

Why Is It so Difficult to Learn from Accidents?

Kohta Juraku

Abstract After the Fukushima nuclear accident, the whole Japanese society swiftly achieved a consensus to have comprehensive accident investigations to identify the root cause of the disaster. The Government and other major actors established several accident investigation commissions to meet this public will. However, the author has to say the lessons have not been learned and absorbed well so far, with deep regret. Because the issues centering on responsibility and social justice have not been dealt with well, the outputs of the investigations transformed into alternative sanction on nuclear industry and poorly articulated regulatory reformation, for example. This trajectory has been considered as a result of the particular and common culture of East Asian societies, but the author would argue that it should become more and more important global problem in the future world with high-reliability and complicated technological systems and their failures. The integration of the concept of risk governance to build prescribed consensus of responsibility distribution is strongly suggested as a key idea of remedy to this problem.

Keywords Accident investigation · Responsibility · Social justice · Risk governance

1 Introduction

Why is it so difficult to learn from accidents? This is the given question of this chapter. In fact, it seems that the learning process from the Fukushima nuclear accident has not been satisfying so far, while the major investigation reports attracted very strong public attention both domestically and internationally when they were published. For example, the deficits in risk governance of Japanese nuclear program has not been getting better, but has even become worse in some aspects [1]. Difficulty in post-accident (or “disaster”) social learning process often

K. Juraku (✉)
Tokyo Denki University, Tokyo, Japan
e-mail: juraku@mail.dendai.ac.jp

shows similar symptom to it, although many people point out the importance of comprehensive accident investigation and reflection from its result, and actually try to carry out those processes. People often notice that we are taking wrong trajectory again, but it is always difficult to breakthrough it. Why do we have to have such frustrating, regrettable and disappointing experiences again and again in many fields of modern technical enterprise? The author would try to explore the background of this aporia from the point of view of sociology of science and technology. This is not based on strict empirical analysis, but would rather be something discursive illustration. The author, however, believes that it should still be suggestive to stimulate the interdisciplinary discussions to elaborate the concept of “resilience.” This chapter will also touch upon the ethical issues and their strong relation to the post-accident social learning process.

2 Post-Fukushima Accident Investigation and After

It is common understanding that deliberate, comprehensive and careful investigation for terrible technological accidents is essentially important and must be done officially. This tradition had evolved especially well in Anglo-Saxon countries such as the United Kingdom and the USA since nineteenth century. In the mid twentieth century, the modern accident investigation paradigm was established in these countries. These are well-known early cases that the Tacoma Narrows Bridge collapse in 1940 and the Comet disasters in 1954. In the former case, the US Government established the Board of Engineers consisted of the three experienced engineers under the Federal Works Agency. They conducted a comprehensive scientific survey on the cause of devastating shake that destroyed the just four-months-old suspension bridge and provided the findings on important aerodynamic phenomenon—self-induced vibration. It opened our eyes on the importance of aerodynamic considerations to design and construct safer suspension bridges and the lesson encouraged the progress of research and development in the relevant engineering fields.

Also, in the later case, a couple of in-flight disintegration accidents of the world-first jet airliner called for the world-first modern, systematic and uncompromised airplane accident investigation by the RAE (Royal Aircraft Establishment) with the strong commitment of then UK Prime Minister W. Churchill. They let us know many things about both of the mechanism of metallic fatigue and the methods of aviation accident investigation. All of those contributed a conspicuous progress of aviation safety.

Such a great success in the early stage of modern technology strongly imprinted us the effectiveness and necessity of post-accident investigation to have technological improvement (especially in terms of engineering safety) based on the lessons of tragic disaster. It meant the progress of our technology, and the society. It meant the prevention of the next similar disaster. It did make amends for the victims and their families of the accident. Especially, it is the most successful that accident

investigation tradition in aviation field. Almost all countries now have their permanent accident investigation institution for aviation (and sometimes for public transportation in general).

It was also quite natural that people took over and extended the paradigm from aviation to space vehicle accident because these two fields are closely related each other and have many similarities. The Presidential Commission on the Space Shuttle *Challenger* Accident (Rodgers Commission) was chartered after space shuttle *Challenger* crash in 1986. Also, the NASA (National Aeronautics and Space Administration) convened the *Columbia* Accident Investigation Board responding to the space shuttle *Columbia* accident as the official accident investigation body, although it was not presidential commission. Other than these symbolic cases, many official accident investigations have been conducted after serious accidents in space development in many countries.

This was also the same story in the field of nuclear utilization. The President's Commission on the Accident at Three Mile Island (so-called Kemeny Commission) have often been acknowledged as the milestone in the history of post-accident investigation and safety improvement in the nuclear field. Now many people believe that we learnt and could learn from disaster through accident investigation process.

This belief has seemed to be well-shared in Japan, too. Soon after the Fukushima accident happened, public discussion about formal and comprehensive accident investigation was begun. This belief was acknowledged and adopted by the Japanese Government, the Japanese Diet, TEPCO (Tokyo Electric Power Co.) themselves and a non-profit organization (NPO) established for an independent investigation. All of these four major committees (or commissions) published their final reports by the mid of 2012. We can now have them on the web and/or as printed matter, and some of them have already been translated into English, for non-Japanese readers. Post-Fukushima formal accident investigation seems to be concluded.

This fact creates an expectation that many lessons have already been learned well, next Fukushima will be prevented by the measures responding to those lessons and the society as a whole should have become more resilient to similar (and even other) type of disaster. Also, some people have believed and even still believe that such changes should have positive effects on public opinion/sentiment about Japanese nuclear program.

However, the reality in Japan now is pretty far from these expectations. It has taken different trajectory than people's belief of "learning from disaster through investigation" theory.

As mentioned above, some deficits in Japanese nuclear governance have remained, or even become worse than before the Fukushima accident. The majority of public opinion is still negative on nuclear program as a whole, for relevant organizations and on restart of safety upgraded nuclear power plants, while the Abe Administration officially decided to maintain Japan's nuclear power utilization

[2, 3]. Nuclear advocates continue the discussion to restore public trust, to build the consensus and to promote their program again. Critics persist in their counterarguments on the efficiency, risk, transparency and feasibility of “nuclear village’s” theory. This landscape is almost the same to the scene BEFORE the Fukushima nuclear disaster happened. Sandwiched in between those polarized discourses, the rate of pro- and con-nuclear poll has been stabilized—at the point of a little bit negative against nuclear—for these six years. General public gradually lost their interest on nuclear dispute as well as trust towards the people relevant to nuclear activities. On the other hand, nuclear power station restart program is still walking randomly, not articulated well and the experts in nuclear field are pretty demoralized.

It is hard to say the learning process through accident investigation was successfully finished and we overcome the accident. It is really far from the oracle of “learning from disaster through investigation” theory.

3 Untaken Responsibility: Unsuccessful Prosecution and Alternative Sanction by Tightened Regulation

Then, a question comes up: what has the Japanese society been doing after the accident investigation? The author’s answer is “unsettled discussion about the locus of responsibility.” Not only the direct stakeholders, such as the Government, TEPCO, and the investigation commissions, but also the whole society, of course including general public, have experienced the difficulty in coping with the separation of the issues centering on social justice and practical improvement based on the lessons learned from the accident since it happened.

Severe nuclear accident could be interpreted as one of the most extreme and typical cases of organizational accident with serious consequences [4]. Needless to say, the Fukushima case was the first experience of this kind for Japanese society. It is well known that Japanese society (and perhaps other East Asian societies as well) have relatively strong retributivism and martinetism (severe punishment policy) for individuals involved in the cause of disaster even when the nature of accident is organizational [5, 6]. There is a long history of controversy about separation of criminal prosecution process and accident investigation activities in Japan, and it has never been settled down. People, as well as the victims and their family members, have pretty strong feeling of unjust without strict punishment for individual’s fault that cause and/or worsen the damages caused by accident.

In this respect, no one has been officially punished through criminal prosecution process on the Fukushima accident so far. This fact should be very uncomfortable for accident victims as well as for many members of Japanese society, thinking about the strong tradition of socially embedded retributivism and martinetism. Of course, damage compensation and life recovery assistance for suffering people have been

carried out by incrementally improved official schemes. But it does not work instead of the punishment of responsible person. The author would like to argue, the major accident investigations and their reports did play another role in society than practical learning of lessons from the accident, to fulfill this unfocused public outrage.

It was the most authoritative one that the National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission (NAIIC) among four major accident investigation committees (or commissions) established after the Fukushima accident. NAIIC was established on December 8, 2011, with the legal basis by a special act. Their report was published on July 5, 2012 and some of its statements attracted the strongest public attention and even encouraged public anger. The author would take two examples from their provocative theories here: (1) “manmade” and “Made in Japan” disaster theories on the root cause of the accident and (2) “regulatory capture” criticism against the corruption of the past nuclear regulation [3].

The first case, “manmade” and “Made in Japan” disaster theory was suggested in the “Message from the Chairman” page of the Executive Summary written by Chairman Kurokawa, not in the body text of full report [7]. That page was exclusively for its English version and no counterpart in the original Japanese report. However, this expression was broadly cited in its media coverage. The word “manmade” attracted rapid and positive attention mainly in Japanese domestic public opinion because this interpretation was consistent with the tradition described above: it legitimated the lay theory accusing the relevant persons and their faults. It seemed to even encourage the legal criminal prosecution process for the relevant officials in the Government, TEPCO and other institutions.¹ The process was virtually started on August 2, 2012, after the NAIIC’s report published, although no one was finally indicted after prosecutor’s investigation.

Kurokawa also suggested another message at the same time in his letter—the theory of “Made in Japan” disaster with “Japanese Culture” explanation. It was spread all over the world very quickly, as well as in Japan. This could obscure our analytical understanding on the root cause of the accident and there were negative responses on this point from foreign major journalism [8, 9]. It also seemed to be odd because this was something contradictory to individual prosecution approach supported by his own “manmade” theory (because everyone could be dismissed their responsibility if the root cause was the “culture”). But, these keywords are often cited simultaneously without any inconvenience, and considered those as the most important messages of the NAIIC report.

¹In Japan, the result of accident investigation could be used as the evidences in criminal case. For example, the Aichi Prefectural Police, the Nagoya District Public Prosecutors Office adopted the materials and final reports of then Aircraft Accident Investigation Committee (AAIC, transformed into Japan Transportation Safety Board (JTSB) in 2008) as their evidences to prosecute the captain in the case of the JL706 accident happened in 1997. In this case, the Nagoya District Court and Nagoya High Court formally admitted those materials as evidence. Then AAIC commissioner was summoned by the courts as the witness. These practices fallen foul of the Convention of International Civil Aviation (Chicago Convention), but the Japanese Government formally issues the difference notification on the separation of accident investigation and criminal prosecution to the council of International Civil Aviation Organization (ICAO).

The second eye-catching narrative suggested by the NAIIC report was “regulatory capture” criticism against the corruption of the nuclear regulation in Japan. It strictly pointed out the deficits of past nuclear regulatory system, then proposed the fascinating keyword—“regulatory capture.” Shuya Nomura, a member of the NAIIC, a jurist and the proponent of this concept described its outline precisely: “Regulatory capture is a theory posited by George Stigler in *The Theory of Economic Regulation*. It refers to a condition in which regulators are “taken over” by the operators due to their lack of expertise and information, which results in the regulations becoming ineffective” [10].

However, this Nobel Prize awarded concept was never used as an analytical framework in the report. It just exemplified the historical process of collusive regulatory practices as a case of “regulatory capture.” This was interpreted as just a strict criticism against the corruption and became very popular. But, causal relationship between any particular factors and the result (= corruption) has never been demonstrated by using this concept in the NAIIC report.

These NAIIC’s narratives inspire us an approach to punish victimizers: sanction through regulation.

People’s unsettled outrage has seemed to result in unlimited and never-ending efforts to reduce the risk from hazard created by any nuclear activities. New regulatory authority (NRA, Nuclear Regulatory Authority) adopted decisively strict approach that calls for further measures to increase and to demonstrate plant safety in bit-by-bit manner (i.e. additional safety measures against similar scenario to the Fukushima case, safety review with “new regulatory standards,” earthquake resistance retrofit, on-site active fault survey, and so on). This sequential regulatory actions has made operators and manufacturers impoverished by never-ending review process while public trust has not been effectively recovered in proportion to their efforts. It could be interpreted that regulation fulfills the public will to punish “evil” nuclear industry instead of legal prosecution process.

Additionally, it should be noted that the final conclusion of the investigation reports and the actual design of nuclear regulatory reform did not have causal relationships as a matter of fact. The discussion about the reform of regulatory system was carried out at the Government and the National Diet before NAIIC and other major final reports were published. Japanese Government established the NRA in September 19, 2012, three months after the Act was approved on June 20, 2012. The sessions about the change in law was held during spring of the year. At that moment, only the report of so-called “Independent Commission” (established by an NPO) and the interim report of the Governmental Commission (ICANPS, Investigation Committee on the Accident at the Fukushima Nuclear Power Stations) were released. It was chronologically impossible to reflect the final recommendation of NAIIC report on this institutional reformation in formal and traceable manner.

Actually, NRA themselves do not admit that the recommendations of NAIIC report was a part of the background of their establishment, according to their website [11]. It seems to be quite unreasonable that the National Diet did not wait for their own commission’s conclusion and recommendation, as well as other major committees’, though their final reports had almost been finished.

4 Implications for “Resilience”: Beyond Cultural Essentialism

This situation should cause a serious contradiction—random-walking of policy and practice of nuclear power utilization, while more and more rigorous regulation without strategic and effective safety upgrade program. Past discussions on this issue, trying to sort out the incoherence, have focused on the cultural background of Japanese society that was described above, and tend to suggest ways to “redress” it to comply with “global standard” of separation of prosecution and investigation [6, 12]. This tendency shows interesting consistency with Kurokawa’s “Made in Japan” theory. However, the author would like to discuss further implication of this responsibility issue to deepen and broaden the discussion centering on the concept of “resilience.”

Indeed, retributivism and martinetism could be interpreted as particularly prominent characteristics of East Asian societies. It should be admitted that these “cultural” differences are observed and need to be considered. Separation of prosecution and investigation is still essentially important to make accident investigation effective, reliable and just, in principle. We should call for careful arrangement when we think about institutional and legal harmonization with international standards such as multilateral treaties on utilization of nuclear and other advanced technologies.

Nonetheless, the author would argue that this issue should become more and more global, and more and more difficult to cope with. It can no longer be trivialized as a local issue caused by particular “cultural” context. It should become more and more unsolvable even in other societies that have been considered as not so “retributivistic” or “martinetistic” so far.

As a series of studies including the ones on the cases of nuclear accident have shown, the contribution of so-called human factors has increased both in causes of accidents and amplification of damages by them, inversely proportional to the improvement of reliability of advanced technological system [4]. This trend is perhaps an irreversible and historically inevitable tendency. It must become one of the most central questions in many fields of contemporary society to cope with the problems that are relevant to human factors to prevent or to improve the “resilience” to possible disasters. Every leading nuclear engineer knows that the most dominant and variant factor in the PRA (probabilistic risk assessment) is human factor. For this very reason, it is still under discussion how to appropriately include it to make the PRA method reliable and suggestive. After the long history of engineering efforts to improve technologies in “technical” sense, human factors are coming back to the core of the discussion about the success and failure of our artifacts.

On the other hand, accident always creates its victims in some sense, regardless of the nature of the cause of accident. This proposition has been unchanged since ancient times. Rather, the more society become advanced and deeply interconnected with technological systems, the more diversified types of “damage” and “victim” to be compensated and cared. Some of those must trigger big public outrage that could never been soothed so easily. We always have to face the issue of social justice: to remedy damaged and violated rights of them.

These two contexts would make more and more difficult to separate the issue of responsibility from the other parts of discussion to learn lessons from accident. Separation of prosecution and investigation might become much more practically difficult even in the societies that adopt this principle and have long experience of practice of it.

In our conventional idea, especially in engineering field, we use an analytical approach of accidents. We break down an accident as a whole into “factors” and find causal relationships among them. Finally, we identify the root causes of each accident. In this approach, “factors” caused by or relevant to individual or organization also need to be dealt as “human factors” or “organizational factors.” Experts consider those “factors” as manipulable (operational) elements. Thus, many researches have invented various ways to prevent undesirable human behaviors or to encourage desirable ones (so-called human engineering).

But, this conventional approach of engineering effort has little impact on the post-accident human-related issues—responsibility issue and its ethical consequences. As described above, the increasing weight of human factors in causes and amplification of damages of future accident is inevitable. It should lead people’s attention and even anger to responsibility issue. Without to invent and implement the way to deal with this aspect appropriately, every society would experience the similar social deadlock that has been observed in post-Fukushima Japan centering on nuclear issue. This is no longer a local requirement but the universal condition to realize more resilient governance on advanced technologies, including nuclear technology, of course.

5 An Idea of Remedy: Revisit the Origin of “Resilience” Concept

It is obvious that this aporia very badly spoils our post-disaster resilience. It prevents our recovery process from the damages caused by the accident, spoils improvement of technology based on the lessons of it, delays advancement of robustness of the society and abstracts any other proactive efforts responding to the disaster. Public outrage can never have positive effect for society to exert its resilience thoroughly, if it is just neglected or poorly cared.

Some (engineering) experts may still argue that this problem is solvable by “education” of public (that encourage them to accept experts’ notion): we should let them know that we need to keep those two things separated to make our society resilient and to prevent the next similar failure. If this is a discussion about just “failure,” not “accident,” it might be possible to maintain this strategy. However, it is an indisputable principle of modern democratic society that we must take care of the issue of damage and responsibility with deliberate ethical considerations and the deep sense of social justice. That is the nature of “disaster.” Therefore, it is

inevitable to cope with those aspects integrated with technical and practical activities to understand and overcome accident.

At this point, the author would argue that an idea to remedy this problem might be found in the original context of “resilience” concept. Needless to say, “resilience” is the word originally used in the field of psychology and psychiatry to describe, analyze and encourage the human beings’ ability to adopt and cope with stress and adversity. In those fields, resilience is considered as an inherent ability of us, but, it is studied that it could be encouraged by appropriate support by relevant people and society, at the same time. Thus, if we extract some implications from this original context of “resilience” concept, we should recognize the importance of social healing process to remedy post-disaster emotional trauma of society and individuals. The process must be clinical and call for very intensive and grass-root but sometimes low-profile efforts beside victims. Their damages need to be cured by psychological, bedside and ethical practices, while compensation, assistance funding, town reconstruction program and any other institutional and pragmatic supports are still important and effective in many cases. We need this kind of careful emotional treatments *before* we talk and do something about engineering resilience under the actual post-disaster situation like post “3.11” Japan.

Furthermore, it is even required to apply the similar healing process to encourage the resilience of expert community, as the victimizer’s side. Japanese STS (Science and Technology Studies) researcher Ekou Yagi introduced her own experiences of “just be there with victimizers” after serious technological disasters, JR Fukuchiyama line train derail accident in 2005 and Fukushima Daiichi nuclear accident in 2011 [13]. She points out that the members of victimizing companies/organizations of serious accidents also require emotional support to be proactive and to build sound and respectful relationship with victims and their families. She tried to be a supporter, not by doing something actively with them, but by just being beside them and hearing their voices calmly. She reported that the existence of such an escort person with the knowledge on their business (it was the advantage of her as a STS researcher) seemed to be supportive for “victimizees” and did encourage the positive signs of their own changes towards the rebuilt of public trust.

6 Concluding Remarks: At the Heart of Risk Governance

To enhance post-disaster social resilience, however, we should arrange some appropriate arrangement to reduce the burden of such a psychological healing process after the actual occurrence of serious accident. As the concluding remarks of this chapter, the author would suggest an idea to help to make the arrangement more properly: to build a consensus about framing, characterization and evaluation of risks and distribution of mandates, roles and responsibilities among stakeholders. At this point, it should be noted that this is the very substantial goal of risk governance, and its core activity is risk communication.

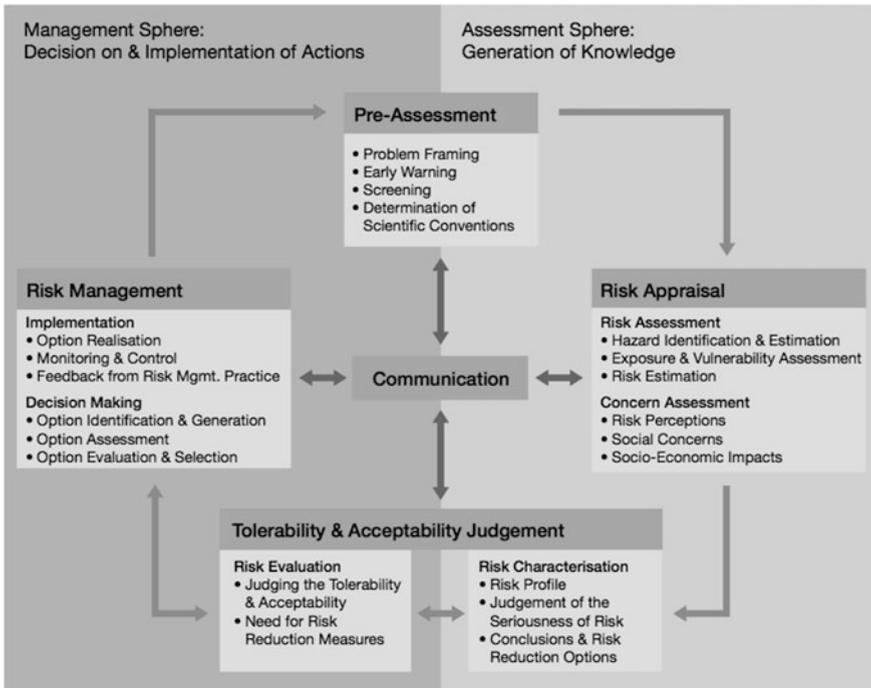


Fig. 1 IRGC Risk Governance Framework

It is one of the contributing things to prevent settlement of public anger that the locus and distribution of responsibility becomes vague, is intentionally changed or makes trivialized afterward. These injustices often trigger public outrage and emotional trauma of society and individuals more serious. It also heavily destroys public trust towards major actors and makes the recovery process slower and ineffective significantly. Once it is damaged, the trust would never be restored in the short term, as classical social psychological work demonstrated [14]. Loss of public trust should cause deadlocked situation that spoils public interests in the same way to Japanese case described in the earlier sections of this chapter.

To avoid such a fault and to realize effective risk governance, the figure illustrated by IRGC (International Risk Governance Council) would be suggestive even for “resilience” discussion in engineering fields (Fig. 1) [15]. It shows four phases of activities to cope with activities and the “communication” element connects these four factors. The important implication of this figure is that the concept of “risk” is not so evident, clear-cut, quantitative and easily operational thing. It should be discussed that the framing of risk issue in the “pre-assessment” phase. It should be included the “concern assessment” process in “risk appraisal” phase in parallel with so-called “risk assessment.” To make any judgment on risk issue, we need to “characterize” the profile of risk. It is not an automatic output from the result of assessment, but a proactive and qualitative process to make the discussion concrete.

Finally, “managing” risk, but it is not the end of once-through cycle but the beginnings of next cycle. Communication is the key element for all of these four phases and not on-directional flow of the result of evaluation or decision made by limited number of experts.

In this multi-dimensional process of risk governance, all of stakeholders is encouraged to participate in the discussion about the distribution of mandate, role and responsibility to keep risks smaller than tolerable level. This discussion should be done on a daily basis to build consensus before something wrong happens. Prescribed (formal and informal) agreement would help post-accident remedy process by encouraging proactive collaboration among them to learn from and overcome the disaster.

Considerations on ethical implications of accident and integration of the concept of risk governance with risk communication will cultivate constructive and collaborative pathway towards more “resilient” engineering practices in the reality of our societies.

Acknowledgements Part of this chapter is based on the author’s recently published and forthcoming book chapters [3, 16] and supported by the JSPS (Japan Society for Promotion of Science) academic funding program “Higashi-Nihon Dai-shinsai Gakujutsu Chousa” (Academic Survey Program for Great East Japan Disaster).

References

1. T. Taniguchi, Lessons learned from deficit analysis of nuclear governance, *Proceedings of the International Symposium on Earthquake, Tsunami and Nuclear Risks after the accident of TEPCO’s Fukushima Daiichi Nuclear Power Stations*, Kyoto, Japan, 30 October 2014, Research Reactor Institute, Kyoto University (2014)
2. T. Sata, Oi-hanketsu ga Toikakeru-mono (Implications of the judgment of the court on Oi Nuclear Power Plant Case), *J. At. Energ. Soc. Jpn.*, **57**(2), 119–122 (2015) (in Japanese)
3. K. Juraku, S.G. Knowles, S. Schmid, in *After Fukushima: Legacies of 3.11*, ed. by S.G. Knowles, K. Cleveland, R. Shineha. Learning from disaster: experts and the contested meanings of 3.11 (University of Pennsylvania Press, Philadelphia, Pennsylvania, *Forthcoming*)
4. J. Reason, *Managing the Risks of Organizational Accidents*, (Ashgate Publishing Ltd, 1997)
5. Y. Ikeda, Problems on criminal negligence and aircraft accidents, *Bull. Sch. High-Tech. Hum. Welf. Tokai University*, **4**, 81–91 (Tokai University, 1995)
6. Science Council of Japan, Ningen to Kougaku Kenkyu Renraku Iinkai Anzen Kougaku Senmon Iinkai Houkoku: Jiko-Chousa no Arikata ni kansuru Teigen (Report of the Safety Engineering Expert Committee, Committee of Human and Engineering: Recommendations on Practice of Accident Investigation). (Science Council of Japan, June 23, 2005) (in Japanese)
7. NAIIC, Executive Summary of The Official Report of Fukushima Nuclear Accident Independent Investigation Commission, July 5, 2012, National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission, Tokyo, Japan (2012)
8. Bloomberg, *Japan’s Unsatisfying Nuclear Report*, *Bloomberg*, (July 9, 2012)
9. M. Dickie, *Beware post-crisis ‘Made in Japan’ labels*, (The Financial Times, July 8, 2012)

10. NAIIC, The Official Report of Fukushima Nuclear Accident Independent Investigation Commission, July 5, 2012, National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission, Tokyo, Japan (2012)
11. Nuclear Regulatory Authority, Background of the Reform of an Organization in charge of Nuclear Safety Regulation, Nuclear Regulatory Authority, http://www.nsr.go.jp/english/e_nra/outline/03.html (2015)
12. Y. Hatamura, *Shippai-gaku no Susume [An Encouragement of Learning from Failure]* (Kodansha, Tokyo, Japan, 2000) (in Japanese)
13. E. Yagi, Staying beside persons identified as responsible for preventing accidents—case studies on the Fukushima Nuclear Power Plant accident and the JR Fukuchiyama line train derailment, *J. Sci. Technol. Stud.* **12**, 106–113 (Tamagawa University Press, Tokyo, Japan, 2016) (in Japanese)
14. P. Slovic, Perceived risk, trust, and democracy, *Risk. Anal.* **13**, 675–682 (1993)
15. International Risk Governance Council, IRGC's *White Paper Risk Governance—Towards an Integrative Framework*, *International Risk Governance Council* (2005)
16. K. Juraku, Deficits of Japanese nuclear risk governance remaining after the Fukushima accident: case of contaminated water management, in K. Kamae (ed.), *Earthquakes, Tsunamis and Nuclear Risks: Prediction and Assessment Beyond the Fukushima Accident*, (Springer, 2016)

Open Access This chapter is licensed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this book are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

