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Matsuda, Tsuyoshi

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Environmental Risks as Seamless Events and Institutional Gaps of Expertise

Tsuyoshi Matsuda⁽¹⁾

First I appreciate you all colleagues here having given warm support to the people in Tohoku in the time of a severe earthquake on the 11th March, the succeeding Tsunami and the disastrous accidents of the Fukushima nuclear power stations in these months. And this is my great honor to talk about the related philosophical topics, that is, this tremendous tragedy of our technological civilization here in Dalian University of Technology invited by Professor Wang.

1. Applied Philosophy in Japan

In Japan a society of applied philosophy (*Japanese Association for the Contemporary and Applied Philosophy*) has been established since 2009 and a book for introduction⁽²⁾ to this relatively new discipline has just been published in this month in 2011: We can survey the topics of applied philosophy from the view point of this association in the table of the book (table1). This anthology consists of 10 parts and 30 chapters whose topics vary from “the questions of technology” to “a history of applied philosophy”. In this work there are at least four parts which are related with the topics today: they are briefly listed as follows. And the author is involved with the part of risk and safety.

Ch1. “the questions of technology”
▪ pseudoscience ▪ clinical trial ▪ engineering ethics ▪ risk and safety
Ch5. “from the environment to human habitation”
▪ climatology (風土学) ▪ conservation of Satoyama ▪ environmental pragmatism
Ch6. “philosophy of modern society”
▪ philosophy of life ▪ caring ▪ “disabilities”
Ch8. “the problem of citizen”
▪ clinical philosophy ▪ critical thinking
《table 1》

Environmental Risks as Seamless Events and Institutional Gaps of Expertise

On the surface, applied philosophy is very various and seems to lack coherence or integration as a whole, so there can be indicated a first institutional gap within applied philosophy. However, one point can be very clearly seen that main issues of this discipline in the table cover almost with those of applied ethics as engineering or biomedical and environmental ethics, except some metaphysical topics. Despite it, the chapter of my part, Science and Technology, that is, “the philosophy of risk and safety”, for instance, is not solely ethically orientated, so far as it concerns not only the philosophical analysis of problematic concepts of environmental risks theoretically, but also the methodological improvements of the public health risk research and risk communication by the way of fieldwork based studies and collaboration with various kinds of stakeholders including victims, NPOs and scientists about related issues. And this style of philosophical researches is not new any more, as it has been already performed in biomedical or engineering ethics in which philosophers are trying to dialogue with patients, doctors and the nurse in the clinics or engineers on the site.

Broadly and historically speaking, as a matter of fact, this stream is a reaction from the side of academic philosophers in the institutions as university to the “needs” of society or government, besides an answer for the university reforms, especially for a modernization of curriculum in the general and professional educations during over these twenty years⁽³⁾: they say that the public and the most of the students do not always want to take a highly sophisticated course of theoretical philosophy, for example, about skeptical epistemology or existential ontology, and the detailed history of western philosophy, about Plato or Descartes et al. It may have been really the case. Anyhow, the situation has been critical especially for the department of philosophy since then. In this sense, an institutional gap, that is the second one, remains still now between the department of philosophy and the public.

I will give you an instance of a Japanese scholar of philosophy. It is my own case: I started my academic career with the issues of phenomenological epistemology in Husserl or historical studies of metaphysics regarding Leibniz, while I participated in a student and citizen initiative for handicapped people in my youth after student movements in Japan: that was a volunteer action outside the university. However, these two activities were not connected yet in late 1970s and early 80s. When I began teaching philosophy in a department of the general education in a state engineering college in Fukuoka (Kyushu Island) in the early

90s, it was just the first phase of import of environmental ethics from USA.

When I was told to teach the students of the department of (urban and rural) environmental designs with an expert of landscape architecture, I could organize rather freely my parts of the lecture “environmental ethics”, by bringing in the local and not official information and the results of field works on the site: one of the most important and controversial issues at that time was the environmental problem caused by the public big project of reclamation of wetlands in Isahaya- and Fukuoka bays there. The problem is the ethics of environmental designs of nature for lay citizens and professionals⁽⁴⁾. The method of my fieldwork was mainly the interviews with stakeholders as the lawyers or activists in a citizen group and scientist of marine ecology and so on, to give the students the critical views about the projects of exploitation of natural environment; one of the reasons for it was not easy for us as sheer philosophers to get detailed information or real thoughts about such projects from the officials of the local government other than those of a newspaper or TV news.

Besides it, I taught and discussed the basic thoughts and arguments of Western ecological ontology as Land ethics of Aldo Leopold and Deep Ecology of Arne Naess or the “rights of nature” of Frederic Nash for the ethical foundation of the protection of the “wilderness” as that of wetlands or the biodiversity there. However, after twenty years of my research and education in this discipline I must confess with other authors in the above mentioned book about applied philosophy, that the metaphysical tendency in the environmental ethics as in these trends has been not always successfully accepted by the public and university students in Japanese society. And this strategic error of the implementation of this applied ethics into our society has been recognized and discussed also by environmental pragmatist as Norton also in its homeland, USA. Therefore based on the reality of our society, we are forced to revise the environmental issues themselves from both the origins of our own ecological thoughts and the histories of the public hazards or pollution and human disease as, for example, in Minamata caused by production of acetaldehyde also in Kyushu Island⁽⁵⁾.

Therefore in those days, at the same time, I tried not to forget introducing the thoughts and practices of my own native or local philosophical traditions including a sort of Buddhism

Environmental Risks as Seamless Events and Institutional Gaps of Expertise

like those of Minakata Kumagus (1867-1941) ⁽⁶⁾. And from my academic career above mentioned, I had to study these all for myself with almost no models to handle the problems appropriately, because we did not have such institutions yet, namely organized educational system, stuffs and texts or established discipline for environmental ethics as applied philosophy in our university time ⁽⁷⁾. However, this situation remains more or less unchanged in applied philosophy still everywhere. Therefore we are challenged and at the same time we are challenging.

2. Social Collaboration and Action Research based Studies

Now before entering into issues of environmental risks as seamless events and institutional gaps of applied ethics, that is our third sense of institutional gap, we are going to briefly introduce an example of as a seamless event from our public health risk research. That is the health problem of asbestos exposure ⁽⁸⁾: the break in Japan was an event named “Kubota shock” 2005 when three citizens came out their fatal mesothelioma as typical tumor caused by asbestos, around the former asbestos factory of the company in Amagasaki (about 400,000 inhabitants), an industrial city near Kobe ⁽⁹⁾. The asbestos, especially most risky crocidolite for water pipe had been dispersed from the factory around during about 20 years, whether consciously or not, until the international prohibition of its use ⁽¹⁰⁾. After the incident of “Kubota shock”, over two hundreds victims had been, as it were, “compensated” by the company until now, without official clear declaration about the responsibility of the company for its cause of the hazards. The surprising and terrible fact is that all these patients or the dead had been environmentally, that is not occupationally, exposed, besides more than one hundred and fifty dead among workers in the factory and related works with it. We can surely say that this is obviously a seamless event as a case of *environmental and occupational* health risks or public hazards.

Generally speaking, asbestos has two faces, namely “a magical natural mineral” for industries, that is individually unseen micro-fiber, and at the same time, a “killer dust” that can cause fatal diseases as mesothelioma, the lung cancer and asbestosis. Mesothelioma is the most serious among these diseases in its pain and prognosis for remaining life, because of no efficient cures. Additionally, this sickness has some remarkable features: one of its awkward

problems is its very long latency, from 20 to 50 years after the exposure. And one cannot determine the threshold of its exposure. To make the matters worse, asbestos as materials has been ubiquitous in our life world, in house or school and factory buildings, in engines of the ships and even in the oven as insulator, for its technical usefulness and economic effectiveness⁽¹¹⁾.

This shocking incident of Amagasaki raised public concern about asbestos exposure in our society. Since then, also stimulated by press, national and local governments cannot have neglected the health risks of citizens and the voices of anxious people. Because of it, the Ministry of Environment has been conducting health risk surveys every year in 7 industrial areas including Amagasaki city since 2006. These 7 areas have their own histories with asbestos related industrial and social factors, besides the difference of its size or population.

However, local people are not always satisfied with the results of this survey. In comparison with the obvious case of Amagasaki, for some areas, there are only a few cases of environmentally caused mesothelioma about which the family of victims of a citizen group have come out. This causes the difficulties for them in claiming compensations by pollutant local companies, if they should still exist. Therefore they are searching for other evidences of exposures in the neighbors. It can be called actually a need in local people. On the other hand, the problem is a very challenging case for applied philosophy to exploit its abilities regarding the theory of risks, from the view point of environmental justice and a critical assessment of the scientific research including conventional epidemiology, for instance. For it, I myself have been working with interdisciplinary colleagues in Japan and France for three years. And we were offered some data and cooperation by a citizen group in Tsurumi of Yokohama city among 7 areas. Thereby our study has become literary action research⁽¹²⁾ or social collaboration with local stakeholders beyond fieldwork as a neutral observation.

Therefore the study is at last in part motivated by a gap between the result of official survey and the evaluation of it by the suffered local citizens who have disbelief about the experts as, in a word, “there should have been more victims than in the official report, but why not so?” In this starting point, we assumed some elements, to fill that gap, it means the fourth and most acute one, and further to explain it from the epistemic and ethical points of view, especially by emphasizing the aspect of environmental justice from the backgrounds of the

Environmental Risks as Seamless Events and Institutional Gaps of Expertise

social invisibility of public health hazards. So as to reach this objective, we have made some devices for an “adversary” health risk assessment by asbestos in the sense of Shrader-Frechette ⁽¹³⁾. Thus we have introduced some additional approaches for methodological improvements in cooperation with victims and NPOs, to make inferences from limited data more plausible and a reconstruction of the reality of asbestos hazards as far as possible, as follows:

1. The detailed interviews with the affected and related persons including workers or medicals, about episodes with asbestos and their exposure in their life histories, to interpret their narratives in their own contexts for understanding the social-historical backgrounds and capturing the extension and existential depth of this problem ⁽¹⁴⁾.
2. A questionnaire of 70 former fellow pupils of an elementary school of an affected 80 years old man and additional interviews with volunteers from the result of the questionnaire ⁽¹⁵⁾.
3. The reconstruction of the past environments around the factory in the most operative era, from climate conditions as the direction and the volume of the winds, to assess the dispersion of the asbestos geographically and quantitatively by the method of Gaussian Plum.
4. The mapping of related data as the spreading of the patients with pleural plaque ⁽¹⁶⁾ around the factory by GIS (Geographic Information System) etc., including the comparison of the mapping data of the governmental survey ⁽¹⁷⁾.

These are so to speak a hand made mixture of disciplines.

Naturally a philosopher cannot do these many scientifically qualified tasks alone. Also in this sense, the risk event like asbestos hazard appears seamlessly for us “academics” or experts in many aspects, not only in the sense of spatial and social dispersions of the exposure and the actual and potential victims, but also in its long scale duration of influences by such an event. To overcome this obstacle for the attainment of the “reality”, we are challenging to fill the gaps also within the sciences by this type of collaborations.

However, here our team has encountered another and fifth institutional gaps at the final dimension of the study: One of the most difficult to bridge them can be found in the lacks of legal systems of compensation between occupational and environmental exposed victims. On

the one hand this causes an injustice in the relief of victims despite the same buffet of the fatal disease or tragic death of a family member by asbestos exposure, to have motivated our study. And we have been zealous in finding new positive proof of the environmentally exposure of some victims around a former asbestos factory.

Despite our challenge and some discoveries, theoretically speaking, it is never easy to prove such a fact definitely without doubt for everyone, from various reasons including the limitation of the small number of samples from the view point of conventional epidemiology, except for the decisive distinction of the token and type cause of asbestos related illness⁽¹⁸⁾. It would be a dead end, if we would not revise the objective of our study fundamentally again, to see the essence of the environmental risks.

A doctor of our team, he is professionally an epidemiologist, supposes that it would be essentially epistemic and normative errors to divide the victims into two kinds of occupational and environmental ones in the health risk research, if we would uncritically presuppose the present institutions for compensation. Ideally speaking, he claims, all victims must be equally compensated in one scheme of the social safety, as in Holland. As a matter of fact, a new law for the relief of victims treats all the victims with medical proofs without difference. However the level of financial support from governmental budget is not sufficiently high in comparison with that of worker's insurance. As far as we observe this circumstance, it would make still a sense for us to dwell on a difference of the environmental exposure by a definite pollutant from other cases.

So here would appear a sort of dilemma for the orientation of the study, if we could neither show the more persuasive result about the exposure nor propose some institutional reforms of compensation system. And it would be the case in a degree. Despite it, it is our responsibility to proceed to realize both these targets by various ways of collaboration of experts and layperson on the interdisciplinary and national or international levels, instead of various sorts of institutional gaps from the view point of environmental justice.

3. Seamless Events and Institutional Gaps

From above said, now you can conceive the bearings of the thesis, that environmental risks are seamless and that there exist some institutional gaps especially against the solution of

Environmental Risks as Seamless Events and Institutional Gaps of Expertise

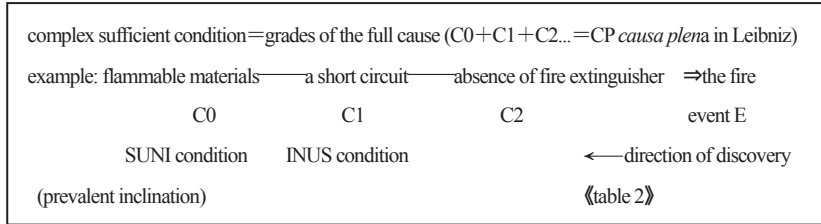
the problems. In the last part of my lecture, we are going from Amagasaki to Fukushima or from asbestos to nuclear hazards: in the case of severe asbestos hazards, we went back to the past from the recent incidents, to catch the reality of exposures of inhabitants about from 30 to 60 years ago. That is a sort of follow-back study of a cohort group in epidemiology to search after the cause, here the pollutant.

On the other hand, from now on we will face the public health risks of cancers, as thyroid tumor by radioactive iodine or leukemia and so on, caused by exposure from accidents of Fukushima nuclear power station in the long run. It is announced that the government conducts prospective study of the cohort group, inhabitants of the areas including children around the power stations. Analogically speaking, we will face various kinds of similar difficulties of the events with the case of asbestos hazards: for example, cancers can be caused by various kinds of factors, not only by nuclear impacts of the accident, as the causes of lung cancer in the case of asbestos exposure⁽¹⁹⁾. From it, the problem of compensation for potential patients will be surely conflicted, not only politically, but also financially. Thus this event will be also seamless in this social respect in near future.

Naturally we must discuss also the causes of the catastrophic accidents and the responsibility for it, from the view point of the theory of environmental risks including the philosophy of science. Actually in this point, the event of accidents is seamless or endless, as far as we cannot exactly determine, where and when it began and will end: the whole series of the causal chain is not easy to delimit. For it is said from various source of knowledge and information about the nuclear industry like Tokyo Electric Power Company that we could have prevent the accident by some technical improvements and reforms of risk management of nuclear power station in governmental institution, except for the alerts of the dangers of severe earthquake and tsunami by experts of seismology⁽²⁰⁾ and NPOs.

The first Japanese textbook of engineering ethics raises a scandal case of hiding troubles from the public as an example of case study⁽²¹⁾. The problem is naturally not confined to the company and the political parties, by considering the roll of mass media, not to have made issues of it. In addition to it, the book indicates the important problem of electric utility deregulation; if a consumer would buy electricity from a company of natural energy, she could do it, to encourage the greening the society⁽²²⁾. As a matter of fact, this idea was

regrettably weak among citizens and academics including myself before the disaster. We must confess that the nuclear industry has been accepted as self-understanding fact and we have been unguarded among so many people⁽²³⁾. Thus causes of such an accident are often cumulative. To succinctly illustrate its complex structure from a modified scheme of Leibniz and Mackie⁽²⁴⁾:



From this simple scheme alone, an accident is generally analyzed into at least three factors or conditions including human actions or institutions, to either prevent or worsen such an accident or an event like a certain fire caused by a series of full cause, as we can easily and analogically conceive the structure of asbestos hazard and nuclear accidents in the power station caused by earthquake and tsunami.

For example, to each C0, C1 and C2 in the case of asbestos hazards we ascribe, first the natural carcinogenic feature of various kinds of asbestos, various opportunities of exposure in work place or general atmospheres, and institutional or personal negligence of the prevention or lack of the precaution of its use. For these factors the experts, as toxicologist, epidemiologist and officials for occupational and public health, including managers of company or professional ethicist in the university, have been responsible in some degree. Despite it, they have been not always well consciously corroborating for stopping this type of incidents.

Further we can complement more specifically the phase of complexity of these human and institutional factors from the explication of “6 common pathways to disaster” of risk experts to overlook, by Shrader-Frechette in her *Risk and Rationality* (1991) in connection with the case of the accident of Chernobyl (1986), to be able to apply that of Fukushima⁽²⁵⁾.

This is based on the psychometric researches: (1) the expert’s failure of considering “the ways in which human error cause technical systems to fail.” That is the case of Three

Environmental Risks as Seamless Events and Institutional Gaps of Expertise

Mile Island. (2) Their too strong confidence in current scientific knowledge. (3) Their failure to appreciate how technical systems functions as a whole. (4) Their neglect chronic, cumulative effect. (5) Their failure to anticipate inadequate human responses to safety measures. This is the case of Chernobyl, officials to evacuate immediately. (6) Their failure to anticipate to “common mode” failures simultaneously afflicting systems designed to be independent.

The last (6) is the case of “black out” (stop) of all emergency cooling systems in the power station to be independent in Fukushima case just after the earthquake and arrival of tsunami, as the standstill of the diesel engine turbine for it or misunderstandings of the functions of IC (isolation condenser) . An expert, he was a member of Japanese Nuclear Safety Commission, emphasizes the last point from technological point of view ⁽²⁶⁾, while most media has made issue of the risk model of the height of tsunami. It could be said to be a rather simple technical failure to be avoid, if we would take the general appropriate geographical conditions for nuclear power station into the consideration.

He adds further some historical institutional failures of the administration of the risk managements for the nuclear safety during 40 years since the start of first nuclear industry in Japan. The problem is more structural also in the social and political sense. In fact, we must say, that risk or risk perception is not a natural fact, but a complex of natural and socio-historical and political facts. It was also a lesson from our research about asbestos health hazards. Against these 6 pathways, Shrader-Frechette concludes with Kahneman and Tversky, that

“it is important, both to avoid the errors frequently made by experts and to correct our risk models. By definition, we cannot avoid errors and correct models under uncertainty. Therefore, prudence dictates that we use conservative risk-evaluation rules, such as maximin.” ⁽²⁷⁾

In a sense, for us, now is the last chance to avoid repeating such a disaster. Naturally it is a little too early to discuss the causes of the Fukushima case, as far as the accident is still not perfectly ended. However we must say at this point of the time that most experts related with

nuclear industry and its risk, including applied ethicists in the university are challenged about their expertise by the public and local victims. In other words, one of the most vital problems in a series of this catastrophe is the lost of the confidentiality of the officially authorized expertise, as people begin to feel, when they have been repeating in mass median about the risk of radioactive exposure, there are no immediate impacts to health by the exposure. ⁽²⁸⁾

In this predicament of the expertise in a critical situation of technological society, we need tackle together with this type of industrial and environmental risks also from the view point of philosophy and ethics. Ideally speaking, Philosophy can and must be a keystone of the synthesis for integrating the variety of the expertise and social actions or history to theoretically and practically concentrate the problems of industrial and environmental risks as a vital issue of public health by binding the disciplines or institutions and voices of the victims together. To cope well with seamless events, we must be at least ready for filling the institutional gaps everywhere in the globalized society.

Notes:

- (1) This is a slightly revised paper read at the annual conference the Chinese National Conference on Ethics of Science, Technology, and Engineering in the Dalian University of Technology on 23. May. 2011. And I appreciate Dr. Inaoka for his advice for clearing the issue of this paper.
- (2) *An Introduction to Applied Philosophy*. The editor of this book attributes the origin of applied philosophy to Kant's "Die Philosophie applicata" as empirical philosophy in 18th century.
- (3) First it was introduced in the general education for all students in the university because of its concrete contents for easier and vivid understandings and secondly it was developed for professionals like medicals and engineers to match a necessary condition to fill the global standards as in USA. It has been performed as JABEE in Japan for professional ethics of engineers.
- (4) See, Matsuda. 1997b.
- (5) Cf. Contributions of Kurata, Maruyama in the above mentioned book and the afterword of the author's own Japanese translation of Shrader-Frechette's *Risk and Rationality*. In this regard, they have the one and same view. Now I agree with the judgment of Norton about the unproductiveness of the debates between "anthropocentrism" and "anti-anthropocentrism" in environmental ethics. Nonetheless, while Norton emphasizes the problems of ecological managements of nature against

Environmental Risks as Seamless Events and Institutional Gaps of Expertise

the main stream of the policy of EPA, the author comes back to the humane problems as the public health risks again from the above mentioned reasons.

- (6) Minakata, as a great natural historian from East Asian traditions and an internationally well known biologist of Myxomycete in his time, so to speak waged a one-man battle against the governmental destructive policy of wild forests in and around the old shrines about 100 years ago. Incidentally he was a friend of Sun Wen (孫文) during their stays for study in London. The author discussed about the actual philosophical relevance of the Tantric Buddhism eco-philosophy and his heroic and humane practices of protection of local nature in Kumano in the contemporary context. Cf. Matsuda.1997a.
- (7) This situation is not so rare also among the pioneers of the environmental ethics in USA, as Callicot, he is a contemporary representative and an interpreter of influential Land ethics after Aldo Leopold, told about his own similar case.
- (8) This hazard broke out first in UK and USA as top runners of industry society at latest in 1970s. After three decade the same thing happened in Japan. The problem of this time lag implies many issues for us in the late started Asian countries for industrialization and modernization of society, while this time lag is getting shorter and shorter by the dynamics of the globalization which may cause other risks.
- (9) The medical view that the type cause of mesothelioma is asbestos, is established by so called Helsinki criteria.
- (10) After the stop of the production of water pipe, the company had produced building materials by another sort of asbestos named chrysotile until rather recently.
- (11) ILO reports in 2003 that mesothelioma spreads now and we have 100,000 victims in the world every year statistically. See, <http://www.ilo.org/public/english/protection/safework/accidis/asbestos-dresden1.pdf>. This data is from the history of the BANJAN, p.8.
- (12) Although here I do not discuss the definition of “action research,” the method of which the experts or academics of various disciplines as in sociology or social science and so on, have been applying to the concrete problem solutions, at least, we can say, that we are consciously involved in the social process to discover the victims of asbestos hazards or reality of risks behind some invisible socio-historical dynamism.
- (13) See, Shrader-Frechette, 1991.pp.215ff.

- (14) Through it we could make sure the significance of the counter movements of the affected families against the actual risks vividly, not to mention the problem of the anxiety or trauma of future illness. About these problems, see Matsuda, 2010a.
- (15) He had about 300 fellows in his age before the 2nd world war. We have 18 answers from 70 people and 4 persons among them offer further cooperation: there are two asbestos related cases. More details see Matsuda.2011a.
- (16) Pleural plaque is generally a physical trace of exposure of asbestos in the lung.
- (17) You can see some remarkable results of the study. That non-concentric circle of the dispersion of asbestos is similar with that of nuclear pollution around the Fukushima power station.
- (18) A token cause of related disease is almost impossible to detect from (past) ubiquitous existence of asbestos in our ordinary life.
- (19) In this sense the case of mesothelioma is exceptional in contrast to lung cancer caused by smoking or other factors. By smoking the risk of mesothelioma of smokers will be increased about 50 times in comparison with no smoking case.
- (20) The most risky case was Hamaoka plant in Shizuoka. On 14th May its operation has just been stopped by governmental wish. After the presentation in Dalian the governmental committee's interim report about the accident was announced on 26. December 2011, according that the meltdowns or melt through of reactors in Fukushima First Nuclear Power Station could have been well avoided by sufficient equipments and preliminaries of the factory and the management of the Japanese government against tsunami. However the exhaustion of the causes of this catastrophe is still on the way at the end of 2011. And the possibility cannot be excluded that the earthquake itself caused the meltdowns or melt through, according to some experts. See, *The End of Nuclear Power Station*.
- (21) See *An Introduction to Engineering Ethics*, pp.88-91. In that occasion Fukushima Prefecture requested inspections of nuclear power reactor.
- (22) About the reform of electricity market by local people or communities see Hasegawa's works.
- (23) Irrgang tries to explicate this social process of the embedding the technology into the ordinary life world hermeneutically and pragmatically from his philosophy of technology. The author will discuss the problem later in another place.
- (24) The author who discussed the philosophical problem of the causation in the context of Leibniz

Environmental Risks as Seamless Events and Institutional Gaps of Expertise

interpretation, intends to rather freely apply the general scheme of 《table 2》 to our problem. Here INUS is an abbreviation of the initials of the ‘insufficient but necessary part of an unnecessary but sufficient condition’ by Mackie’s famous doctrine of causation. And SUNI condition also means with the same abbreviation ‘a sufficient but unnecessary condition of a necessary but insufficient condition.’ Cf. Matsuda. 2010d.

- (25) The attention to the human error and socio-historical factors is not the affirmation of the social constructivism with relativist tendency as in Latour. We would prefer rather critical realism as a philosophical stand point. This thesis must be examined also in the case of accident of Fukushima.
- (26) Cf. for example, Takeda. He indicates the problems of interlocking relationships of industry, political party, mass media and the experts of the universities.
- (27) Cf. Shrader-Frechette, p. 128. Her genuine strategy is to observe a modified Rawlsian maximin principle for social decision of implementation of new hazardous technology under uncertainty, to secure the environmental justice. She would emphasize the strategy for safety of laypersons by appealing the maximin against the utilitarian risk trade off strategy by calculation of the expected utility. Cf. Matsuda. 2006.
- (28) The governmental standard is based on that of ICRP, not on stricter ECRR. The problem of health risk of radio activity for children is so a conflictive issue that a member of the Nuclear Safety Commission got out of the office as a protest. Generally speaking, the risk of cancer has no definite threshold as in the case of asbestos. Cf. Matsuda. 2010a.

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Environmental Risks as Seamless Events and Institutional Gaps of Expertise

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(Professor, Graduate School of Humanities, Kobe University)