

Chapter 2

The Processes Through Which Nuclear Power Plants Are Embedded in Political, Economic, and Social Contexts in Japan

Yuko Fujigaki

Abstract To analyze the process through which nuclear power plants are embedded in political, economic, and social contexts in Japan, this chapter first deals with a brief history on nuclear power plants in Japan and explore cultural acceptance of nuclear energy, the role of nuclear energy in the political system, and the status of the nuclear industry. Then I will examine the politics of “unexpected” or “beyond expectation” discourse using reports by the National Diet, by the Cabinet and by Independent Investigation Commission to survey the source of legitimate expertise in this domain. Furthermore, this paper deals with the communication disaster after the accidents as well as public debate in Japanese society to analyze the role of media and the culture of public debate over complex techno-scientific issues. From these analyses, we can determine that segregation was established between sites that accepted nuclear power plants before the 1970s and sites without nuclear power plants. After the accidents of March 11, 2011, this segregation expanded between these sites as well as within each site. In addition, discussions about whether to consider the accidents as universal lessons from Fukushima or to regard the accidents as culturally specific leads us to a discussion on technological culture with relevance to techno-orientalism.

2.1 Introduction

How are nuclear power plants embedded in political, economic, and social contexts in Japan? To answer this question, we should consider the local techno-scientific-political culture in Japan. In the survey of techno-scientific-political culture, Felt (2013a, b) highlighted the importance of long-term, comparative research to reflect on: (A) cultural acceptance of nuclear energy, (B) the role of nuclear energy in the political system, (C) the status of the nuclear industry, (D) the source of legitimate

Y. Fujigaki (✉)
The University of Tokyo, Tokyo, Japan
e-mail: fujigaki@idea.c.u-tokyo.ac.jp

expertise in this domain, (E) the role of media, and (F) the culture of public debate over complex techno-scientific issues.

In the following sections, I will examine these six items. In Sect. 2.2, I will present a brief history on nuclear power plants in Japan and explore items (A), (B), and (C) through this historical analysis. In Sect. 2.3, I will examine the politics of “unexpected” or “beyond expectation” discourse using a report by the National Diet (2012), a report by the Cabinet (2012), and a report by Independent Investigation Commission on the Fukushima Daiichi Nuclear Accident (2012). Item (D) will be surveyed in this section. Section 2.4 will deal with the communication disaster after the accidents as well as public debate in Japanese society. Through the analysis of the communication disaster, items (E) and (F) will be clarified. In addition, Sect. 2.5 will describe the international reaction to the Fukushima accidents.

2.2 Brief History of Nuclear Power Plants

How are nuclear power plants embedded in political, economic, and social contexts in Japan? Table 2.1 shows a brief time table of Japanese nuclear power plant development. Following the atomic bombs detonated in Hiroshima and Nagasaki in August 1945 and U.S. President Eisenhower’s address on “Atoms for Peace” in December 1953, the budget plan for nuclear power in Japan passed the Japanese Diet in March 1954. In 1955, the Japanese Diet enacted the basic law for nuclear power, resulting in the establishment of the Science and Technology Agency in 1956.

In the 1950s, nuclear power was a kind of dreamy media for Japan’s come-back story after World War II. As a result, in the Japanese political system, nuclear energy played an important role for post-war reconstruction and for overcoming Japan’s limitation as a country of few natural resources. From 1956 to 1969, the government succeeded in siting nuclear power plants in 17 regions, and each of these power plants began operation at some point between 1970 and 2005 (Kainuma 2011, p. 298). In the construction process of nuclear power plants, the “dream for regional developments” by residents in the region and the “dream for independence of the resource

Table 2.1 Historical background of Japanese nuclear power plants (NPP)

Year	Event
1945	Atomic bomb in Hiroshima, Nagasaki
1953	“Atoms for Peace” U.S. Presidential address
1955	Basic law of nuclear power
1956	Establishment of Science and Technology Agency
1956–1969	Attempted siting of NPP by several municipalities
1970	Anti-nuclear movements in the world
1970–	Failure in attempted siting and in construction of NPP

supply of Japan” by the central government system led the two parties to cooperate. However, at the end of the 1960s and in the beginning of the 1970s, anti-nuclear movements prevailed all over the world and resulted in decreased support for nuclear power plants in Japan after 1970. This is a brief examination of the history of nuclear power plants from the period after World War II to 1970. In the next section, I will examine this period of history in greater detail based on the items I listed above.

2.2.1 Cultural Acceptance of Nuclear Energy

Japan was the first and the only country against which the atomic bomb was used to kill civilians. As a result, a “dark shadow” clouds the image of the “atom” for Japanese citizens. Cultural acceptance of nuclear energy in Japan is complex, and it can be divided into three phases; phase I (1945–1969), phase II (1970–2011), and phase III (2011–).

2.2.1.1 Phase I: 1945–1969

With the potential promotion of nuclear power in the 1950s, some physicists played an important role in garnering cultural acceptance of nuclear energy. For example, Koji Fushimi insisted on three principles, “peace,” “openness,” and “democratic control,” for the promotion of atoms for peace, which became the Nuclear Power Charter by the Japan Science Council in 1952 (Yoshioka 1999). Another physicist, Taketani (1952), insisted that “Japan is the only county that ever experienced nuclear devastation; therefore, the Japanese deserve a strong statement on nuclear power. The Japanese have a greater right to do research on atoms for peace than other countries.” Taketani’s claims divided the use of nuclear power into two faces, light and shadow, and stated that the depth of the “shadow” from which the Japanese suffered from nuclear power gave the Japanese a right as well as a duty to use the “light” side of nuclear power (Yoshioka 1999). This claim to promote peaceful atom usage based on Japan’s existence as a bomb victim strongly affected cultural acceptance of nuclear energy. The three principles mentioned above were included in the Basic Law of Nuclear Power (1955) with slight changes, appearing as “autonomy,” “openness,” and “democratic control.” Raising these three principles, physicists persuaded the public of the need for nuclear power despite the public’s anxiety regarding the negative side of nuclear power.

2.2.1.2 Phase II: 1970–2011

By 1970, the government’s attempted siting of nuclear power plants succeeded in 17 regions (e.g., Fukushima, Fukui, Kashiwazaki-kariwa); however, in the beginning of the 1970s under the influence of global environmental movements, anti-nuclear

activities gained momentum in Japan, and many residents began to resist plant construction. As a result, Japan experienced a segregation of promoters and opponents of nuclear power plants after 1970.

Juraku (2013) characterized this segregation through the analysis of the concentrated siting of nuclear power reactors at a single site. Pronuclear government, facing many anti-nuclear activities after 1970, promoted strategically concentrating nuclear power reactors at the sites where residents had already accepted nuclear power before 1970. At such sites, “fundamental problems and issues, which would have hampered progress, were ignored, down-played, neglected or shunted aside” (Juraku 2013, p. 52). Instead, pronuclear supporters focused on the local economic benefit and development by subsidies (e.g., Dengen San-pou Ko-fu-Kin Seido, which means a law on electricity to provide subsidies to local governments that support the generation of electricity). At these sites, any problems posed were seen as being manageable; therefore, residents came to believe that problematic safety factors would never become critical issues. On the contrary, citizens who lived in different areas did not see those problems as manageable and did not believe that safety factors would never become a critical issue. In this way, segregation on the basis of safety issues arose between residents in sites with nuclear power plants and those without them.

This segregation gives us some insight to answer several questions. The first question is: how are nuclear power plants embedded in political, economic, and social contexts in Japan? Pronuclear individuals who had institutional politics to enhance economic development with subsidies at sites with nuclear power plants used strategic agenda-setting to successfully promote the safety statements at these sites, segregating between pronuclear and anti-nuclear citizens. With the segregation, nuclear power plants are embedded in political, economic, and social contexts in Japan. This explanation leads to an answer to the second question: under what kinds of relationships between science, technology, and society are such accidents produced? In Japanese society, anti-nuclear activities existed, but their power did not reach to the sites with nuclear power plants. The strong segregation between pro- and anti-nuclear power activities developed in parallel with segregation in statements on the safety of nuclear power. The accident occurred within this situation.

In the introduction to this book, I raised three questions: (1) Why did the “precautionary principle,” which existed in Japan in the 1970s to govern environmental issues, not work in the field of nuclear power plants? (2) From the observation of administrative lawsuits, several experts pointed to the lack of public engagement in the administrative process in the initial approval of the construction of the plants (Fujigaki 2009). These points, which came to light after the controversy in the administrative lawsuit, were not utilized for nuclear power safety discussion after the lawsuit. Why? (3) Finally, although the relationship between science, technology, and society has led to new technology in various fields (e.g., food sciences, including genetically modified organisms, and information technology), it has had little effect on the historically-rigidly constructed relationships among them in nuclear power energy. Why?

The above explanation on segregation gave us some insights into these questions. First, the “precautionary principle” had an effect on environmental problems of chemical contamination, as seen in Chap. 7 on the Itai-itai disease case. However, this principle in the environmental field could not reach the sites with nuclear power plants, since atomic power was promoted in the “atoms for peace” context and any problems posed were seen as being manageable at these sites. Second, public engagement and the construction of the public sphere were not enough in the field of nuclear power plants because of the segregation mentioned above. Why were the points that came to light after the controversy in the administrative lawsuit—that is, the lack of public engagement—not applied to nuclear power safety discussions or risk communication after the lawsuit? The reason is the existence of segregation. For example, the Japanese government (specifically the Prime Minister) approved the establishment of the Monju nuclear power plant in the Tsuruga District, Fukui Prefecture, in May 1983. In response, local residents began legal action against the government in September 1985. Although any problems posed were seen as being manageable at sites with nuclear power plants in areas that had accepted nuclear before the 1970s, the local residents who brought the Monju lawsuit did not believe the “manageable” or safety myth. Therefore, local residents who had legal action against the government in the 1980s did not have the same safety beliefs as local residents who accepted the nuclear power plants before 1970s. The former’s skepticism did not reach to the latter’s belief and could not deconstruct the belief. Third, the new relationship between science, technology, and society resulted in new technology fields like food science or information technology; however, the new relationship has had little effect on the historically-rigidly constructed relationship in the field of nuclear energy. The reason and basis for this “rigidness” is the segregation mentioned above. That kind of segregation makes mutual discussions impossible, and the “public sphere” for constructing new relationships can hardly become a reality.

2.2.1.3 Phase III: 2011–

The Fukushima Dai-ichi accidents have clearly revealed this kind of segregation. Now Japanese society is in the process of reconstructing the cultural acceptance of nuclear energy. At the same time, in a Fukushima health surveillance on the effect of radiation, doctors at Fukushima Medical University (FMU) are now facing many conflicts in risk communication which were partly caused by the segregation among the public. I will deal with this point again in Sect. 2.4.

2.2.2 Role of Nuclear Energy in the Political System

As I mentioned in the previous section, the budget plan for nuclear power in Japan, based on the U.S. presidential address on “Atoms for Peace” by Eisenhower on December 1953, passed the Japanese Diet in March 1954. In 1955, the Japanese

Diet enacted the Basic Law of Nuclear Power. Some politicians, including Mr. Nakasone who was the Prime Minister of Japan from 1982 to 1987, played an important role in promoting nuclear energy for peace and were also said to be considering atomic armament (Yoshioka 1999). The Nuclear Power Preparation Committee was established on May 11, 1954, and the Atomic Committee was established in January 1956. On May 19, 1956, the Science and Technology Agency (STA) was established and began conducting nuclear power research. At the same time, electric industries began to seek a way of constructing commercially viable nuclear power plants. From this point, the governance of nuclear power was conducted by the Ministry of International Trade and Industry (MITI) and the STA. Yoshioka (1999) insisted that the “dual-structured sub government system” in Japan began at this point. That is, Yoshioka (1999) asserted that policy decisions concerning nuclear power were monopolized by two insider groups: the alliance of the MITI and Japan’s electric power industry on the one hand, and the STA on the other. These two insider groups in combination constituted a “sub government” outside of democratic control.

2.2.3 Status of the Nuclear Industry

The Japan Nuclear Power Industry Association was established in March 1956, and five groups of nuclear industries were established mainly by the heavy electric machinery manufacturers (e.g., Mitsubishi, Toshiba, Hitachi, etc.). The Kansai electric company established the Atomic Power Research Team (ART) in April 1956, and the Tokyo Electric Power Company (TEPCO) created the TEPCO Atomic Power Research Team (TAP) in January 1955. Genden (Japan Atomic Power Company) was established on November 1, 1957. In this way, in Japan, heavy electric machinery manufacturers and electric companies began to deal with nuclear power in the middle of the 1950s through their alliance with the MITI.

Following the beginning of the nuclear industry in the 1950s, the industry grew and developed in the 1960s. The Tokai Atomic Power Plants first went critical on March 4, 1965, and began commercial service on July 25, 1966. Many pressurized-water reactors (PWRs) and boiling-water reactors (BWR) began commercial service in the 1970s. For example, Tsuruga Daiichi opened in March 1970, Mihama Daiichi in November 1970, Fukushima Daiichi in March 1971, Mihama Daini in July 1972, and so on. In the 1970s, a total of 20 power plants began commercial service.

The First Oil Crisis in 1973 invited economic disorder in Japan because the Japanese economy depended on thermal power generation, which requires oil. In 1974, Dengen sanpo (the Law on Electric Power) was enacted to de-concentrate the risk of dependence on oil. The crisis and this law promoted the development of nuclear power. The law established certain amounts of subsidies to local governments at the sites of nuclear power.

The subsidies also included other power-generation methods, such as hydro-electric generation, wind-force power generation, and geothermal power generation. However, the amount of power generated through nuclear energy was so high that most of the subsidies were fulfilled by nuclear power. In addition, the monopoly of big electric companies also created obstacles for the promotion of other power generation sources. If electric power can be supplied by many small companies based on a change in law, then utilization of other power generation would increase. In this sense, several nuclear industries, especially electric companies, are given preferential treatment by the Japanese government.

2.3 Politics of “Beyond Assumption”

In this section, I will analyze the politics of risk-governance by examining the politics of “beyond assumption” discourse, which is often used in reports on accidents (Fujigaki and Tsukahara 2011). These analyses will help illuminate item (D), the source of legitimate expertise in this domain.

For examining this discourse, I will explain the detailed process of the actual disaster. An earthquake at 15:42 on March 11, 2011, triggered a large tsunami along the east coast of Japan, which damaged the cooling system of the Fukushima-Daiichi nuclear power plant and led to a hydro-explosion of the plant’s core. After this accident, the words “unexpected” or “beyond assumption” were used frequently by nuclear engineering experts and the media. What is the meaning of “unexpected”? This word contains highly political nuance.

The Japan Nuclear Energy Safety Organization had already released a simulation report predicting the “loss of electric power supply of the cooling system” five months before the earthquake (Japan Nuclear Energy Safety Organization 2010). Table 2.2 indicates a comparison between the results of the simulation and what happened in reality based on Makino’s analysis (2011).

Table 2.2 Comparison between results of simulation and what happened in reality

Results of simulation	What happened in reality
	March 11 14:46 Earthquake
Loss of power	15:30 Loss of power
	16:36 Damage in cooling system
	18:00 Fuel rod exposure
2.4 h later Nuclear fuel rod fall	19:00 Nuclear fuel rod melt
3.3 h later Damage in pressure container	19:50 Rod fall down
	March 12 00:49 Abnormal pressure of container
16 h later Breakage of pressure container	06:50 Melt down of fuel
	14:30 Vent from container
	15:36 Explosion

The simulation shows that, after a loss of power, the following would happen: at 2.4 h after the loss of power, the nuclear fuel rods would begin to fall. At 3.3 h, the pressure container would begin to show damage, and at 16 h, the pressure container would break. In reality, the earthquake occurred at 14:46. Power loss occurred at 15:30. At 19:00, 3.5 h after power loss, the nuclear fuel rod began to melt, and at 19:50, about 4 h after power loss, the rod began to fall down. At 6:50, almost all of the fuel melted. Thus, there is a clear correspondence between the simulation and reality.

Therefore, the “loss of electric power supply of the cooling system” was predicted, but no countermeasure was considered for this eventuality. In addition, the disaster produced much discourse asserting that the “loss of electric power supply of the cooling system was beyond assumption”. Why were such statements frequently used when addressing the public? One reason is that professionals and the government were trying to shift the blame away from technology and TEPCO by saying that the situation was uncertain. However, the report on this disaster published in July 2012 by the National Diet indicated that the “loss of electric power supply of the cooling system” was predicted:

Since 2006, the regulators and TEPCO were aware of the risk that a total outage of electricity at the Fukushima Daiichi Plant might occur if tsunami were to reach the level of the site. They were also aware of the risk of reactor core damage from the loss of seawater pumps in the case of tsunami larger than assumed in the Japan Society of Civil Engineers’ estimation (National Diet Official Report of Fukushima Nuclear Accident Independent Investigation Commission, Executive Summary 2012, p. 16).

The reports by the Cabinet Office published in July 2012 also mentioned this assumption:

The words “beyond assumptions,” broadly speaking, can refer to two meanings. One means that an incident, which could not be predicted even with possession of the most advanced academic knowledge, occurred. The other one means that, in light of financial limitations and other limitations to the ability to respond to all predictable events, a line was drawn to exclude incidents that were realistically assessed to have a low probability of occurrence, and an incident of a scale far beyond that line occurred.

Based on the study of the seismological progression and emergency preparedness administration over the past ten or so years, it is clear that the latter meaning held true in the case of the latest major tsunami (Cabinet Office Investigation Committee on the Accident at the Fukushima Nuclear Power Stations, Final Report, Executive Summary 2012, p. 30).

Thus, two reports indicated that “loss of electric power supply of the cooling system” was predicted and assumed. In particular, the second meaning presented in the Cabinet report (2012) is important: “in light of financial limitations and other limitations to the ability to respond to all predictable events, *a line was drawn* to exclude incidents that were realistically assessed to have a low probability of occurrence, and an incident of a scale far beyond that line occurred” [emphasis added].

We can re-consider “a line” in this sentence using the framework of risk-concept developed by Beck (1986). Beck published the book *Risk Society* just after the accident at Chernobyl. He divided scientific rationality from social rationality.

Scientific rationality deals with scientific probability and predicts hazard. On the other hand, to plan the countermeasure, we have to consider “what should be protected,” e.g., the health of citizens, the environment, or the economic system with sustainable development. If we consider something that should be protected, then “a line” will be drawn, and based on this line, “probability” turns into “risk” concept. Based on this discussion, “loss of electric power supply of the cooling system” was predicted in terms of scientific rationality; however, it was unexpected and “beyond assumption” in terms of social rationality. Therefore, based on the expression in the Cabinet report, “beyond assumption” refers to an area of social rationality. “A line” was drawn “to exclude incidents that were realistically assessed to have a low probability of occurrence, and an incident of a scale far beyond that line occurred”; in other words, this line was drawn to protect mainly the economic system with sustainable development (see, e.g., “in light of financial limitations” in the Cabinet report) rather than the health of citizens or the environment.¹

These facts indicate that in Japan prediction regarding scientific rationality is done adequately; however, integration of knowledge regarding social rationality has had some problems. In other words, the levels of research in nuclear technology and simulation technology as well as the levels of research regarding tsunamis and earthquakes in Japan were not low. However, this research and these technologies were not integrated for risk-prevention. In reality, there was no “sphere” to discuss this integration (Imada 2014). We have to admit that there is segregation not only between the sites, but also in fields of research. In addition, the lack of democratic control under the sub-government system, which I mentioned in Sect. 2.2.2, invites a situation in which engineers have been insulated from close investigation by the public. The American historian Porter (2013), who studied severe public scrutiny in flood control in the U.S., indicated that the “Japanese nuclear engineers were insulated to a striking degree from public scrutiny of the sort faced by American ones” (Porter, Preface for the Japanese-Translated Version of “Trust in Numbers” 2013).

We can consider this situation further by applying Bijker’s (2007) comparative analysis of flooding in the U.S. and in the Netherlands. He analyzed the aftermath of the flooding of New Orleans by hurricanes Katrina and Rita in 2005, comparing Dutch coast engineering, and noted:

Does this suggest that the US Army Corps of Engineers is less able than the Rijkswaterstaat engineers in the Netherlands? I will argue that something else is going on: that the

¹ In addition, there is a computer simulation that can calculate the development of an accident in real-time using the same code of the Japan Nuclear Energy Safety Organization (JNES). This also means that the accident was predicted in scientific rationality. Prediction sometimes becomes the cause of other victims. For example, as the Tsunami countermeasure, some professionals have done “disaster drills” in the Kamaishi-city based on their “assumption” of the effect of a tsunami. However, the height and power of the tsunami was beyond their assumption, and more than 50 people died even though they followed evacuation instruction by these professionals (NHK 2011, March 21). However, if we cannot make assumptions, then we cannot prepare for disasters. It was a criticism on what can we formulate the responsibility of these professionals.

difference is not one of expertise and competence. ...I compare the styles of US and Dutch coastal engineering, and argue that they express different conceptions of risk management in relation to flooding. These differences can, perhaps, be explained by reference to the wider technological cultures of both countries rather than to the specific engineering culture (Bijker 2007).

Bijker finally indicated that the difference in technological cultures exists in the “risk criteria” and in the way to establish this criteria in the society:

The risk criterion that is used in designing levees and other coastal defence structures in the USA is a 1:100 chance, or a “hundred year flood.” This criterion is a technical norm, carrying important professional “weight” among coastal engineers, but it carries no legal authority. ...in the Netherlands, ... the water should be kept out. In the Deltaplan Law, the criterion of 1:10,000 was specified: not merely as a technical norm, but as an obligation embedded in the “Delta Law,” unanimously approved by parliament (Bijker 2007).

We can apply Bijker’s comparative analysis to the nuclear power plant accidents in Japan. The risk criterion of the tsunami that would lead to “loss of electric power supply of the cooling system” was not specified in the Japanese law approved by parliament. Rather, a closed community of engineers decided the criterion, and it was not exposed to public scrutiny, e.g. Diet deliberation. This practice of closed-community decisions is the technological culture of Japan. Mr. Kurokawa, who headed up the report of the National Diet, stated, “It is a man-made disaster,” as an expression of this technological culture (National Diet Official Report of Fukushima Nuclear Accident Independent Investigation Commission 2012); however, this statement is fraught with controversy on “techno-orientalism” among researchers in an international conference. I will discuss this point again in Sect. 2.5 again.

In this way, the “beyond assumption” discourse reveals embedded politics to shift the blame for technology and TEPCO to “the situation under uncertainty.” Segregation between fields of research, lack of democratic control and of public scrutiny, and the technological culture in Japan were exposed to the light of day by the accident. What is brought by this exposure? The aftermath is the fallen credibility and the public’s lack of trust in authorities (both government and professionals), which leads to a “communication disaster.” I will deal with these results in the next section.

2.4 Effect of the Accident on the Technology-Society Relationship in Japan

In this section, I will deal with communication between experts and citizens after the disaster. This analysis will make clear (E) the role of the media and (F) the culture of public debate over complex techno-scientific issues.

2.4.1 Communication Disaster and Enhancement of Segregation

After 2011's Triple Disaster—that is, the earthquake, the tsunami, and the nuclear power plant accident—Japanese society experienced a “communication disaster.” The National Diet Official Report of Fukushima Nuclear Accident Independent Investigation Commission (2012) also stated that there was a communication failure in protecting public health. It indicated that sufficient risk-communication on radiation was not provided to residents. The information disclosure after the accident was not a good example for other democratic countries. American anthropologist Hugh Gusterson criticized that the “Japanese Government continues to announce disorganized knowledge.”² Chapter 3 of this book will deal with the detailed information on this communication disaster from the standpoint of the science media center.

A gap arose between the information that citizens wanted to know and the information professionals wanted to provide. Citizens who lived in Fukushima wanted to know impartial, non-partisan, broad information (Yamaki 2011); however, professionals wanted to provide decisive action guidelines and limited, absolute information. It is not a deception but a simple misunderstanding of what the public wanted. Professionals hold an ideal that what is most needed from the public to the professionals is to provide the public with decisive action guidelines and limited, absolute information. The Science Council of Japan insisted on “unique” or “unified” knowledge (Onishi 2012). The Japanese government and professionals were hung up on unique, decisive action guidelines and disclosed only “safety” information. As a result, Japanese citizens began to distrust the government and professionals. Likewise, the two groups experienced differences in the anxiety they felt over this information. Citizens (or residents) experienced anxiety over both the limited information and their distrust. However, professionals had anxiety over releasing information in a non-unified voice and for the public unrest.

These gaps raise important questions on the responsibility of scientists. Which behavior is responsible on the part of scientists: to disclose only unique knowledge decisive enough for action guidelines or to disclose a variety of knowledge and enhance the individual decision-making ability of the citizens? This is a very difficult question that can also be applied to item (E), the role of the media.³

To examine these questions on responsibility, we should think about the segregation in Japanese society. First, I will explain the salient value similarity

² It was a criticism in a joint plenary of the History of Science Society (HSS), the Society for History of Technology (SHOT), and 4S on Fukushima in November 2011 in Cleveland.

³ Of course, we should distinguish between communication during “emergencies” and communication during normal life. However, the information disclosure attitude during an emergency is affected by the relationship between science and society as well as by the public's trust in authorities throughout the course of their normal life.

(SVS) model in social psychology. In social psychology, it is said that two components are necessary to construct “social trust.” One is competence, and the other is fairness in motivation. Competence means ability, experience, and qualification. Fairness in motivation means impartiality, integrity, and honesty in motivation of research. If a person with competence does something with fair motivation, then people will trust him/her. This was a theory, but after the Triple Disaster, some statements made by people with competence and fair motivation were not trusted. Why? The SVS model will explain these situations better.

The SVS model postulates that shared values determine social trust in institutions and persons related to a technology (Siegrist et al. 2000). In this model, if an individual thinks that the person in front of him/her shares similar salient values with him/her, then he/she will trust that person. Therefore, one who holds the salient value to ease the public’s worry trusts other people who hold the salient value to ease the public’s worry. Likewise, one who holds the salient value to open neutral data trusts other people who hold the salient value to open neutral data. The same holds true for those who wish to abolish nuclear power. In this way, one trusts people who hold similar salient values, and this tendency accelerates the segregation of groups that have different salient values.

As previously discussed in Sect. 2.2, segregation between sites with nuclear power plants and other sites without them already existed in Japan. In the sites where residents had already accepted nuclear power plants before the 1970s, any problems posed were seen as being manageable; therefore, residents believed that problematic safety factors would never become critical issues, since they were manageable.

How did the segregation between sites develop or change after the accidents? First, new segregation developed within the sites with nuclear power plants. It is not hard to imagine how these residents felt when their belief in safety was shattered after the nuclear power plant accidents. Some people lost trust in authorities (engineers and policy-makers), while other people tried to keep their trust in authorities. One who holds the salient value to want to know impartial, non-partisan information trusts other people who hold the salient value to want to know impartial, non-partisan information. On the contrary, one who holds the salient value to ease the public’s worry trusts other people who hold the same salient value. This kind of segregation was pushed forward by their decision-making on whether to stay in the land of their birth or to evacuate to other prefectures.

At the same time, residents who lived in sites without nuclear power plants also lost trust in specialists and the government since these authorities released only one-sided safety information after the accidents. One who holds the salient value to abolish nuclear power trusts other people who hold the salient value to abolish nuclear power. This distinction accelerated the segregation between sites with nuclear power plants and sites without them. Social trust toward international agencies [e.g., International Atomic Energy Agency (IAEA)] was also divided: some people clung to the hope that the IAEA would bring the Japanese government toward the right direction. On the contrary, others criticized the IAEA as the

organization that enhanced the nuclear energy generation (Shimazono 2013; Watanuki 2012). In this way, the communication disaster after the accidents accelerated the segmentation of Japanese society.

This fragmentation of the society makes attempts to survey Fukushima residents' health difficult. In doctor–patient communication, both parties can easily share the salient value to fight the disease or to improve the quality of life. However, in doctor–public communication, there are so many different salient values, and doctors seldom share their salient values with the public. For example, in a crisis, it is the doctors' tendency to try to avert panic or to ease the public's worry, while the public—presumably suffering from radiation—wants to abolish nuclear power. Thus, in doctor–public communication, the doctor and the public rarely share salient values; therefore, it is very difficult to build trust among them. Several doctors in the FMU noted this situation (FMU-IAEA International Academic Conference 2013, 2014).

2.4.2 Culture of Public Debate Over Complex Techno-Scientific Issues

Under this segregation, Japanese society tried to engage in public debate over the decision-making for future energy sources, giving rise to a few questions, such as: How should Japan manage the future energy supply? Should we live with less electricity without nuclear power plants? What are some alternative energy sources?

The government of Japan (Democratic Party) tried to deal with questions of the future of energy using a deliberative poll (DP) survey. On June 30, 2012, the Agency of Energy Resource in the Ministry of Economy, Trade and Industry released their plan. The agency insisted that there is a strong need for nationwide discussion by citizens. So, in July and August 2012, the agency conducted the DP regarding future energy. From July 7th to the 22nd, they conducted random sampling and selected 6,849 people for the survey. Among these 6,849 people, 285 people were selected as candidates for the deliberative meeting. The idea of the DP is to conduct a poll before and after the meeting to see what changes were made in opinions.

Participants were asked to choose which of the following situations they would most like to see: 0 % nuclear power in the future, 15 % nuclear power in the future, and 20–25 % nuclear power in the future. On August 4th, the results of the pre-meeting polling were released: 42 % selected the scenario of 0 % nuclear power in the future. In addition, on August 5th, the results of the after-meeting polling showed that 47 % of people selected the scenario of 0 % nuclear power in the future. This result was released in the press on August 22nd, and the agency concluded that “Japan should set a goal of 0 % nuclear power by the 2030s.” However, the Cabinet decision did not include this proposal in the body, but included it as a reference. The precise results are shown in Chap. 5 of this book.

The Japanese DP attempt was widely broadcasted outside Japan. A researcher at the International Joint Conference of European Association of Science and Technology Studies and Society for Social Studies of Science (2012) remarked that the “earthquake and Fukushima accidents are changing Japanese public policy,” and another researcher at the same conference stated that “Fukushima’s case has become the trigger in Japan to re-write boundaries between ‘public’ and ‘administration’.” How can we describe these situations? Is it accurate to say that Japanese society is moving from “paternalism” to a “democratic society with public engagement”?

Paternalism in Japanese society means that people rely extensively on professionals and only want to know decisive action guidelines and limited, absolute information. Extensive public trust in professionals co-exists with the professionals’ desire to provide unique information. At the same time, it co-exists with a lack of democratic control over the nuclear power “sub-government” model mentioned in Sect. 2.2. Furthermore, it invites a situation in which engineers are insulated to a striking degree from public scrutiny of the sort faced in other countries, as I mentioned in Sect. 2.3. After the accidents, the credibility of authority fell and trust in professionals was lost. In the aftermath, how should Japan construct new relationships between science, technology, and society, or between the public and professionals? Is there a right way to re-construct the trust exactly as it was before? Can Japan build trust which co-exists with the professionals’ desire to provide decisive action guidelines and limited, absolute information? Can the country build trust which co-exists with a lack of democratic control and without public scrutiny? The answer may be no. Another way for Japanese society is to construct new relationships between citizens and professionals without extensive reliance on professionals, with democratic control, and with public scrutiny.

Some Japanese professionals have noticed and are examining these issues. Some committees of the Science Council of Japan are trying to summarize reports on free, unconstrained information disclosure by professionals. One of the committees self-criticizes the professional communities’ silence, isolation, self-regulation, and information control in emergencies after the Triple Disaster, noting that they did not give enough information to the public (Science Council of Japan, Committee on Autonomous Disclosure of Wisdom from Scientific Community for Crisis Response, 2014 June 4). It is trying to enhance information disclosure without strict control and to provide plural opinions. This change means that professionals should not stick to a “unique” voice, but should provide impartial, non-partisan (independent from the government), broad information that the public can evaluate for themselves.

These discussions lead to conflicts between areas that scientists should decide and areas that should be open to the society. People who believe that professionals should disclose only unique knowledge that is decisive enough for action guidelines have insisted that professionals should decide what should be done. However, people who believe that professionals should disclose a variety of knowledge and enhance the individual decision-making by citizens insist that the public should decide what should be done. In other words, these people claim areas that we

should open to the public. The former attitude is a classical, formal belief that professionals should disguise and hide all controversy from the public. M. Rudwik explained this attitude as follows:

The role of formal published papers in relation to informal argument during the controversy could aptly be compared with the role of occasional—and generally unrevealing—press releases during the real hard work of diplomatic negotiations behind closed doors (Porter 1995, p. 220).

This metaphor is very insightful in the current situation if we change “published papers” to “information disclosure by professionals.”

Information disclosure under disaster can expand to the discussion on information disclosure under uncertainty. What kind of knowledge should be disclosed under uncertainty? In the case of the earthquake in L’Aquila in Italy, scientists who disclosed only safety information were arrested and received prison sentences in October 2012. Therefore, knowing where to draw the line between disclosing only unique knowledge decisive enough for action guidelines or disclosing a variety of knowledge and enhancing the individual decision-making by citizens is very difficult. The legal responsibility of information disclosure (or no information disclosure) is in the process of discussion in the above committee of the Science Council of Japan. It is asking the system not to hold researchers personally responsible.

The DP attempt also contains a discussion on information disclosure under uncertainty. The decision to conduct the DP reflects the change in Japanese society from being closed and paternalistic (with high reliance on professionals without democratic control and without public scrutiny) to democratic (with public engagement in decision-making and with public scrutiny). However, as mentioned above, extensive segregation exists between sites as well as research fields; therefore, some people like paternalism while others like the democratic process. The culture of public debate over complex techno-scientific issues in Japan requires some sort of integration of this segregation.

2.5 Universal Lesson from Fukushima or Techno-Orientalism?

The Fukushima nuclear power plant accidents and the Japanese DP attempt have invoked many international reactions. For example, a Dutch sociologist at the International Joint Conference of European Association of Science and Technology Studies and Society for Social Studies of Science (2012) expressed that “people in European countries are curious about the future of Japanese nuclear power as well as about the effect of citizen movements on future policy.” A French social economist at the same conference showed strong interest in the effect of Japanese nuclear power policy on similar policies in Europe. In addition, a German researcher at the same conference told me that it was an epoch-making event that the agency of Energy Resource, Ministry of Economy, Trade and Industry

concluded that “Japan should set a goal for 0 % NP by the 2030s.” Thus, Japanese policy and citizen movements seem to be attracting worldwide attention.

The Japanese accidents have induced two kinds of reactions in the world. First, based on the fact that the accidents happened in a high-technology society like Japan, the public has recognized the possibility that the same-level accidents could happen in every country. From this perspective, Fukushima is a “universal lesson” for every country, and human beings should question the safety of nuclear power plants. Based on this perspective, the German parliament decided to completely abolish nuclear power by 2022. For example, the German report by the Ethical Committee on Safety Energy Supply noted, “We consider it very important that the accident happened in a country with high technology like Japan” (Kumagai 2012). The report also explained that the German society cannot assure that a grand-scale accident will never happen in Germany. In this way, Japan was an important benchmark to judge nuclear power safety.

The other perspective is to perceive the accidents as a “made in Japan” disaster and to treat the accidents as “specific to Japan,” rather than being universal. This perspective is supported by the statement of the chairman of the report of the National Diet, Mr. Kurokawa. In the “Message from the Chairman,” he wrote, “What must be admitted—very painfully—is that this was a disaster ‘Made in Japan’” (National Diet Official Report of the Fukushima Nuclear Accident Independent Investigation Commission, Executive Summary 2012, p. 9, line 15). This perspective induces the “techno-orientalism” which shifts the responsibility from universal technology to the Japanese techno-culture. If one adopts this perspective, then the accident is not seen as a universal lesson for every country with high technology country like Japan, but as a problem specific to Japan.

“Orientalism” is a term to show the biased image by Westerners of Eastern countries. This concept reveals that “general knowledge,” which is considered to be non-political, has a tendency to have highly politically organized issues especially in literature, historiography, philology, and sociography. Saïd (1977) pointed out that, when knowledge is produced, there are several political conditions highly structured in circumstances of knowledge generation even if we cannot see them as follows:

What I am interested in doing now is suggesting how the general liberal consensus that “true” knowledge is fundamentally non-political (and conversely, that overtly political knowledge is not “true” knowledge) obscures the highly if obscurely organized political circumstances obtaining when knowledge is produced (Orientalism, Introduction III 1977, p. 26).

In these political conditions, Western countries hold a biased view of the Orient (Eastern) countries. This biased view is called “orientalism.”⁴

⁴ Orientalism is a term used by art historians and literary and cultural studies scholars for the imitation or depiction of aspects of Middle Eastern and East Asian cultures (Eastern cultures) by writers, designers, and artists from the West (Wikipedia 2014).

Science and technology are considered to be universal; therefore, they are left out of discussions of orientalism in literature, historiography, philology, and sociography. However, when we consider Kurokawa's statement on the "made in Japan" disaster, we must question the line drawn between the universal facets of science and technology and their culturally-dependent facets. In addition, Bijker's statement on "technological cultures" that I mentioned in 2.3 gives rise to the same question.

Scientific knowledge is considered universal, rather than culture-specific, and any scientists can produce scientific knowledge universally without regard to their nationality. For example, we do not distinguish between an electron in the U.S. and that in Russia or that in Japan. However, scientific activities to produce scientific knowledge are conducted by human beings whose institutions to support these activities vary in different countries. Likewise, the research environment, relevant laws, and historical backgrounds are vastly different among countries. It is very difficult to determine whether knowledge on risk management of science and technology is universal or culturally dependent.

One point of view is to classify the stage of science and technology: whereas science is universal, technology includes a culture-dependent facet. Furthermore, risk management includes deeper cultural dependency. This idea is well-used; however, placing too much emphasis on the cultural dependency of risk management causes us to blame the technological culture, not technology itself, when an accident occurs. If one considers that a grand-scale accident like Fukushima could happen in any other highly technological country, such as the U.S., France, or Germany, then the lessons from Fukushima will be important ones that should be shared with other countries. On the contrary, if one considers that the Fukushima accident was "made in Japan" and very specific to Japanese culture, then one can say that there is nothing that we can learn from Fukushima. Therefore, the decision of whether to consider the accidents as universal lessons from Fukushima or to regard the accidents as culturally specific on the basis of techno-orientalism determines the countermeasures in the policies of the next generation of nuclear power plants.

2.6 Conclusion

From the analysis of the processes through which nuclear power plants are embedded in political, economic, and social contexts in Japan, we can determine that segregation was established between sites that accepted nuclear power plants before the 1970s and sites without nuclear power plants. After the accidents of March 11, 2011, this segregation expanded between these sites as well as within each site. For example, those who hold the salient value to trust officials continued to support nuclear power while those who developed the salient value to distrust sought to abolish nuclear power. This segregation among the public with several different salient values and the historical segregation between the sites make Fukushima Medical University's health surveys very difficult.

In addition, discussions about whether to consider the accidents as universal lessons from Fukushima or to regard the accidents as culturally specific leads us to a discussion on technological culture with relevance to techno-orientalism. The remaining problems are: (1) how to build trust between doctors and the public in the health survey in Fukushima in light of the historical segregation worsened by their separation of salient values; (2) how to rebuild trust in professionals without extensive reliance on professionals and with public engagement in Japanese society; and (3) how to construct new relationships between science, technology, and society with democratic control and with public scrutiny in Japan. These are also challenges to the critical engagement by Science and Technology Studies (STS) with society.

References

- Beck, U. (1986). *Risikogesellschaft auf dem Weg in eine andere Moderne*. Frankfurt am Main: Suhrkamp.
- Bijker, W. E. (2007). American and Dutch coastal engineering: differences in risk conception and differences in technological culture. *Social Studies of Science*, 37(1), 143–151.
- Cabinet Office Investigation Committee on the Accident at the Fukushima Nuclear Power Stations (2012). Final report. <http://www.cas.go.jp/jp/seisaku/icanps/eng/final-report.html>. Retrieved August 5, 2014.
- Felt, U. (2013a). Presentation at the IAEA technical meeting, Vienna, May 6–10.
- Felt, U. (2013b). Beyond refection: STS knowledge and practical action. In: Paper Presented at the FMU-IAEA International Academic Conference, Fukushima, November 21–24.
- FMU-IAEA. (2013). International Academic Conference: Radiation, Health, and Society: Post-Fukushima Implications for Health Professional Education, Fukushima, November 21–14.
- FMU-IAEA. (2014). International Academic Conference: Radiation, Health, and Population: The Multiple Dimensions of Post-Fukushima Disaster Recovery Fukushima, July 25–27.
- Fujigaki, Y. (2009). STS in Japan and East Asia: Governance of science and technology and public engagement. *East Asian Science, Technology and Society: An International Journal*, 3, 511–518.
- Fujigaki, Y., & Tsukahara, T. (2011). STS implication of Japan's 3/11 crisis. *East Asian Science, Technology and Society*, 5(3), 381–394.
- Imada, T. (2014). Statement at the committee meeting. Kagakushya kara no jiritsutekina kagaku jyouhou no hasshin no arikata kenntou iinkai (Committee on autonomous disclosure of wisdom from scientific community for crisis response, Science Council of Japan). Summary of meeting minutes will be posted at <http://www.scj.go.jp/ja/member/iinkai/jiritsuhasshin/jiritsuhasshin.html>.
- Independent investigation commission on the Fukushima Daiichi nuclear accident. (2012). *Fukushima genpatsu jiko dokuritsu kenshyou iinkai chyouso kensyou houkokushyo* (Independent investigation commission on the Fukushima Daiichi nuclear accident, final report). Tokyo: Discover 21.
- Japan Nuclear Energy Safety Organization. (2010). Jishin ji reberu 2PSA no kaiseki: BWR (Level 2 PSA analysis for seismic events: BWR). <http://www.nsr.go.jp/archive/jnes/content/000017303.pdf>. Retrieved August 5, 2014.
- Juraku, K. (2013). Social structure and nuclear power siting problems revealed. In R. Hindmarsh (Ed.), *Nuclear disaster at Fukushima Daiichi: Social, political and environmental issues* (pp. 41–56). New York: Routledge.

- Kainuma, K. (2011). *'Fukushima'ron: Genshiryoku-mura wa naze umaretanoka (Why was the "genshiryoku-mura" (nuclear power village) born?)*. Tokyo: Seidosha.
- NHK. (2011). *Close-up Gendai*. Broadcasted program. NHK, March 21.
- Kumagai, T. (2012). *Naze Merkel wa tennkou shitanoka (Why Merkel changed her decisions?)*. Tokyo: Nikkei BP.
- Makino, J. (2011). 97. Fukushima genpatsu no jiko (2011/3/19–21) (Accident at the Fukushima nuclear power plant on March 19–21, 2011). http://jun-makino.sakura.ne.jp/articles/future_sc/note098.html. Retrieved August 5, 2014.
- National Diet. (2012). *Kokkai jiko cyou houkokushyo: Tokyo denryoku Fukushima genshiryoku hatsudenshyo jiko chyouka iinkai* (National Diet official report of Fukushima nuclear accident independent investigation commission). Tokyo: Tokuma shytoten.
- Onishi, T. (2012). Posuto 3.11 kowaru kagaku gijyutu rikkoku (ge): kagakusya no yakuwari wa; nihon gakujyutsu kagigi Onishi Tkashi kaichyou ni kiku (The role of scientists post-3.11: interview with Takashi Onishi, President of Science Council of Japan). *Nikkei Shinbun*, morning edition, p. 11.
- Porter, T. M. (1995). *Trust in numbers: The pursuit of objectivity in science and public life*. Princeton: Princeton University Press.
- Porter, T. M. (2013). Nihongo ban (2013 nen) eno jyo (Preface for the Japanese edition of *Trust in numbers: The pursuit of objectivity in science and public life*). T. M. Porter, *Su-chi no Shinraisei* (Y. Fujigaki, Trans.). Tokyo: Misuzu syobo.
- Saïd, E. (1977). *Orientalism*. London: Penguin.
- Science Council of Japan. (2014). Remarks by committee members at a committee meeting. Kagakushya kara no jiritsutekina kagaku jyouhou no hasshin no arikata kenntou iinkai (Committee on autonomous disclosure of wisdom from scientific community for crisis response). Summary of meeting minutes will be posted at <http://www.scj.go.jp/ja/member/iinkai/jiritsuhasshin/jiritsuhasshin.html>.
- Shimazono, S. (2013). *Tsukurareta houshasen 'anzenron' (Man-made radiation safety)*. Tokyo: Kawaide shobo shinshya.
- Siegrist, M., Cvetkovich, G., & Roth, C. (2000). Salient value similarity, social trust, and risk/benefit perception. *Risk Analysis*, 20(3), 353–362.
- Taketani, M. (1952). Nihon no genshiryoku kenkyu no houkou (Direction of the Japanese nuclear research). *Kaizou*, 33(17), 70–72.
- Watanuki, R. (2012). *Houshasanou osen ga mirai sedai ni oyobosumono (Chernobyl research: effect of radiation contamination on next generation)*. Tokyo: Shinkyouronsya.
- Yamaki, T. (2011). Statement in the annual meeting. In: Paper Presented at the 10th Annual Meeting of Japanese Society of Science and Technology Studies, Kyoto.
- Yoshioka, H. (1999). *Genshiryoku no shiyakaishi (Social history of atomic energy)*. Tokyo: Asahi Shimbunshya.

Lessons From Fukushima

Japanese Case Studies on Science, Technology and
Society

Fujigaki, Y. (Ed.)

2015, XIV, 242 p. 9 illus., Hardcover

ISBN: 978-3-319-15352-0