radiation. Exposure of farmhands working for extended periods of time on comparatively highly contaminated land is still a major concern, particularly among younger workers. What is required from now on is a long-term and ongoing health control framework that is publicly funded.

Major damage to dairy and livestock

One week after the accident, radioactive materials were detected in fresh milk from Iitate Village, of which shipment was prohibited. Farmers spent everyday milking cows and then throwing away the milk. Subsequently, the cows were resold outside of the region, and dairy farmers in the evacuation zone had to actually close down their businesses. The same goes for livestock farmers. Despite serious contamination in areas adjoining evacuation zones, on the grounds of not being a zone included in the scope of evacuation, these farmers were not eligible for any public subsidies or support; it was nothing short of absolute misery for them. Milk and dairy products were screened at their raw material (fresh milk) stage.

Regarding feed crop, in some regions of Fukushima Prefecture and in Iwate Prefecture to the north, coarse feed and grazing were subject to "voluntary restraint". Dairy farmers in these regions subject to restraint worked hard to ensure the safety of fresh milk by purchasing imported coarse feed to give to their dairy cattle as an alternative to their usual feed, which came at considerable cost to their business.

Feed for pigs and cattle was subject to screening with the same standards as dairy farmers. All beef farmers in areas where shipment restrictions were applied had to undergo full screening; municipalities also carried out sample monitoring on other

kinds of meat (pork, chicken) and eggs coming from slaughterhouses in these areas.

Unlike cows, pigs and chicken are not fed with feed crop, and were mainly fed with imported grains. There were concerns about contamination of eggs from poultry raised on small farms fed with locally sourced feed, but unexpectedly there was not much evidence of contamination.



was not much evidence of Cows dead from starvation in the deserted evacuation zone April 2011 Photo: Naomi Toyoda

The fisheries industry – facing tough consumer scrutiny

Related to the problem of contaminated water containing radioactive materials that has continued to leak into the ocean since the accident, consumers are continuing to cast a stern eye over the contamination of marine products. Fisheries and trawl fishing businesses along the Fukushima Prefecture coastline are exercising voluntary restraint for their operations due to the impact of the nuclear accident. Under such circumstances, Fukushima Prefecture has made public fish species deemed to be safe, based on the results of over 10,000 monitoring measurements. Currently, small-scale operations and sales are taking place on an experimental basis, while obtaining feedback from purchasers of these fish species. In this way, "experimental operation" is continuing in order to acquire the basic knowledge
required to re-start fisheries operations in Fukushima Prefecture. As of September 30, 2014, 52 species are included in the scope of this experimental operation. The Fukushima Prefectural Federation of Fisheries Co-operative Associations is spearheading the sales of these marine products, with the results of all screenings for radioactive materials made public. Fish species found to have over 50 bq/kilo are being removed from the scope of experimental operations by the Fisheries Cooperative. Concerned about the issue of contaminated water, Fukushima Prefecture is bolstering radiation screening of the ocean; in the permitted fishing zones, radioactive cesium and tritium have not been detected, or have only been detected at extremely low levels. It should be noted however, that there are concerns from some quarters over the fact that the types of nuclei subject to screening are limited.

Freshwater fish have a biological characteristic whereby it is very easy to take in radioactive cesium but very difficult to get rid of it. There are still many instances in both Fukushima Prefecture and indeed a lot of Eastern Japan where freshwater fish contain radioactive cesium in excess of the baseline standard (except for farmed fish). Mountain stream fisherman are required to follow a catch-and-release policy, and have been instructed by the local authorities not to take any caught fish home to eat.

Lesson 5 It is important to create a monitoring system in which producers and consumers alike can participate

Once a situation arises where there are questions about the impact of radiation, even if producers of fisheries products demonstrate safety through rigorous screening, it is not at all easy to recover the trust of the market. And even if the government and producers endeavor to brush away harmful rumors, consumers will not feel peace of mind unless they can feel trust towards the monitoring and screening levels/ systems, and even more so towards the distribution systems.

In Fukushima, four years have passed since the accident occurred yet still the situation has not been brought to a conclusion. Fears remain about nuclear fuel and contaminated water. This unease is not limited to Fukushima Prefecture, and there is little hope of recovering trust the way things are. Put simply, it is simply inconceivable that people will regain trust over a short period of time in primary produce emanating from the area near the nuclear plant, which caused the disaster.

What is more, the local industries are facing increasingly serious labor shortages due to more people evacuating away and overall instability of the region. At this rate, the whole local industry could face collapse. This is a problem that cannot be tackled by one-off subsidies and compensation monies.

Due to the effects of radiation on primary industry produce, the primary industries take a massive hit. Not only that; even if the impact of radiation is not so harmful, damage cannot be stopped unless there is widespread confidence among the people in the measurement systems.

To this end, people in each country must demand that the relevant authorities establish baseline standards for radiation pertaining to primary industry products, food products and drinking water before a major disaster occurs. There is the danger that even if you have strict standards during normal times, once an emergency occurs the authorities may seek to majorly loosen or even lift these standards. Other potential problems include screening oversights, products disguised as coming from another region, and data falsification. Citizens need a robust wide-area supervision framework, including seeking advice from independent experts.

It is indispensable to always have screening and measurement instruments for radiation in stock at all times, and to ensure a system whereby farmers, fishermen, and consumers can carry out measurements themselves at the levels of agricultural/fisheries coops, coops and communities. Disclosure of information is the key to winning trust for screening and measurement. Citizens need to undergo training on a regular basis in order to raise their ability to read and understand screening and measurement.

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Radiation straddling the prefectural borders

Mr Takashi Sato (38, pseudonym) lived in a village in Miyagi Prefecture, which borders the northern part of Fukushima Prefecture. He had moved there 10 years ago from Tokyo, yearning for a countryside living. When the nuclear accident happened he somehow felt safe because he lived in a different prefecture. However, in the neighboring village in Fukushima Prefecture people were rather concerned. One of his friends measured the radiation of his village and raised the alarm. Following this, he evacuated his wife and child to Sendai City in Miyagi Prefecture, where his wife's parents lived. Despite his village being contaminated with radiation, he cannot receive any compensation from the government or prefecture for the incomprehensible reason that it is not part of Fukushima Prefecture. Takashi learnt the hard way that "radiation does not have anything to do with borders, which are decided by humans."

6 Complete decontamination is impossible

A house with no toilets

From the outset, Japan's nuclear plant policies have made no clear indication regarding the final disposal of spent fuel. This is likened to "a house with no toilets". What is more, following the Fukushima accident, Japan must now dispose of rubble and other detritus covered in radiation, as well as the spent fuel and waste substances that will be collected during the decommissioning work that will continue for several decades into the future.

The rubble from the disaster has sparked great debate, because of moves by the authorities to implement wide-area disposal by transporting rubble to areas outside of the disaster zone. Citizens kept a close eye on these moves, borne from concerns about the diffusion of radioactive contamination. However, the investigative commission organized by the Ministry of the Environment was not made public and was off-limits to citizens; minutes of the meeting were not made public. 1 trillion yen was allotted for wide area disposal, scheduled to take place over 2 years from 2011.

Decontamination work started in 2012. In post-Chernobyl Europe, however, decontamination was regarded as not being very effective given the enormous cost – thus, there were no precedents for decontamination of the scale required in Fukushima.

Facing up to issues that been delayed for too long

Decontamination produces decontamination waste, including soil and sand full of radioactive particles. Decontamination waste is heaped together in temporary storage sites. Designation of these temporary storage sites was left to the cities, towns and villages to decide, and to begin with organizing these was heavy going. As a

last-ditch measure, the garbage is being temporarily "stored onsite" in temporary storage sites, parks, and gardens of large houses and other premises. The latest plan is to move this garbage into the interim storage facilities that are scheduled to be constructed in municipalities where Fukushima Daiichi Power Plant is located (Futaba Town and Okuma



Decontamination of downtown areas using high pressure cleaning equipment. February 2012 Photo: JANIC

Town), after which it will be sent outside the prefecture within 30 years. However, where it will end up after this storage period is still unknown.

Decontamination done by amateurs risking radiation exposure

Although decontamination is the job of the country and local municipalities, in reality it is the large-scale construction and civil engineering companies who are sub-contracted. Most of these are major corporations, known in Japan as "general contractors", from outside the prefecture. These general contractors subcontracted to small to medium sized companies in the local area, which in turn enlisted workers from all over the country. It was an unknown task, approached through a process of trial and error. The basic method involves cleaning and then removal of the topsoil. High-pressure cleaning equipment blows radioactive materials into the rivers, which flow into the ocean. Following criticism from citizens that radioactive materials were being unnecessarily dispersed, Tokyo then instructed workers to retrieve all of the cleaning water.

Sluggish housing decontamination

Decontamination of housing was slow to get going. Decontamination of nurseries, kindergartens and schools was either outsourced to local businesses, or could be done by school staff and parents. In some cases, volunteers offered to help. In areas where there were no evacuation directives, residents ended up living where there should have been decontamination work implemented. Unable to wait for the authorities to get around to their area, many residents took up the initiative themselves.

General contractors who promoted nuclear plans are now profiting from the nuclear accident

Most wide-area disposal of disaster rubble and decontamination work provides profit for the major general contractors. With wide area disposal, general contractors receive the jobs, acting on behalf of the prefecture or Tokyo; after taking their margin, they subcontract the work to local industrial waste contractors. At the level of cities, towns and villages, decontamination provides an opportunity for local contractors to form a business union together and to create some momentum for recovery in their locality; alas, they had a hard fight when major general contractors from outside the prefecture entered the picture. The very people who had profited up until now from nuclear policies now set to gain from the nuclear accident.

A multilayered subcontracting arrangement that obstructs the sense of mission of the workers involved in decontamination/decommissioning work

The people on the front line of decontamination work are from small to

medium and micro-sized businesses. The work comes down from the original contractor, down through several other operators. It is normal to have work go from sub-contractor to sub-sub contractor, with 4 or 5 intermediaries involved. This is the traditional structure in Japan, not just limited to decontamination work, and common in construction and civil engineering. It is the same for the work to decommission a nuclear power plant. Workers are exposed to radiation and risk their health, but it is an essential and necessary job. However, the conditions are not at all satisfactory, neither economically nor mentally. Reportedly, people working on decommissioning the reactors in Ukraine are assured sufficient conditions; yet in Fukushima, the conditions offered to front-line decontamination and decommissioning workers are completely at odds with the importance of the job and the risks involved.

Lesson 6 It is not possible to completely get rid of radioactive contamination

Despite the term decontamination, in reality, it is not possible to completely get rid of contamination. In most cases, it just amounts to transporting the contaminated material somewhere else. The very process of decontamination and the gathering up of waste materials could actually increase the risk of exposure to radiation. Accordingly, areas should be divided into those where decontamination work is absolutely necessary and areas where it is not so necessary, so as to avoid raising the possibility of exposure to radiation. In the process of the decontamination work, or due to a hit-or-miss management system for decontamination and waste materials, the danger of exposure to radiation increases.

Rather than being left to a few municipalities and corporations, decontamination work must be implemented under a public system with responsibility for a wide area. It is a grave error to consider it an issue that is the personal responsibility of afflicted municipalities and communities. Public organizations must have the duty of responsibility to provide full explanation to afflicted residents.

In Fukushima, a tsunami and nuclear accident inflicted composite damage. There are instances were disposal of huge amounts of rubble created by the tsunami could not proceed due to the rubble possibly being contaminated with radiation. Dealing with complex disasters can make the problem more and more complicated – this is a point that must be borne in mind.

7 There is no hope of the accident being brought under control unless workers are given better treatment and healthcare

A serious worker shortage

Many workers are required to operate a nuclear plant. Before the accident, the amount of radiation that workers could be exposed to was strictly regulated; yet after the accident, this limit was drastically loosened. Even when a nuclear plant is operating normally, workers cannot avoid being exposed to radiation. Many more workers are now required to bring the accident under control and to



Post-disaster work within the Fukushima Daiichi Nuclear Power Plant July 2013

complete the decommissioning work.

As well as preventing health damage for workers, radiation exposure standards are also used for authorizing workers compensation when health damage does occur. However, it is evident that managers detest recognition of work-related damages, and through faulty radiation exposure control are attempting to show the exposure as being lower than it actually is.

Multi-layer subcontracting, meager wages

Workers on the frontline of reactor decommissioning receive lousy treatment for their toil, which carries a higher exposure risk than decontamination work. Between the original contractor that utilities companies contract with and the frontline workers, there are many other contractors on the way down, meaning that middlemen are all taking a cut from the workers wages. Many of the workers are irregular workers with no benefits on hourly or daily rates. Homeless people are among some of the workers who are sent to Fukushima by urban worker dispatch companies. In this type of industry, there are underground operators known as "people dispatchers" who are often linked to the Yakuza, or the Japanese mafia. This multilayered employment situation within the nuclear plants has been identified as a problem before the accident, with citizen groups appealing to TEPCO that the Yazuka (organized crime syndicates) have gotten involved and that it is providing a hotbed for illegal treatment of workers.

Insufficient healthcare for workers

Nuclear plants are often constructed in depopulated areas, and people have tended to see utilities companies and their affiliated companies as being solid and stable places to work. However, most workers at subcontracted companies are unorganized laborers; frontline workers, in particular, are often temporary workers paid on a daily basis. Depending on the company, some workers don't even receive health insurance. "Hidden workers" are also widespread –where workers are not authorized for labor as it will cause a major problem to the contracting company if they become ill or get injured. In Japan, nuclear plant workers accident compensation for illnesses caused by radiation was first filed for in 1975, but was not granted. As of 2013, only 16 people have ever been authorized for this compensation.

People actually affected by the disaster from within Fukushima Prefecture are themselves also among the workers. Before the accident at Fukushima Daiichi Power Plant, the ratio of subcontracted workers exposed to radiation was by far the highest in the country, and it was becoming an issue. The issue was that workers at Fukushima had been exposed to 4 times as much radiation as full-time employees working in nuclear plants all over Japan; despite a lack of any accident occurring, some workers had annual exposure of as high as 8 mSv.

Before the accident, the mass media did not give much coverage at all to the issue of nuclear plant workers being exposed to radiation. While citizen groups continue to provide steady and patient support, the utilities companies are keeping a tight lid on information, which prevents frontline workers from telling their side of the story. When it comes to exposure to radiation by nuclear plant workers, it is the subcontracted laborers at the frontline who are overwhelmingly exposed. 97% of the total amount of radiation exposed to corresponds to that of subcontracted workers.

During work carried out on-site to bring the accident under control until March 2014, the number of workers with accumulated radiation exposure dosage greater than 100 mSv was 174. The highest was a TEPCO employee exposed to 678 milliseiverts, and a worker from a cooperating company at 238 mSv. There were also cases where radiation supervision data has been falsified.

After the accident, Tokyo raised the accumulated radiation exposure upper limit for

workers to 250 mSv. Exposure in excess of 50 mSv requires mandatory annual screening for cataracts, and exposure of over 100 mSv requires mandatory annual screening for cancer. However, the experts involved in writing the "Self-Guarding Manual for Manual Laborers Exposed to Radiation" (issued by a citizens' group named "Emergency Council on Fukushima Nuclear Plant Accident"), have pointed out the fact that people exposed to radiation after Hiroshima and Nagasaki were issued with personal health records that entitled them to free healthcare, while on the other hand workers in Fukushima are receiving no such coverage. These experts are urging the government to provide such personal health records and lifelong coverage to exposed workers.

Furthermore, actual working hours for nuclear plant laborers are much shorter compared to ordinary labor given the need for protection from radiation exposure. Work in highly irradiated areas can be limited to as short as 10-20 minutes per day. Even if workers know that they may develop late-onset disorders due to radiation, they don't actually feel anything directly after radiation exposure. Much more stringent management and control of radiation exposure is necessary.

■ A radical rethink of working environment and worker treatment is now required In the preceding section, we compared the treatment of workers involved in the cleanup and decommissioning work since the nuclear accident in Fukushima with that of Chernobyl. There is a large gap in the treatment that these two sets of workers received. In Japan, there are laborers being exploited through multi-layer subcontracting with no assurance or hope for their future, while at the thick end of the wedge are companies making a profit without getting their hands dirty at all. This kind of working arrangement is simply not healthy. Workers involved in decommissioning operations that involve radiation exposure must be provided with sound treatment and a working environment that fulfills all aspects of safety, as well as system that will look after them once they have retired from these jobs.

Lesson 7 Nuclear plant workers must be provided with proper health management

When nuclear plant accidents occur, in most cases, victims and their families are among those who end up involved in cleanup and decommissioning operations. Offsite residents and onsite workers have different concrete standards, however, the same principle applies for both that health care measures must be extremely thorough. Above all, when workers are forced to resolve emergency situations, there is the danger that their basic human rights are being neglected. Among other concerns, it is vital to insist on information disclosure regarding the conditions of workers. While safety and confidentiality concerns can stand in the way of information closure, journalists from both countries with nuclear power and those without must be encouraged and urged to shine a light on the conditions faced by onsite workers.

As a matter of public responsibility, the many temporary workers must be guaranteed medical expenses in the long run after they have retired, and be issued with a personal health record, which entitles them to follow-up checkups later on in life.

-column

Radioactive waste, burnt in secret

Ms Mayumi Kanno (38, pseudonym) is originally from Tokyo, and ten years ago married a farmer in a village within Fukushima Prefecture. It has been four years since the nuclear accident, and she is now worried about incinerators being built one after another within the prefecture. Mayumi, who has a child at elementary school, considered evacuation following the nuclear accident; her husband and parents-in-law, however, were opposed to this decision and she was obliged to carry on living in Fukushima. Sewage sludge, decontamination waste, rubble and rice straws, all containing radioactive materials, will be burnt at the incinerators. After the accident, the government raised the standard with which they decide what to treat as radioactive waste from 100 bq/kg to 8,000 bq/kg outside nuclear power plants. However, it is possible that materials containing in excess of 8,000 bq/kg could be burned at this incinerator. There is no maximum radiation dosage for materials to be brought to the incinerator, and restrictions are placed only on the ash after incineration. Mayumi has begun to oppose this together with friends from the local community.

8 Rebuilding the daily lives and community for of those affected is essential

People pressured into unreasonable choices

People facing up to radioactive contamination caused by the nuclear plant accident are under pressure to make various decisions in trying to cope with the situation. The issue of radiation governs everv decision, from major matters such as whether to stay put or evacuate somewhere else, to smaller everyday decisions such as what to eat and where to hang the washing.



Temporary accommodation in Fukushima City February 2014 Photo: Kristian Laemmle-Ruff

The fact that radiation is invisible and that there are many unknowns including the effects of low-dosage radiation exposure on health, all serve to make people even more worried and to further complicate their decisions.

A bountiful natural environment where people can bring up their children with peace of mind, a job that feels worth doing, the land of their ancestors, relationships with neighbors, shops and schools necessary for daily life, hospitals and infrastructure – all of these elements that are necessary for people's lifestyles should all be present within the local area by right. However, due to the nuclear plant accident, many people have been forced into making unreasonable decisions about what to prioritize, and what to give up on.

The division between people who evacuated and those who stayed

Decisions about what to prioritize while under pressure to make such unreasonable choices differs between people and families. In areas where there were no evacuation directives despite a high radiation dosage, people were under pressure to decide whether to carry on living there or to evacuate. Long-term evacuation means making major sacrifices, including cutting off ties with work, the local community, and children's schools. People have to weigh up these various elements against the risks of radiation, and to reach their own decisions.

Under these circumstances, people who chose to evacuate feel somehow sorry or indebted to the people who stayed. Some people were discriminated against in their new areas of residence simply because they came from Fukushima, or due to misconceptions about radiation. On the other hand, people who stayed were wracked with anxiety about exposure to Low-dose radiation.

Division within households

Even within families, people do not share the same priorities. Tensions mounted between mothers worried about health and fathers worried about their jobs, as well as tensions regarding their parents who are used to living in the local land. There were differences in opinion about where to live, what the children should eat, and other issues.

While on one hand there are many families who chose for the mother and children to evacuate, there were also mothers who wanted to evacuate with the children, but gave up on the idea because the rest of the family did not feel it necessary. There are cases where radiation is a taboo subject at home, and where mothers become isolated in their point of view. In more than a few cases, couples ended up getting divorced as the crisis revealed different ways of thinking about child-reading and different sets of priorities in life.

Division within schools

Once schools re-opened, parents concerned about children's exposure to radiation decided to take them to and from school by car, to stop them from participating in outdoor activities and sports, and insisted on giving them their own lunch to eat at school over worries about radioactive contamination in school food. Depending on their parents' way of thinking, some children could participate in outdoor sports activities while others could not, and similarly some could eat school lunch provided centrally and made with local produce, while others could not; this causes divisions within daily school life. There are cases where school staff put pressure on worried parents to get in step with other parents.

Division between areas that received evacuation orders and areas that did not Contamination due to radioactive materials spread with no regard for boundaries between towns and villages, dispersing in a complicated manner due to the land's features and weather conditions. This meant that boundary lines were drawn within villages or towns to indicate which areas were subject to evacuation orders and

which areas were not. Apart from the issue of whether to carry on living there or not, depending on which side of a boundary line a house is, the amount and type of compensation payable by TEPCO differs significantly. In some instances, despite being neighbors with almost exactly the same circumstances, one household would receive tens of thousands of yen (hundreds of dollars) monthly in compensation, while their neighbors only received a one-off payment; this only served to ratchet up tensions between people within the same community.

Conflict between people coming from areas issued with evacuation directives and local citizens

One coastal city in Fukushima Prefecture which is located some 40~50km to the south of Fukushima Daiichi, lost about 300 residents to the tsunami, and has more than 7,000 people forced into living in temporary housing or rental accommodation. Despite this they have taken in some 24,000 evacuees from municipalities in the vicinity of the Fukushima Daiichi Power Plant. In this city, there is friction between evacuees and local citizens. These local citizens were devastated by the tsunami and continue to be affected by radiation, yet they receive little compensation; as such, they feel doubt and antipathy towards evacuees who are receiving substantial monetary damages from the nuclear incident. Another separate issue stems from the fact that the large inflow of evacuees has suddenly increased the local population, further exacerbating the existing shortage of doctors, making longer waiting times in hospitals, worsening traffic jams, causing a shortage of rental properties, and making property and land prices shoot up as evacuees buy up homes in the area; these have all been identified as the root causes for antipathy felt by local citizens towards incoming evacuees.

Lesson 8 The importance of rebuilding lifestyles and communities cannot be overlooked

Regarding the nuclear accident at Fukushima, several high-ranking politicians from the ruling party have heartlessly claimed, "nobody has died from the accident." This has led to great debate - while it is true that there have been no deaths directly attributable to exposure to high doses of radiation, it is a fact that many people have died due to the illness and stress stemming from the dramatic change in their lives, including evacuation. These are referred to as "nuclear accident-related deaths." To limit the effects of the nuclear accident to direct loss and illness serves only to trivialize the damage.

Measures for people afflicted by a disaster are not limited to one-off compensation

payments and health check-ups, neither does merely building them a house solve their problems. In response to their prolonged life as evacuees, it is vital to think in terms of rebuilding the daily lives of those affected, and also to maintain, or where necessary, rebuild their communities. In order to do so, comprehensive initiatives are required, encompassing employment, securing a means of making a living, accommodation, education, leisure, as well as mental care. As well as demanding that the government provides these services, the roles of the local doctors' associations, lawyer groups, educators, NGOs and community groups are also very important in constructing a collaborative framework for rebuilding communities.

column

Carrying on farming on contaminated land

Ms Miko Endo (26, pseudonym) is the only daughter of a farming family in Kawamata Town. Her parents were organic farmers, who used to ship their products to a local community marketplace. Miko was about to graduate from university and had secured a job in Tokyo, but returned home in order to support her parents, who were extremely worried by the radiation issue. At the moment, radiation is barely detected from their agricultural products. After the accident, university researchers cooperated with farmers in an attempt to prevent radioactive materials in the soil migrating into crops. Miko is very appreciative of these efforts. However, the radiation level of their farmland remains high and Miko sometimes gets hit with uncontrollable anxiety that she could have health problems by carrying on farming.

9 Rebuilding the daily lives and community for of those affected is essential

Enactment of the Nuclear Disaster Victims' Support Act

Due to the explosion caused by the Fukushima Daiichi Power Plant accident, radioactive materials were dispersed far and wide, contaminating areas beyond the zones in which the Japanese government issued evacuation directives. In such areas,

many people had no choice but to evacuate on their own decision.

In June 2012, a year after the nuclear accident, lawmakers established a new law in the Japanese parliament. The purpose of this new law was to provide support not only to people who evacuated based on government directives, but also to peo-



Mothers and children heading for the first day of school ceremony April 2011 Photo: Naomi Toyoda

ple who evacuated voluntarily, as well as people who did not chose to evacuate but who lived in areas where a radiation dosage above the baseline standard was detected, who now have to face up to worries about health and other concerns in their daily lives. It was named the Nuclear Disaster Victims' Support Act (Official name: Act Concerning the Promotion of Measures to Provide Living Support to the Victims, including the Children, who were Affected by the TEPCO Nuclear Accident in Order to Protect and Support their Lives). This bill was pushed for both by pleas from people affected by the disaster and citizens supporting them, and was unanimously enacted by members of the Diet in a non-partisan effort.

The "Nuclear Disaster Victims' Support Act" was an epoch-making piece of legislation that recognized head on the "right to avoid exposure to radiation". "The right to avoid exposure to radiation" consists of the two concepts of "the right to evacuate" and "the right to avoid radiation exposure in the course of daily life". The key principles of the act are as follows: "Support must be afforded to afflicted persons residing in the "Support Target Area" in instances where they choose to continue to live in that area, in instances where they choose to evacuate or move

away from that area, or in instances where they chose to return to their original residences. Support must be provided in any of these instances, and all choices are to be equally respected".

The premise of "the right to avoid exposure to radiation" is the Precautionary Principle. This principle stems from the environmental law stating that: "In cases where there is a major impact on the environment, countermeasures should be adopted even if scientific knowledge is insufficient:" The "Nuclear Disaster Victims' Support Act" states that, because the negative impact of radiation on human health has not been scientifically verified beyond any reasonable doubt, minimizing radiation exposure and ensuring full health management of exposed persons are necessary measures to support victims, from the perspective of actively prevention of health damage.

The Nuclear Disaster Victims' Support Act in crisis

When this act was passed, many people affected by the disaster including those who evacuated autonomously, were pleased as they felt this law would benefit them. Two years since it was passed, however, it was evident that the act had been significantly watered down by the government. The basic policy plan, which was supposed to be established within one year after the act was passed, was significantly de-



"All-Japan assembly to help those affected by the nuclear plant accident" convened in Fukushima City September 2013 Photo: Shalom

layed; although the Reconstruction Agency finally announced it in August 2013, its contents were completely out of joint with the principles of the act.

Despite the act specifying that the "support target area" would be "areas where the radiation dosage is lower than baseline standard set by the government for evacuation directives, but higher than a certain standard", when it come down to it the basic policy plan ignored this premise, limiting the "support target area" to a small area comprising thirty-three cities, towns and villages in Fukushima Prefecture, rather than conducting any debate on what the aforementioned "certain standard" should be.

Affected citizens and their supporters were incensed by this, and held meetings

with the government and related agencies, organizing hearings all around the country – where they appealed for the following: the holding of public hearings all around Japan; involving those affected by the disaster and those supporting them in the public debate process, and at the least the designating of any area with an annual radiation dosage over 1 mSv as being in the support target area. Many people submitted opinions in writing to the government, not just citizens but also municipalities and local assemblies throughout Japan.

However, in October 2013, without holding any hearings, and completely ignoring the opinions of citizens and assemblies, the cabinet approved a basic plan with minor adjustments. Despite the support act stating that necessary measures would be pursued by the government to reflect the opinions of those affected by the disaster when formulating the basic plan, their opinions had not been reflected in any way at all.

Comparison with Chernobyl

"The Nuclear Accident Victims' Support Act" was drawn up using references from legislation known as the "Chernobyl Laws" which were created by Russia, Ukraine and Belarus five years after the Chernobyl Accident. The Chernobyl Laws clearly stipulate the standard that for the critical group of population - children born in 1986 - the effective exposure dose due to the Chernobyl accident should not exceed 1 mSv per year and 70 mSv for the life period in any specific environment (except for exposure due to natural background radiation). Based on this basic concept, the

Air radiation dose(annual)	Fukushima zoning	Chernobyl zoning
50mSv and above	"Difficult to return" zone	Forced evacuation zone
20 - less than 50mSv	Habitation restricted zone (temporary return possible)	Forced evacuation zone
Less than 20mSv	Zone being prepared for lifting of evacuation order	Forced evacuation zone
5mSv and above	No instructions	Compulsory resettlement zone
1 - less than 5mSv	No instructions	Right to resettlement zone
0.5 - less than 1mSv	No instructions	Radiation control zone

Differences in evacuation segmentation between Fukushima and Chernobyl

N.B, segments in red are in principle off-limits

Chernobyl laws established "zones with the right to evacuate", where residents can choose whether to evacuate or not, even outside forced migration zones designated by the government. Residents in these areas are granted the right to migrate, and are able to demand compensation from the government to cover their moving expenses, as well as aid to help them secure housing and employment in their new areas of residence. On the other hand, those who chose not to migrate and to remain within the region were paid compensation and provided with had their medical expenses paid.

Under the "Nuclear Accident Victims' Support Act", people in Japan expected that the government would establish zones with the right to evacuate outside of zones subject to evacuation directives; yet at present, this is still not the case.

Lesson 9 Laws for rights and relief for those affected must be made with their participation

Relief for victims is not something that comes from neither the kindliness of governments nor the expression of concern by corporates. Receiving legitimate compensation and having your life rebuilt are basic human rights. As seen in the example of the Victims' Support Act of Fukushima, those affected victims can stand up for themselves and enlist the cooperation of lawyers and legislators to win.

While this is no simple matter, there are precedents from around the world including Chernobyl and Fukushima, demonstrating this possibility. It is hoped that people around the world threatened by nuclear pant accidents can think up countermeasures and preventative measures based on these precedents.

When creating these systems, it is absolutely essential that the affected communities and individuals themselves can be at the center of the process. Those who have a personal stake in the process must create a cooperative framework, overcoming the inevitable differing points of view and conflicts. Even if a legal system is established, its significance differs greatly depending on how it is operated. Those who were afflicted by the original disaster must be present on a constant basis to participate in inspecting operational regulations and frameworks.

10 Taxpayers are being made to bear the compensation costs

Who is responsible for the accident?

The Fukushima Daiichi Power Plant accident was on a different order of magnitude to other industrial accidents that have struck Japan in the past, causing colossal and serious damage. Yet four years on from the accident, it has still not been made clear who is responsible for such a huge disaster.

Responsibility of the Japanese Government

The Japanese government is responsible for promoting nuclear power generation as a national policy. The central government and some politicians got close to the utilities companies and related companies, forming the "nuclear village" to promote nuclear power. The government is also responsible for not implementing sufficient crisis management measures to prevent accidents. Particularly serious is the fact that the system for monitoring and regulating the operators was not functioning.

Indeed, because the government did not imagine a complex disaster such as this one, there were many inadequacies in the initial response framework deployed by the office of the Prime Minister, forcing many people to be exposed to radiation that could have been avoided.

Responsibility of TEPCO

TEPCO, the operator of the nuclear power plant, has the responsibility of neglecting to put in place sufficient crisis management measures to prevent accidents despite being fully aware of the dangers posed by tsunamis, in the pursuit of profit and on the foundation of its own "safety myth."



Appeal by Complainants for Criminal Prosecution of the Fukushima Nuclear Disaster. February 2013 Photo: Peace Boat

When the accident occurred, on top of problems related to information sharing within TEPCO and backup systems, information disclosure about the accident was insufficient. TEPCO's failure to provide information to the government caused there were delays in evacuation directives that ended up leading to even more damage. Not

to mention the fact there is still no indication of when the ongoing issues of radioactive materials dispersal and leakage of contaminated water might be resolved.

Responsibility of the Fukushima Prefectural Government

The Fukushima Prefectural Government must assume part of the responsibility for enticing the Fukushima Daiichi Power Plant, and for promoting nuclear power. The prefecture must also be called to account for various oversights which served to increase the damage directly after the accident, including not making public the System for Prediction of Environmental Emergency Dose Information (SPEEDI) information and not providing appropriate directives regarding the administering of iodine preparations.

Responsibility of local municipalities

Okuma Town and Futaba Town where Fukushima Daiichi Nuclear Power Plant is located, and Naraha Town and Tomioka Town to the south where Fukushima Daini Nuclear Power Plant is located, all received large grants as kickback for hosting the power plants, and gradually developed a strong dependence on these grants. These local municipalities are responsible for playing the role of promulgating the nuclear safety myth among the people.

While areas where nuclear plants are located and the municipalities in the vicinity are in one sense victims of the nuclear accident, they also assume responsibility for the safety of residents of the respective municipalities. During the accident at Fukushima Daiichi Power Plant, municipalities made their own decisions that decided the fate of residents, in the absence of proper instructions from Tokyo and the Prefecture. There were municipalities in the vicinity of the nuclear plant that were woefully unprepared.

The nuclear accident compensation framework that foists the burden onto the taxpayers

There is a law in Japan known as the "Act on Compensation for Nuclear Damage", which touts the two conflicting goals of "protecting victims" and the "healthy development of the nuclear industry."

Under the provisions of this act, the business operator bears primary compensation liability, which is supplemented by financial aid by the nation if insufficient. This act does not require proof of negligence; therefore the question of where responsibility lies tends to remain ambiguous. Under the compensation framework decided on by the government following the Fukushima disaster, the basic premise is to uphold the existence of TEPCO, who should be held responsible for the accident, with support from utilities companies nationwide and from the government. Ultimately, the cost of compensation is being transferred onto the people, through both hikes in electricity rates and through the injection of tax.

The actual state of compensation

There are 3 methods for seeking compensation from TEPCO for victims of the nuclear plant accident: 1) Direct claim to TEPCO; 2) File a lawsuit; 3) Plea through alternative dispute resolution (ADR).

In the case of (1), victims must use a format prepared by TEPCO, and must complete a complex compensation claim process, forcing them to comply with standards defined by TEPCO. On the other hand, the method in (2) whereby victims have to file a law suit for compensation and go to court means a huge burden in terms of time and money. Given this, the "Dispute Reconciliation Committee for Nuclear Damage" (ADR Center) was set up, providing an intermediary agency between TEPCO and the victims.

However, there have been various stumbling blocks from the outset such as the ADR Center not taking on pleas that TEPCO considers to be outside the scope of consideration.

Cost of decommissioning work

According to TEPCO, it will take between 30-40 years to finish decommissioning of the reactors at the Fukushima Daiichi nuclear power plant. However, the overall cost of decommissioning work and the time required to do it will greatly exceed TEPCO's estimation, even for decommissioning work on reactors that have ceased operating. If we consider the handling of the problem of highly contaminated water, which is still ongoing, it is extremely difficult to gauge just how much money and time will be required.

Furthermore, as an indirect result of the serious damage done during this accident, it is expected that as well as Reactors 1-4 at the Fukushima Daiichi Nuclear Power Plant which were directly damaged by the accident, the remaining two reactors 5 and 6, as well as reactors 1-4 of the Fukushima Daini Nuclear Power Plant will also need to be decommissioned - this cost must be added on. Finance Green Watch (FGW), which sends out environmental information of Japanese financial institutions. have put the decommissioning cost of reactors 1-6 at 7 trillion yen (approximately 58 billion USD, with calculations throughout this booklet made at 1USD=120IPY). The U.S. Government Accountability Office (GAO) reported to US Congress in 1986 that damage caused by a catastrophic accident would amount to 15 billion US



A pile of decontamination waste October 2014 Photo: Fukushima Beacon

dollars for one power plant.

Decontamination and disposal of waste

As a result of preliminary calculations, a research group from the National Institute of Advanced Industrial Science and Technology (AIST) has announced the maximum total cost of decontamination work implementable within Fukushima Prefecture for residential and agricultural areas, at 5.13 trillion yen (approximately 43 billion USD). The costs of "Special Areas for Decontamination" directly administered by the government were calculated at 1.83-2.03 trillion yen (15-17 billion USD). The cost for decontamination implemented by municipalities in "decontamination implementation zones" was estimated at 700 billion-3.1 trillion yen (5.8 – 26 billion USD). Calculations are made (for decontamination) in two ways - one based on the standard unit cost and the other on the highest unit cost, derived from hearing sessions with municipalities. Calculations include costs for moving contaminated soil to temporary storage sites and interim storage facilities, as well as the cost of storing within interim storage facilities. (Kyodo News, July 24, 2013)

Other data for compensation costs made public by the government and TEPCO

A new policy was concluded for compensation in December 2013, based on which TEPCO's estimate exceeds 5 trillion yen (42 billion USD). Separate from this, the following budgets were enacted by Tokyo and Fukushima Prefecture due to the nuclear accident:

1. 200 billion yen (1.7 billion USD) in subsidiary aid paid to Fukushima Prefecture for hosting nuclear plants.

- 2. 160 billion yen (1.3 billion USD) in subsidiaries to accelerate restoration/ reconstruction.
- 3. 96 billion yen (800 million USD) to cover costs for prefectural citizens health care examinations
- 4. 73 billion yen (608 million USD) to cover costs of constructing disaster public housing
- 5. 40 billion yen (330 million USD) for Nuclear Power Disaster Restoration Fund

These do not include costs for the final disposal of the soil from decontamination work, nor the personnel costs incurred for public servants responding to the accident. It is also considered appropriate to add to these numbers the cost of support required for revising employment conditions for workers involved in decontamination and decommissioning efforts, as well as revised treatment that covers health care and medical costs.

Just with these limited estimations and the previously mentioned estimations for decommissioning and decontamination costs, the total amount exceeds 23 trillion yen (190 billion USD). Incidentally, the general account budget for fiscal 2014 was approximately 95.9 trillion yen (800 billion USD).

Cost to victims that cannot be recuperated through compensation

Through evacuating, victims of the Fukushima Daiichi Power Plant accident lost their houses, land and household goods. Whole families lost everything they had amassed until now, including items with sentimental value. This amounts to losing the family's history. There were many cases where mothers moved away with their children due to concerns about radiation, leaving fathers behind and breaking up families.

There are a considerable number of cases where having to lead two separate lives has resulted in divorce, as mentioned before. Similarly, the increase in spending to maintain two separate households, such as transportation costs, pushed low-income families towards poverty.

Stolen livelihoods

An occupation is not solely for the purpose of earning money for daily life. Work is also about making a social contribution that provides a feeling of worth, a feeling of being needed. In this sense, no amount of compensation can make up for losing one's livelihood and calling. Most evacuees were robbed of their social standing that they had built up over the years, in some cases even losing their confidence and dignity as a human being.

Broken communities, and lost neighborhoods, hometowns, cultures and nature

Most evacuees had greatly enjoyed their lives in the rich natural environment replete with mountains and the sea. They are no longer able to live alongside nature or be part of a community rooted in it. Due to evacuation – both forced and voluntary – and due to the ineptitude of the government and authorities, many communities have collapsed. Never knowing when their "temporary" lives as an evacuee will end, people have lost



TEPCO employees apologizing to the bereaved family of a victim who committed suicide by self-immolation in her own garden following the accident. September 2014 Photo provided by related parties

their hometowns while at the same time having no way to restart their lives anew. Local cultures may be able to survive intact if some community ties remain; however, most young people who should inherit the culture have left –if they return to their hometowns, only the elderly will be left.

Anxiety about health damage in future, resolving mental anguish

There are still aspects to be scientifically verified regarding the impacts of radiation on health. At present, we have no idea about so-called late-onset health disorders that may occur in the future. For parents who are worried about the health of their children in the future, "peace of mind" campaigns rolled out under such circumstances are simply counterproductive. In particular, mothers and children separated from their families due to evacuation face a great deal of mental strain, as do the fathers who have been left behind.

Difficulties of Compensation

People who have sustained damage have a clear right to compensation payments. If you consider the seriousness of the damage, including losses that cannot be replaced by money, in most cases the amounts of compensation are not satisfactory. On the other hand, however, those affected by the disaster who continue to receive compensation can lose the will to work, and there are many cases of divisions occurring between people and communities due to receiving different amounts of compensation. Policies are not being designed with a view to rebuilding the lives of those affected.

Lesson 10 Damage from accidents must be factored into "the cost of nuclear power"

Governments and corporations singing the praises of nuclear power often make the following claims: "it will benefit the local economy" or "nuclear power is comparatively inexpensive". In most cases, however, such calculations omit the cost of accidents, compensation, and expenditure required to clear up the accidents. In the case of Fukushima, even 4 years after the accident occurred, the damage is still ongoing and even ballooning; it is problematic even trying to put a figure on the sum total of damage. TEPCO, who should be held responsible, have not gone bankrupt and in fact continue to operate as normal. In the background to this is the fact that TEPCO, the perpetrator of this accident, is being kept afloat through large injections of tax money provided by the people of Japan, who are themselves the victims.

Governments provide various financial subsidiaries and grants for constructing and operating the plants, and once an accident occurs, the same government then provides a financial safety net for the operators. Under such a framework, in instances where nuclear power is promulgated as a national policy, the real cost is not reflected in the management of the operators. As a result, those who ultimately bear the brunt of the damage are the victims themselves, and the taxpayers.

-column

Hidden Exposure to Radiation

The village where Mr Takashi Watanabe (33, pseudonym) was born is about 30 minutes by car from Fukushima City, around where the Abukuma Mountains start. He lived with his 31-year old wife, 7 and 4-year old daughters, and his parents, and kept about 20 cows as a dairy farmer. After the accident, his wife was worried about their children being exposed to radiation. However, because the doctors and officials from Tokyo (claiming to be experts) declared that there was not any danger, he convinced his wife that evacuation was not necessary. However, a month later, the entire village was ordered to evacuate, and he had to give up his cattle and everything else. On top of this, he was forced to live separately from his parents. Recently his wife told him about the prefectural survey results, which indicated that most of the Fukushima residents who were estimated to have been exposed to more than 5 mSv of radiation (during the first 4 months after the accident) were from his village. Takashi could no longer look her in the eye.

Chapter 3

International law and disaster risk reduction framework

- tools we can use to protect ourselves

How should ordinary citizens, those affected should a nuclear accident occur, go about exercising their rights? Furthermore, which rights are acknowledged to be universal, and how exactly can people insist on exercising their rights? Below is a summary of tools that can be can used, including international agreements.

From the human rights perspective

Humans have basic human rights, and the societies they inhabit are formed based on universal values. These include the right to safety, the right to health, and the right to know and participate. To expect information and protection is universally recognized as a basic human right. The basic approach regarding human rights is codified in the following international treaties:

* International Bill of Human Rights, 1948

http://www.un-documents.net/a3r217.htm

3 years after the United Nations was established, the UN General Assembly adopted the Universal Declaration of Human Rights, which became the cornerstone of modern human rights. The Universal Declaration of Human Rights was adopted on December 10, 1948, stating that every human is entitled to civil, political, economic, social and cultural rights.

* International Covenant on Economic, Social and Cultural Rights, 1976

http://www.ohchr.org/EN/ProfessionalInterest/Pages/CESCR.aspx Entering into force in 1976 and ratified by 163 countries (as of January 2015). The human rights promoted and protected by this covenant include the right to work under fair and decent conditions, the rights to social security, the right to an adequate standard of living, the right of everyone to the enjoyment of the highest attainable standard of physical and mental health, the right to be educated, and the right to the development and diffusion of science and culture.

* Convention on the Rights of the Child, 1990

http://www.ohchr.org/en/professionalinterest/pages/crc.aspx

Entering into force in 1990 and ratified by 193 countries, this treaty is a comprehensive body of law summarizing human rights in all categories for protecting children. According to this treaty, all states parties pledge no discrimination, and the guiding principle for all actions is the pursuit of the best interests of children.

Those affected by the Fukushima Nuclear Plant disaster, due to this completely unforeseen accident, had various rights snatched away from them. Among these were the freedom to choose and change one's residence (Article 22 of the Japanese Constitution) and property rights (Article 29 of the Japanese Constitution). Many people were unable to continue inhabiting their own houses and were forced to evacuate or move house; alternatively, due to the area around their house being contaminated, many lost their houses/land/property, sustained a decrease in the value of their property, or could not longer use their land/property even if they still owned it. Furthermore, there are cases of infringement of the right to pursue happiness which is protected by the constitution, and many people had "happiness" and "purpose in life" stolen, which can hardly be converted into monetary value.

Without exception, everybody has the right to live in peace and health, free from fear and want. The Japanese constitution states; "All people shall have the right to maintain the minimum standards of wholesome and cultured living". Under international law, in the International Covenant on Economic, Social and Cultural Rights - one of the international human rights treaties - is a provision recognizing the "right of everyone to the enjoyment of the highest attainable standard of physical and mental health." People have the right to avoid exposure to radiation in order to protect the health of their families, and this needs to be guaranteed as a human right.

The following points may also be referenced with regard to the relationship between nuclear disasters and human rights.

* Grover Report, 2013

http://www.ohchr.org/Documents/HRBodies/HRCouncil/RegularSession/ Session23/A-HRC-23-41-Add3_en.pdf

In May 2013, the United Nations Special Rapporteur on the Right to Health Anand Grover submitted a very important report to the United Nations. In it, he exhorted the Japanese government to provide swift information disclosure, to implement comprehensive health monitoring and the provision of treatment, the provision of psychological care, and independent monitoring by a third party to ensure regulation (annual exposure limit for the general public of 1 mSv), and also recommended that residents should to participate in the decision-making process for nuclear energy policies.

* Proposal from Waseda Symposium, 2014

http://www.wcdrr.org/preparatory/commitments/110

In October 2014, an international symposium was held at Waseda University, Tokyo entitled "Legal and Medical Aspects of Nuclear Disaster and Human Rights." The recommendations issued in its final document rang alarm bells about radioactive contamination caused by a lack of morals and responsibility. In particular, the recommendations place the highest importance on human rights, and advocate the importance of formulation of legislation and plans for times of disaster.

* International Physicians for the Prevention of Nuclear War (IPPNW) letter to Japanese Prime Minister Naoto Kan, 2011

http://ippnweupdate.files.wordpress.com/2011/08/ippnw_pmkan082211.pdf The letter sent by 1985 Nobel Peace Laureate organization IPPNW to the then Japanese Prime Minister Naoto Kan in August 2011 emphasized the necessity of "a comprehensive, consistent, best-practice approach." The provisions of this letter included: management based on actual levels of contamination and anticipated total exposures, both external and internal, not simply distance from the Fukushima Daiichi plant; ongoing long-term monitoring with timely, full public reporting of radioactive contamination of the terrestrial and marine environment, and of food, plants and animals and water; and relocation assistance being made available to all likely to receive more than 1 mSv/year additional radiation exposure.

* Guiding Principles on Internal Displacement, 1998

The Guiding Principles on Internal Displacement were submitted to the UN Commission on Human Rights in 1998. While lacking the legally binding force of a treaty, these principles function as an international standard for ensuring the human rights of internally displaced peoples, urging signatory countries to provide legislation and policies that conform to these principles. These principles firmly state that the authorities in a nation/state have a primary duty and responsibility to protect and support internally displaced persons. These principles also contain provisions regarding: Rights pertaining to compensation for assets and rights pertaining to physical and mental health: Freedom to choose migration and residence: Ensuring the participation of internally displaced persons in formulating plans and programs pertaining to repatriation and resettlement.

* Rio Declaration on Environment and Development, 1992

http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=78 &ArticleID=1163 Principle 15 of the Rio Declaration, which was adopted at the 1992 Rio Earth Summit is as follows: "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." Based on this precautionary principle, sufficient precautionary measures must be adopted for nuclear disasters that could cause serious environmental destruction, even in cases where scientific proof is incomplete.

From the perspective of disaster risk reduction

While disaster risk reduction policy of each country is controlled by respective domestic laws, in recent years greater emphasis is being placed on taking responsible action, implementing policies, and international collaboration as a member of the global community., The following internationally agreed frameworks and international documents are of particular mention.

* Hyogo Framework for Action (HFA), 2005

http://www.unisdr.org/we/coordinate/hfa

In 2005, at the World Conference for Disaster Reduction in Kobe, Japan, 168 countries adopted the Hyogo Framework for Action (HFA): a 10-year strategy to integrate disaster risk reduction into the development programs of individual nations. It also functions as a successor version to the Yokohama Strategy and Plan of Action for a Safer World, which was adopted in 1994. (http://www.unisdr.org/we/inform/publications/8241)

The 168 states which agreed upon the HFA are required to proactively engage in the following 5 priority actions:

- Priority Action 1: Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.
- Priority Action 2: Identify, assess and monitor disaster risks and enhance early warning.
- Priority Action 3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels.

Priority Action 4: Reduce the underlying risk factors.

Priority Action 5: Strengthen disaster preparedness for effective response at all

levels.

The major disasters envisioned during the formulation of the HFA included both natural disasters and man-made disasters alike, allowing for a wide range of disasters. Accordingly, it is of course applicable to complex disasters faced by high-risk infrastructure such as nuclear power plants. The following international documents also highlight the relationship between the risks of nuclear power plants and international disaster risk reduction frameworks.

* Asia-Pacific Input Document for the Post-2015 Framework for Disaster Risk Reduction (HFA2), 2014

http://www.preventionweb.net/documents/posthfa/HFA_input_document_Asia_Pacific.pdf

Asserts that the greater the risk posed by facilities such as nuclear power plants, the more rigorous and regular their risk assessment needs to be, as well as the need to always conform to stringent standards. Furthermore, it also highlights the importance of raising international levels of understanding in regards to disasters such as complex hazards, which potentially straddle national borders.

* Chair's Summary, Third Session of the Global Platform for Disaster Risk Reduction and World Reconstruction Conference, 2011

http://www.preventionweb.net/files/20102_gp2011chairssummary.pdf The UN Secretary General called for a high-level meeting at the next UN General Assembly in order to better understand and deal with the relationship between natural disasters and nuclear disasters. There is global consensus that international collaboration is required to tackle this issue.

* Communication from the European Commission to the European Parliament, The Council, The European Economic and Social Committee and The Committee Of The Regions towards a Post-Hyogo Framework, 2014 http://ec.europa.eu/echo/files/news/post_hyogo_managing_risks_en.pdf This communication mentions that new risks are emerging with potentially highly disruptive consequences; specifically, "space weather related events, multirisk events such as the 2011 Fukushima triple disaster, [and] risks in a digital and high-tech era, including cyber risks."

* International Federation of Red Cross and Red Crescent Societies (IFRC) Resolution, 2011

http://ndrc.jrc.or.jp/archive/item/?id=M2013091919392484046&lang=en

At its 2011 General Assembly, the IFRC adopted a resolution on "preparedness to respond to the humanitarian consequences of nuclear accidents," specifying the respective roles of the IFRC and national Red Cross/Crescent Societies in providing aid to victims of nuclear disasters. This was a very significant resolution signifying the need for collaboration between a diverse set of stakeholders in the event of a nuclear emergency, and that prior preparation greatly impacts the ability to respond in the actual event of an emergency.

What has become apparent in the course of appraising the implementation of HFA is that, of the 5 priority actions, the status of achievement of priority action 4 (reducing underlying risk factors) is remarkably low. This is considered attributable to various factors, with the main reasons detailed below:

- 1. Underlying risk factors are extremely wide-ranging, encompassing for example poverty, conflict, climate change, rapid urbanization and economic investment that brings environmental destruction. As such, the standalone efforts of stakeholders engaged in disaster risk reduction are not sufficient. There is a need to go above and beyond the disaster risk reduction sector, and to interweave disaster risk reduction policies into development strategy through multistakeholder collaboration based on a universal set of values akin to human rights.
- 2. There has been a tendency to overlook the overall danger/risk posed by disasters such as the Fukushima Nuclear Plant Accident where one disaster triggers others. The boundary between natural and human disasters is receding.
- 3. The HFA is ultimately an agreement between governments, and the strengthening of grass-roots partnerships for mitigating community risk factors was not sufficient. Another insufficiency was the lack of realistic indicators for monitoring progress.

While the contents of HFA2, the successor to HFA, are currently being deliberated and are to be adopted at the March 2015 Sendai Conference, of particular mention is the emphasis on the need for communities themselves to participate in identifying and mitigating risks. HFA2 stresses the need for risk management focused on communities, as well as evaluating and disclosing ahead of time the risks posed by economic investment. It is our hope that community leaders who obtain this booklet can be confident in taking steps forward to gauge and mitigate the risks facing their respective communities. HFA2 also sets forth the intention to deal with natural disasters and their attendant manmade disasters.

In the debate regarding HFA2, it is asserted that it is important to clearly specify the responsibilities of each stakeholder. The era of risk management being implemented by the central government of one nation is over – surely now is the time to clearly establish the respective roles and responsibilities of business operators/municipalities/international organization/NGOs. The debate regarding risk management and mitigation at both the local government/central government level and within the community must be deepened. Ultimately, the necessary frame of mind when starting to make steps forward is that "everyone must look out for him/herself."

In May 2014, following a lawsuit by citizens in Fukui Prefecture to suspend the restarting of Oi Nuclear Power Plant, the local court issued a ruling to suspend its restart. This was only made possible because of citizens deciding to take action. The following principles can be referenced in the debate encircling this issue.

* Istanbul CSO Development Effectiveness Principles, 2010

http://cso-effectiveness.org/IMG/pdf/final_istanbul_cso_development_ effectiveness_principles_footnote_december_2010-2.pdf

Focus on people's empowerment, democratic ownership and participation.

Of particular importance is Principle 3 – "Focus on people's empowerment, democratic ownership and participation." It could be said that this principle has been pushed to the sidelines in past campaigns to promote nuclear power. Wide recognition is needed regarding the fact that participation and independence are generally accepted ideas internationally.

Necessary Action

In light of the above-mentioned contents, what sort of action is now necessary? First and foremost, we need to grasp what kind of responsibilities our governments bear both internationally and domestically. International law is not exercised by one abiding country punishing a non-abiding country, in the manner that criminal law works within one particular country. In any case, countries that do not abide to international standards will be seen by other countries as not carrying out their responsibilities. Governments surely want to avoid disgracing themselves at international meetings, so it is effective to meet government delegations at such meetings to inform them of the realities on the ground and facilitate policy discussions.

However, as mentioned previously, responsibility is not only borne by central governments. Business operators, local municipalities and other entities have their own roles and responsibilities to fulfill; we need to deepen the debate about how to carry out these obligations. When a tragic disaster such as a nuclear accident occurs, who is responsible for emergency response/evacuation of citizens/disclosure of risk information, compensation for victims and other vital responses? It is necessary to clarify where the responsibility lies if these vital responses are not implemented. It is particularly important for community leaders to clearly confirm this information, as they will probably the ones acting as rescuers directly after a disaster strikes.

What we have learned up to this point is that when it comes to disasters, we should expect anything and everything. There are no limits to the scope of a disaster. We strongly exhort people from around the world to proactively learn from Japan's mistakes in creating safety myths and failing to grasp and disclose the actual risks. Only by specifying and identifying risks ahead of time can we implement countermeasures to mitigate these risks.

Armed with the frame of mind to "solve our risks by ourselves", we need to take action and broaden the dialogue. This is surely our responsibility to future generations.

Afterword

The impetus behind publishing this booklet was the convening of the 3rd World Conference on Disaster Risk Reduction in Sendai in March 2015. The publishing committee for this booklet bringing together the lessons of the Fukushima nuclear disaster as seen from the citizen's point of view, came from the Japan CSO Coalition for 2015 WCDRR (http://jcc2015.net/) which formed with the intention of delivering the voices of civil society at this conference.

In this booklet, we have extracted 10 lessons that must be learned from the Fukushima nuclear disaster, and also presented the international laws and international standards that are at our disposal. None of these are memories of the past. The disaster in Fukushima, four years after the accident, is still very much ongoing , with the situation continuing to change.

Rather than a publication for learning about events that happened in the past, we see this booklet in terms of providing guidelines for dealing with issues in the present, and as such it should be used to prevent disasters that could easily happen in the future. We aim to translate this booklet into as many languages as possible, and to have it read throughout countries that have nuclear plants or in countries where there are plans afoot to build nuclear plants.

This booklet has, out of the plethora of issues, chosen to focus particularly on problems faced by local communities. This, we have not gone into deep detail regarding governmental and political challenges, problems related to nuclear power technology nor the medical domain. There may be parts that need improvements or alterations in line with changing circumstances; there may also be omissions. We look forward to receiving feedback from all readers. We see this as a work in progress.

In putting together this booklet, we made reference to existing literature as well as a great deal of press reports. These references included: The National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission (NAIIC)'s Report (July 2012, http://warp.da.ndl.go.jp/info:ndljp/pid/3856371/naiic.go.jp/ en/); and "Our Path to a Nuclear-Free Japan: Policy Outline for a Nuclear Phaseout" by the Citizen's Commission on Nuclear Energy (April 2014), in particular the first chapter on the full extent of the damage and restoration of damaged lives. (http://www.ccnejapan.com/) During the drafting stage, we received many valuable comments from many people, including the following:

Takumi Aizawa (Iitate Village, teacher) Hideo Hasegawa (Iwaki Independent Living Center) Keniichi Hasegawa (Head of Maeda District, Iitate Village) Yoshiyuki Inoue (Tokyo Shimbun, Fukushima Bureau) Hideki Ishii (Fukushima University) Kenichi Oshima (Ritsumeikan Universitv) Ruiko Muto (Complainants for Criminal Prosecution of the Fukushima Nuclear Disaster) Eiichi Sadamatsu (Save the Children Japan) Maki Sato (Japan Iraq Medical Network, JIM-NET) Satoshi Sugai (Japanese Red Cross Society) Seiji Sugeno (Fukushima Organic Agriculture Network) Mikako Takahashi (Tsunagaro Minamisoma) Emiko Yoshida (NPO The People) Hiroyuki Yoshino (Shalom) (and many others)

We are particularly grateful to (former National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission member) Hisako Sakiyama of Takagi School for kindly providing the text for Chapter One "What is Nuclear Power, What is Radiation?" and for providing valuable editorial support throughout.

We would like to point out that it was not possible to reflect all the comments received due to limitations of space and our own capabilities. While this booklet is underpinned by the cooperation of these people mentioned above, responsibility for any contents lies with the publication committee, the members of which are listed at the end.

We firmly hope that this booklet can cross borders in linking up the experiences of many people and learning lessons together, and that it can be used in the building of disaster-resilient societies that protect human lives.

January 2015 Fukushima Booklet Publication Committee **Akira Kawasaki**

10 Lessons from Fukushima

Reducing Risks and Protecting Communities from Nuclear Disasters

Date of Issue: March 11, 2015 Publication : Fukushima Booklet Publication Committee http://fukushimalessons.jp

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We are seeking donations to translate this booklet into various other languages, and would appreciate any such support. Fukushima Booklet Publication Committee http://fukushimalessons.jp/ Contact fukushimabooklet@gmail.com