Social fission: The political and social determinants of nuclear risk distribution in post 3.11 Japan.

Colin Ross van den Akker

s1113259

MA Asian Studies - Politics, Society, and Economy of Asia

Leiden University

17-12-2015

Word count: 12.473

Introduction

Currently, parts of the Fukushima prefecture are exposed to radioactive particles as a result of the 3.11 Fukushima Daiichi disaster. Around 150.000 people have evacuated as a result of the threat of radioactivity (Gill & Steger 2015). Even though these people moved outside of dangerous zones as indicated by the government, many of these people still live in uncertainty regarding the risks of radiation. How people perceive and construct these risks is crucial to the daily lives of the victims of this disaster. Furthermore, the change in perceived risks of nuclear energy as a result of this incident shapes the debate surrounding nuclear energy in general in Japan, as well as worldwide.

The current governmental procedure for managing nuclear contamination consults a geographical distribution of radioactive particles in the instituting of evacuation zones and safe zones. However, this way of managing the risk of radioactivity is thoroughly disputed in post-disaster public and academic debate. Uncertainty over the acceptable of radiation drives protest against the official decision-making process. The decision of ordering an evacuation or labelling an area as safe becomes a political decision. In the political dispute over nuclear risk, political outcomes will depend on the consensus on safety; a consensus on what is deemed as safe has implications on the actual exposure to radiation of affected people.

This paper discusses the perception and distribution of risk of radioactivity in post 3.11 Japan by drawing on Beck's risk society thesis as well as anthropological studies of disaster. By assessing risk, we can account for the uncertain nature of radioactive contamination. The guiding research question reads: To what extent do perspectives on risk influence the distribution of risk of nuclear radiation in post 3.11 Japan. In addition, this work analyses the mechanisms through which these perspectives are shaped.

In answering these questions, this paper first considers the theories of Ulrich Beck to guide the discussion about risk. Subsequently, this work turns to the anthropology of disaster to deconstruct the abstract concept of risk in the context of disaster. Finally, this paper analyses the case of Japan after the Fukushima Daiichi disaster. By focusing on prevalent perspectives on radiation after this disaster, this work shows that in the case of post 3.11 Japan, risk is stratified along lines of gender and class.

Beck's work exerted great influence on the study of risk. In the case of the Fukushima Daiichi disaster, Beck's framework is an suitable analytical tool, as it portrays the struggles of a public with expert institutions over the hypothetical, incalculable, and threatening force of risk. Conversely, the case study of Fukushima also allows for a critical examination of Beck's theory. In his risk society thesis, he argues how modernity gave rise to dangers that are completely new in nature and effect; existing structures of modern life are incapable of dealing with these dangers. By applying Beck's framework to the case of the Fukushima Daiichi disaster, we can learn more about the perception and (mis)management of risk as a result of modern scientific and political structures and institutions.

Although we can observe concerns of risk in the debate after the Fukushima disaster, Beck's

theory does not concern actual disasters. In his works on the Risk Society (1992, 2009), he views disaster and risk to be separate. Whereas disaster refers to actual hazards, the latter only refers to potential hazards. However, in the aftermath of the Fukushima Daiichi disaster, we can observe concerns about risk amidst an actual disaster. More so, the disaster affected how people came to view nuclear power and its accompanying risks. In Fukushima, hypothetical and actual hazard overlap in a way which Beck's thesis cannot fully account for.

Therefore, to account for the gap between disaster and risk, this work draws on anthropological theories in disaster studies. This paper follows the perspective of disaster studies as presented by Hoffman and Oliver-Smith and studies disaster as a process rather than a simple event. This perspective showcases power relations and vulnerabilities within a given community; these are fundamental in shaping experiences of disaster and risk. Another insight of this approach is that the outcomes of risks and disaster are mediated through complex social processes. On the one hand, the disaster can provide insights in the social composition of the affected society, while on the other, knowledge on the differential vulnerabilities of individuals and groups offers information on how a given society will experience a disaster. By viewing risk through the perspective of disaster studies as presented by Hoffman and Oliver-Smith, the abstract concept of risk can be deconstructed into mechanisms that shape and limit the distribution of hazard and the discussion around risk, as well as divergent perspectives on risk that produce different outcomes in terms of health and wellbeing.

Whereas the introduction of disaster studies to the topic of risk offers a critical perspective on Beck's theory, Beck's perspective on the formation of risk perceptions remains of great importance. Whereas the anthropological studies on disaster show that risk is not universal, they do not account for the existence of different perspectives on risk. Here, Beck's focus on the role of knowledge and expertise on the definition of risk provides an excellent framework to guide the discussion on diverging perspectives.

Subsequently, by examining public and academic debate around the construction of risk of radioactivity in post 3.11 Japan, this paper assesses the forms of knowledge and expertise, as well as the political influences that shape the way in which risk is defined and distributed. First, I turn to academic literature to present an overview of political and social mechanisms that either dictate participation in the debate around risk, or directly distribute the dangers of nuclear power. Subsequently, in order to uncover the focus of the debate – in terms of dominant perspectives - on nuclear risk in post 3.11 Japan, I rely on official governmental publications, newspaper articles, and scholarly accounts on the development and aftermath of the incident. For analysing the effect of these perceptions on the distribution of risk, this paper considers personal experiences of disaster victims in the form of documentaries, transcripts of interviews, and written records by anthropologists.

As political and social factors dictate the ability of groups or individuals to enter the debate, the definition of risk is dependent on the perspectives of groups and individuals who are capable of directing this debate. We shall see that the discourse surrounding nuclear risk in Japan focuses on the

concerns of mothers and children, as well as nuclear workers; resulting perspectives on vulnerability distribute radiation exposure unevenly among men and women. In addition, through political intervention, the distribution of exposure radiation is stratified along social class. From these premises, I assert that the mechanisms and perspectives that shape the distribution of risk are stratified along lines of gender and class.

This work contributes to the literature on 3.11 by showing the results in terms of radiation exposure of public and academic debate so far. Discourse on nuclear risk in Japan is focused on mothers, children, and nuclear workers. This discourse excludes men who are not employed in nuclear facilities from the calculation of vulnerability and risk, and potentially influences the health of future generations adversely. Furthermore, by analysing risk of radioactivity through the channels of class and gender, this work sets up a set of insights for relevant political groups for a hypothetical future nuclear disaster. By showing the structures through which damages of a disaster are distributed, we can mitigate the effects of next disasters. If there is no political option to eliminate potential sources of destruction, at least we can consult and research patterns of vulnerability of a given society to achieve a more efficient and democratic form of risk management and disaster relief. Finally, since Beck's theories are often only superficially discussed with reference to Fukushima, assessing Beck's theory in the light of disaster research hopefully contributes to the deconstruction of the elusive concept of risk as presented by the highly influential Ulrich Beck.

The importance and limits of risk

The works of Ulrich Beck portray risk as a central part of (post)modernity. In 'Risk Society', Beck describes the transition from a modern society to a risk society, where modernization becomes reflexive. Whereas modern societies are concerned with making nature useful, or releasing mankind from traditional constraints, the reflexive modernity necessitates a society to also concern itself with the by-products of modernity. Modernity being reflexive in this sense means that the promise of modernity has to be applied to modernity itself; modernity has to solve the problems that are a by-product of itself. The systematic way of dealing with the hazards and uncertainties as a result of modernity is what Beck identifies as risk. Moreover, he makes a distinction between the risks of modern and pre-modern times and those of contemporary, reflexively modern society. As opposed to the personal nature of risk in the modern and pre-modern world, contemporary risks have the potential for global danger or global (self) destruction (1992, p.21). As modern technologies become increasingly powerful, decentralised, complex, and sophisticated, their consequences become less calculable. Managing of risk becomes more difficult, as the very act of managing risk contributes to further creation of risk. Thus, Beck argues, in the risk society, unintended and unknown consequences become a dominant force in society (1992, p.22).

However, risk is broader than the mere system around the negative consequences of modernity. The aforementioned personal risks, which were dominant in the pre-modern and early modern times still exist alongside this reflexively modern variety of risk. In addition to defining a systematic approach to the uncertainties and hazards of modernity as a whole, the word risk is often used by Beck to refer to singular uncertainties and hazards as well. Even if we accept Beck's concept of risk as the systematic approach to dealing with uncertainties and hazards of modernity, it is necessary to find out how that systematic approach relates to hazards and uncertainties.

It is important to note that Beck (1992 p.34; 2009 p.11) makes a distinction between risk and disaster. Whereas disaster concerns actual events, risk concerns anticipated events. Instead of seeing past or current events as a drive for social change, which is typically the case for the distribution of wealth, Beck argues that social movements around risk solely look to the future (Beck 1992, p.34). Establishing the link between hazard and risk seems difficult, as it is unclear what happens to risk or people's perception of it if one of those hazards of modernity were to manifest itself as a disaster. If we define disaster as actualized hazard, and risk as hypothetical hazard, risk can by definition not refer to actual hazard or subsequent harm, which makes any claim to hazard on the basis of risk rather confusing. So whereas late-modern risk is traditionally perceived as future-oriented, intangible threat with global and universal reach, how can we best understand a disaster as a manifestation of this late-modern risk?

If we were to see disaster as actualised hazard, we would perceive disaster as a singular event, limited in time and space. However, in the case of nuclear radiation in Fukushima, the threat of radiation persists after the occurrence of a disaster, even though there is no immediate perceivable damage. It seems that, with regard to nuclear technology, disaster in itself is also future oriented. Regarding disaster as a single event thus only adds to the confusion. Conversely, if we look at risk and hazard from the viewpoint of disaster, the connections between the three are clearer. Hoffman & Oliver-Smith (2002, p.4) define disaster as:

> A process/event combining a potentially destructive agent/force from the natural, modified, or built environment and a population in a socially and economically produced condition of vulnerability, resulting in a perceived disruption of the customary relative satisfactions of individual and social needs for physical survival, social order, and meaning.

Additionally, they define hazard as:

> the forces, conditions, or technologies that carry a potential for social, infrastructural, or environmental damage. A hazard can be a hurricane, earthquake or avalanche; it can also be a nuclear facility or a socioeconomic practice, such as using pesticides. The issue of hazard further incorporates the

> way a society perceives the danger or dangers, either environmental and/or technological, that it faces and the ways it allows the danger to enter its calculation of risk (Hoffman & Oliver-Smith 2002, p.4)

If we revisit the above-mentioned definitions with regards to Beck's theory of risk, we observe that phenomena such as global warming and radioactivity are potential sources of destruction: They are hazards. Risk and hazard are therefore used interchangeably throughout this work; the negative outcomes of risk are referred to as damage. Adopting these concepts within the context of the risk society thesis has two implications. First, if disaster is a process of the combination of hazard with a condition of vulnerability, damage as a result of hazard becomes dependent on vulnerability. This means that if there exists a differential in vulnerability, there also exists a differential in damages suffered from one specific hazard.

Second, since the satisfactions of individual and social needs for physical survival, social order, and meaning are subjective, damage to these customary entities is dependent on the interpretation of these entities. Less so for individual needs for physical survival, depending on one's perspective on social order and meaning, a society can have a wide range of vulnerabilities. Hazards and the threat thereof can mean different things to different groups and individuals. The condition of vulnerability acts as a moderator between potentially destructive forces and harm to the affected population. Oliver-Smith (2002, p.28) assesses a definition of vulnerability:

> the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard. It involves a combination of factors that determine the degree to which someone's life and livelihood is put at risk by a discrete and identifiable event in nature or society.

Subsequently, he expands the concept of vulnerability to account for the relation between nature and civilisation, arguing that environmental limitations or challenges are experienced only as the result of human social, economic, and cultural arrangements (Oliver-Smith 2002, p.34). Furthermore, he shows how a dichotomous view of nature versus society is not helpful in the face of risk and disaster. Nature and society evolve alongside another and are interdependent on another, thus making the distinction between natural disasters and manmade disasters irrelevant for the construction of risk. Vulnerability also includes capacities to deal with a social practice, or the combination of a social practice and natural hazard.

On the one hand, this view compliments that of Beck, as both explain how modernisation and globalisation have caused vulnerabilities and hazards to become nonlinear in nature. Also, vulnerabilities are linked to positions of power within a society: The negative effects of the material environment are a reflection of the social realm. Conversely, this approach shows how nature and civilization/society have always evolved mutually; the distinction between nature and civilization is

not as clear cut as Beck proposes. This means that disasters and risk of the pre-modern and early modern eras were dependent on the results of their own configurations of civilization. Beck presents disasters as an event, however by looking at disaster as a process that is inherently dependent on the social configuration, we observe that civilization has always been reflexive. Although pre-modern civilizations were mainly preoccupied with the removal of natural limits, these very limits are dependent on the social structure of a given culture. Pre-modern civilization also had to deal with risks that were a consequence of pre-modernity as such.

Thus, if we want to assess the outcomes of risk, we will have to research how vulnerabilities, as well as people's perceptions of these vulnerabilities, are distributed. Definitions and perceptions of risk and disaster are tied to the contesting interpretations of hazard and "ownership" of disaster: Who gets to decide what risk is, and who decides who are seen as vulnerable? (Hoffman & Oliver Smith 2002, p.11). Answering the question of how a given society or culture constructs its own vulnerabilities thus has to take into account the political dimension of definition, which is what we see in Beck's theory as well: Risks as well as its side effects become highly politicised (1992, p.77). As a result of the political struggle around the definition of risk, the construction and distribution of knowledge plays an important role in the construction of risk. Thus, a study of risk will have to account for the distribution of hazard, vulnerability, and knowledge, as well as perception on vulnerability and knowledge.

According to Beck, risks like global warming and radioactivity are universal and supranational (1992, p.23). This universality translates into a potential for global disaster. Risk transcends national borders; even those who profit from the initial distribution of risk, will eventually be confronted with the negative outcomes of this distribution (Beck 1992, p.37). Centeno et. al. (2015) provide an overview of interdependence within global systems; they show how vulnerability is often fixed within the formation of those (global) systems.

Nevertheless, globalisation of vulnerability and hazard do not necessarily entail their universality. Beck (1992, p.23; 2009, p.58) concedes that some people are more affected than others by the distribution of risks. However, he claims that sooner or later, those who profit from risks of modernisation will also suffer from them. Risks of modernisation contain a boomerang effect, in which damage transcend the pattern of class and national society (Beck 1992, p.23). In addition, these damages are not only confined by hazards to health; there are global political and economic hazards as well.

Yet, this means that vulnerability towards risks of a global scale, be it global warming or nuclear risk, differs between immediate victims and the victims of the boomerang effect. In effect, this is an attempt of Beck to link economic downturn as a result of global risks to those very risks, thereby making them universal. However, are risks to health and the economy identical? We know that immediate damage to health as a result of (global) risk is mediated through structures of class (Beck 1992, 37). In addition, the social and economic risks faced by the direct victims also lack the quality of

being universal, as they are mainly carried by the poor (Beck 2009). So the universality of risk depends on the universality of political, social, and economic risks on a global level through the boomerang effect.

If we review Beck's boomerang-effect (1992, p.23) we observe that both the person that profits from initial formation of risk, as well as the direct victim face the same incalculable probability of the manifestation of global warming or nuclear disaster, and that it will affect them both. However, since their condition of vulnerability towards the hazard of global warming or nuclear disaster has a different configuration, we cannot claim that they face the same type of risk: The systematic approach to insecurity and damage will be different for the group of 'globalized' winners from the approach for direct victims.

If we follow Beck and assume that economic risk is formed through complex market transactions, we'll see that the economic conditions of vulnerability are also formed through market positions and transactions. This means that economic risk – even to the extent that it is global – is not universal. Instead, global economic risk is competitive. In the face of disaster, there will be a reconfiguration of winners and losers. The works of Amartya Sen provide the example of speculation in food prices during famine in India. Likewise, for global hazards, there will be a global reconfiguration of conditions of vulnerability.

Beck's argument of universality of risk depends on the influence of disaster on profits or social order elsewhere. However, in the face of (abrupt) change in the market, political and economic vulnerabilities constitute a zero sum game. In the abovementioned case of economic vulnerability, market structures ensure a competitive –as opposed to universal - distribution of damage. In the case of political vulnerability, as long as the risk society thesis relies on the market as a chief distributor of global risks, this means that the global market constitutes main structure of social order on a global level. Even though damage and profit are distributed in the market, these distributions do not influence the social order of the market per se. Only in the event of a complete shutdown of the global market, do risks cease to become a zero sum game. However, this would require a complete and universal risk that we have not been able to define yet. In this sense, Beck's proof for the existence of global risks presupposes the existence of global risks. In conclusion, we see that risks to health are not universal, as vulnerability in terms of health is stratified along class lines. On the other hand, non-health risks are competitive, rather than universal in nature.

For a better fit of the risk society thesis, it is necessary to research of global risks that are also universal. Nuclear weaponry is traditionally most intimately linked with global, complete disaster. However, as nuclear weaponry is maintained within hierarchical, bureaucratized institutions, the question remains to what extent they fit the global decentralized production of risk. It seems that research on nuclear proliferation will be an important topic for those interested in the theory of risk and modernity.

So far, we have observed how risks such as nuclear radiation are a result of modern, global

systems of production. Nevertheless, after taking into account that damage as a result of such risk is dependent on the vulnerability of certain individuals and groups, we see that global risks like global warming and nuclear radiation inflict different damages on different populations: Risks of modernity are not necessarily universal. However, another insight of disaster studies is that the framing of risks is a subjective process, dependent on perceptions of vulnerability. If we want to know what these different perspectives are, we will have to know the origin of these perspectives. In the following paragraphs, Beck's approach to the creation of risk perspectives is discussed. According to Beck, perspectives and definitions of risk originate in the struggle between competing interests, forms of knowledge, and claims to expertise.

Knowledge, politics, and the construction of Risk

As a result of the unique nature of new threats, Beck (1992, p.52) poses that these threats are not directly related to primary experience; the threats of modern civilization can only be experienced through science. In contrast to earlier threats, which were mainly linked to one's class position, the threats of late modernity introduces harm through a unspecific and universal risk position (ibid, p.53). For those potential hazards of which the precise effects are not yet known, as is the case for low doses of radiation, the actual hazard cannot be perceived as it manifests; the effects are only visible afterwards. Here, the distinction between risk and the perception thereof is essential, as it suggests the possibility of objective determining of hazards in a specialized way through expert authority (Beck 1992, p.57). In the view of the technological elite, science determines risk, and the public perceives it; the differential between the two can be attributed to the lack of knowledge of the public, which is then seen as irrational (ibid.). In the case of radioactivity, Stephens (2002, p.91) makes clear how international institutions on radiological protection adhere to this idea of expert authority: "Science establishes the physical and biological facts of radiation. Culture and politics come in with the setting of socially acceptable or tolerable limits of exposure." However, such a view overlooks how culture and politics enter the very formation of what constitutes a "fact" in science, as well as the seemingly given assumptions that underlie the framework of such institutions (ibid.)

According to Beck (1992, p. 58), the perception of risk as objectively determinable is wrong, as statements on risk necessarily contain implicit statements on how we want to live. His claim is that the sciences are incapable of reacting to the risks of modern civilization, as they are involved in the creation of those risks by their insistence on a 'pure scientific method' and their role in legitimizing of the creation of hazard. This becomes clear through the widespread use of acceptable levels. The use of acceptable levels of pollution – or radiation - already implies that there exists an acceptable level of poisoning; everything that is captured within that level is therefore not hazardous (Beck 1992, p.64 - 65). As opposed to the principle that people should not poison each other, the principle now becomes

that people should not poison each other completely (ibid.) In the case of the International Commission for Radiological Protection (ICRP) – the leading authority on radiological research – the guiding principle is the same: To provide an appropriate standard of protection for humans, without unduly limiting the beneficial practices giving rise to radiation exposure (Stephens 2002, p.67) Instead of concerning itself with absolute safety, the ICRP concerns itself with a trade-off between acceptable levels of harm and economic gain as a result of nuclear power. However, according to its own guiding principles, this is something that should lie within the realm of politics and culture.

On the other side of the equation, in the realm of non-expert or lay knowledge, the quest for 'scientific purity' by experts and elites curtails the political power of those who are affected by the side effects of this permissible poisoning. For affected individuals, whose experience of the side effects becomes visible in the form of suffering, there exists no option to combat these effects until they scientifically prove the causal link between their suffering and the alleged source of harm (Beck 1992, p61). Through their measurements, the modernization risks, which are not seen or recognized by experts, take shape. By holding on to the polluter pays principle, the mainstream scientific approach fails to recognize all hazards, as the hazards of modernity cannot be discovered through simple linear links of causation. In this view, as long as people cannot designate one single polluter, there exists no polluter (ibid).

However, as Beck (1992, p.57) points out, there exists no authoritative claim to expertise. Moreover, claims about the nature of risk are dependent on perspectives of how we want to live (ibid). If modernity risks take shape through the continued measurement and political struggle of the public, the perspective on risk by the public shapes the way in which risks of modernization are expressed and how political activity is formed. Also, as we have observed earlier, the perspective on risk of an individual or a group depends on perceptions on vulnerability.

Beck supposes that the definition of risk takes place in the struggle between the self-proclaimed scientific elite and the broader public. As a result, the rationale of technology and science, which have been used by technological elites with the aim of increasing productivity, will be discredited (Beck 1992, p.60). Whereas these elites will adhere to the idea of objectively definable risks, the public, which is concerned with escaping the risks that result from increased productivity, will lose faith in the superiority of the rationale of science and technology. However, is it true that there only exists one public and one abstract techno-scientific elite? Stephens (2002) voices the opinion that the distinction between expert and public is inadequate, yet does not propose in which ways the debate can be adequately labelled. If we take into account that within a society, there can be different perspectives on the way people want to live, as well as what constitutes a threat to this way of living, along what lines are these differences expressed?

Nuclear Risk before the Fukushima Disaster

In 2008, the Nuclear and Industrial Safety Agency (NISA) discovered that the event of a large – 15.7 meter – tsunami occurring in the area was plausible, yet repeated warnings of this possibility were dismissed by Tokyo Electric Power Corp. (TEPCO) (Kingston 2012). TEPCO did not want to prepare for such events, as the existence of emergency trainings would conflict with repeated assurance of the safety of nuclear power plants. After the 3.11 meltdown as well, both the government and TEPCO preferred information dissemination which would preserve the peace and not 'unnecessarily' worry the population.

The assurance of nuclear power as a safe and controlled technology has a long history in Japan. Penney (2012, p.8) provides an overview of propaganda employed by the government and electric companies to promote nuclear energy as safe. This ranges from false assumptions on safety in worker training to the creation of pro-nuclear comic series, parks and interactive science centres for children to familiarize themselves with nuclear energy. In these materials, the images of professional and scientific expertise are evoked through a focus on the clean, scientific, and technical aspects of the nuclear plant. Moreover, the anthropomorphism of nuclear energy with mascots, along with cartoon style illustrations to inform the public, reinforce the notion of nuclear energy as harmless. One of the problems, as Penney (2012) notes, is that the government institution that is responsible for regulating the nuclear industry, the Nuclear Safety Commission, also had the task of promoting nuclear energy. Dissemination of information from the Japanese government served to convince the public on the safety of nuclear energy and left no room for the actual preparation for the accompanying risks.

In part, the promotion of nuclear power was a response to the oil crises of the 1970s (Pickett 2002, 5). The Japanese government promoted nuclear energy as a means of escaping the risks associated with dependence on foreign oil reserves. Support for nuclear energy was portrayed as support for the greater good, for the wellbeing of Japan (Penney 2012). Although there existed aversion towards nuclear power among the population, it was promoted by experts as a means of adapting to real threats. Paine (2002) explains this as the No-risk thesis, where risk is suppressed with regard to an ultimate goal. The reassurance towards the public of the safety of nuclear energy, as well as the technical prowess of Japan that made this safety possible, served as an adaptive strategy to the risks associated with a reliance on foreign oil reserves. However, as Penney notes, such extreme suppression of risks can lead to maladaptation in the long run.

When Fukushima faced the earthquake, tsunami, and nuclear meltdown in March 2011, this strategy of maladaptation became agonizingly evident. An independent commission report on the disaster found out that the talking down of risk resulted in severe deficiencies in the emergency structure of the nuclear power plant itself. According to this report, the occurrence and scale of the disaster were a direct result of insufficient preparation by TEPCO, as well as insufficient regulation of responsible government structures. (National Diet of Japan 2012).

Effective governmental response was hindered as TEPCO refused to disclose on site information (Kingston 2012). Additionally, the commission that was responsible for the distribution of information in an emergency displayed a passive stance. When asked about their passivity, they simple retorted that no one had asked them about the information (ibid). As a result, official decision-making on evacuation was slow and ineffective. Some citizens were sent to areas with higher radiation levels than in their original location (Kingston 2012). Others were perplexed by the amount of contradictory information (Ikeda 2015). Overall, the carefully constructed myth of safety had severely limited the capacity of citizens to cope with the disaster.

So when the government had settled on instituting a radius of 20 kilometres as the official evacuation zone, along with a 30 kilometre zone wherein evacuation could take place on voluntary basis, citizens responded critically. Especially in the voluntary evacuation zone, where levels of radiation are portrayed as safe, citizens were aware of the problems around governmentally approved definitions of safety.

If we look at official documents on the 3.11 disaster, information dissemination fits Beck's theory expert knowledge and layperson knowledge quite well. Especially on the side of the government, claims to expertise are prevalent. On the website of the Prime minister and his cabinet, information on radiation is delivered through lengthy and technical question and answer style documents, and the responsible experts are introduced through extensive listing of their academic titles and professional achievements. In addition, scientists are sent to communities in voluntary evacuation zones to stress the benign nature of local radiation levels (Ikeda 2015). The reliance of expert discourse is best exemplified in the stance of the Japan Atomic Industry Forum as they quote Adam Smith: "Science is the great antidote to the poison of enthusiasm and superstition." (JAIF 2015, slide 14). Beck's presentation of a self-proclaimed expert elite that attempts to distribute information to the clueless common people fits this case particularly well.

Yet, on the other side of the expert-layperson divide, Beck's theory does not fit that well. Although there is a strong anti-government voice within public debate, their criticism is more directed towards the political, rather than the scientific side of expertise. As Kingston (2011) notes, following the declaration of safe voluntary evacuation zones, there was a surge in the demand for Geiger counters. As the public set up its own maps of radiation levels online - Slater (2012) provides an overview of these initiatives - the loss of trust seems not so much directed at the rationale of science, rather more towards the government as a representative of scientific knowledge. As Yoko Ikeda (2015) notes, scientists whom were sent to local communities lost their credibility and were perceived as government lapdog scholars. In this sense, the public that supposedly relies on layperson knowledge had good information on the levels of radiation, and questioned reassurances of safety for the political interests that underlie these reassurances. Also, the memory of scientists reassuring the safety of nuclear power before the disaster most likely helped in shaping these perceptions.

Overall, Beck's theory to risk is limited by the political decisions that underlie the placement

of risk. Responsibility for the hazard of nuclear power plants is shared by TEPCO and the government. Nuclear power plants cannot be placed without government support (Aldrich 2005). In this sense, nuclear power plants are not a part of the market mechanisms that create the organized irresponsibility that Beck (1992) hypothesizes. Instead, the responsibility of nuclear risk is placed in hierarchical, bureaucratic structures of political power. Whereas TEPCO tried to deny its responsibility by portraying the tsunami as an event that could not be expected, and blaming the disaster on government intervention during the crisis, it did indeed try to shirk its responsibility. However, in the case of nuclear radiation, there is often only one polluter; that polluter can be identified. The situation of nuclear energy is different from Beck's (1992) examples of global warming and carbon pollution of the air.

Political determinants of nuclear risk

In addition to active manipulation of the definition of risk, political power distributes the risk of nuclear technology in three ways. First, political power actively distributes the hazards of nuclear energy throughout a society by deciding the locations of power plants; this decision assigns the highest risk to the weakest communities. Second, in the process of establishing evacuation zones, governments exclude parts of society from information and basic goods. Finally, the demarcation of evacuation zones decides who is eligible for compensation and avoiding exposure to radiation.

Regarding the distribution of risk of nuclear energy, Aldrich's (2005) findings on placement of public facilities, such as dams, airports, and nuclear reactors, suggests that the hazard of nuclear power are actively and deliberately distributed by governments. These public facilities can be seen as "public bads", as they increase overall national welfare, yet impose net costs on the host community (Aldrich 2005) At first glance this seems to fit well in Beck's argument on the distribution of wealth and risks, as the call for wealth accumulation typically outshines the (Beck 1992) Yet the risk of a "public bad" is not as easily attributed to the complex structures of shared irresponsibility, as the net costs of such a facility are local and deliberately distributed or assigned.

Aldrich (2005) argues that states will choose sites where they expect civil society to be the weakest and protest the lowest; in places with a weaker civil society and weaker resistance, the state is more likely to utilize coercive techniques and tools of hard social control. He defines civil society as sustained, organized social activity that occurs in groups that are formed outside the state, market, and family. In his model he defines strength of civil society as a combination of community solidarity and relative strength of groups that are more likely to participate in and block siting attempts. This suggests that the hazard of a nuclear power plant is located at places where people have the least say in the decision-making process, as well as a lower capacity to look after each other in the face of disaster. However, as Aldrich only concerns the siting of these public hazards, and only measures strength of

civil society as a predictor of successful protest to plant placement, the question remains whether civil society has changed in the forty years after the placement of the first wave of nuclear reactors. Since placement of nuclear power plants brings with it the construction of further amenities and infrastructure, there is the possibility that civil society and the strength of social bonds improved after the placement of a nuclear power plant. For assessing the strength of civil society at the time of the Fukushima disaster, additional research is needed to measure the effect of the increase in infrastructure on the social and political capacities of the host community.

In addition, Aldrich and Sawada (2015) found that for the 3.11 tsunami, along with tsunami height and level of support for the LDP, stocks of social capital were influential for mortality in the Tsunami. They found that communities which had lower levels of bonding capital – which was measured as high levels of crime rate- before the tsunami, experienced greater levels of mortality during it. Beck's theory does account for social/class stratification regarding natural disasters and modern personal risks. However, the 3.11 disaster was an example of the aforementioned connection between natural and modern, man-made disasters. When we take into account that nuclear reactors are placed in areas with low levels of social capital – or a weak civil society – this means compound hazards arising as side effects from modernity are not only distributed along social strata. The sources of these hazards are actively distributed towards those with the lowest capacity to cope with these hazards. Not only natural disasters are mediated through class or social stratification. Pollution and radiation are not democratic, as the very placement of those risks, and calculation of risk management, is posited within communities with higher vulnerability. Risk is, in this case, not democratic nor dispersed. Instead, its distribution is local, deliberate, unilateral, and calculated.

After having discussed the mechanisms that structurally distribute the dangers of nuclear power, it is necessary to take a look at the influence of political action after 3.11. According to Slater (2012), the Fukushima disaster was fully experienced through social media. He poses that in post 3.11 Japan, we can observe the potential of social media to provide alternative narratives that could give rise to significant political action, especially where official narratives have failed. However, the degree to which people are capable or legitimized to take part in the debate, either through social or official media channels, is mediated by a set of political and social mechanisms: The influence of a narrative is dependent on barriers imposed by the state, as well as gendered expectations of public representation and political action. Furthermore, the division of debate in terms of governmental, or expert, narratives versus public, or layperson, narratives is not always as absolute as Beck (1992, 2009) proposes.

First, the imposition of compulsory and voluntary evacuation zones by the central government has significant effect on the distribution of basic necessities and information; this effect applies to both official and alternative narratives around the 3.11 disaster. In his plea for help, Katsunobu Sakurai, mayor of Minami Soma, explains that the evacuation status for Minami Soma has left residents isolated from basic necessities and information (Minami Soma City, 2011). This city lies just outside the initial 20 kilometre exclusion zone as established by the central government. Residents in this city

were advised to stay inside or evacuate on voluntary basis. As a result, official media channels were not able to access this city and make reports on the situation. Dissemination of information thus relied on social initiatives and combined efforts of local governments and social groups.

Although radiation levels in Minami Soma were relatively low, it was difficult to maintain logistics of necessary goods for those who stayed in the city. The plea of this mayor for volunteers to help the residents of Minami Soma and to help in the fight against the invisible risk of contamination over social media shows that local government institutions are more concerned with the direct threats of radioactivity. Instead of a rigid divide between the public and institutions, we see that parts of the official institutions can also rely on alternative information channels and acknowledge the risk of radioactivity. Anti-nuclear organizations often direct their protests towards the government, and if we accept the government as one monolithic institution, it becomes easy to think in terms of Beck's expert-layperson divide with regards to information and expertise. However, it is necessary to note that even within the governmental institutions, there exist a divergence in interests and access to information.

Secondly, the demarcation of evacuation zones affects the capability of individuals to move away from the hazards of radiation, as well as their capacity of taking part in the debate about nuclear risk. It is necessary to note that the seemingly arbitrary drawing of evacuation zones is not an example of pure conflict between claims of expertise. Politics of demarcating evacuation zones are not solely dependent on assessments of risk, as the limits of an evacuation zones also determine who is eligible for compensation, as well as the expected total sum of compensation. Tom Gill explains that in designated voluntary evacuation zones, there was no compensation for moving, nor was there a prospect of jobs at other places (2015). A common sentiment in these areas is the wish to leave, despite being incapable to do so (Slater 2011; Women of Fukushima 2012, 00:13:30). Governmentally imposed evacuation zones dictate from which point onward radiation is no longer acceptable, as well as who continues to be irradiated. From this it follows that distribution of radioactive hazard is not democratic, as Beck (1992) would propose. However, it is very much political. Particularly for people who hold jobs in these zones, the voluntary evacuation order presents them with a dilemma between the risk of radiation and the risk of financial insecurity.

Social determinants of risk distribution

In addition to the aforementioned political factors, the social factor of gender is highly influential to the experience of the Fukushima disaster. Expectations of social roles on the basis of gender shape the experiences of nuclear risk in post 3.11 Japan in two ways. First, the assignment of the breadwinner role to men and the role of nurturer to women divides the population of 3.11 Japan in terms of capacity to protest. Second, images of duty and vulnerability that are linked to these politicized social roles affect the definition and perception of risk with regards to male and female members of society.

Subsequently, the way risk is perceived on the basis of gender has great implications on the distribution of exposure to radiation.

For men, who in general are more involved in the job market - as indicated by labour participation rates of 70.8% for men and 48.2% for women nationwide in 2012 (Statistics Bureau Japan 2012, table I) – and more often expected to assume the role of wage earner, this economic dependence limits their participation in political activities. As holders of jobs, they lack the time to contribute to political activism. As expected principal wage earners (Morioka 2015, p. 195), they are less inclined to partake in protest that might have adverse effects on local business, employment levels, and subsequently their capacity to provide for their family.

On the other hand, women have been able to assume a leading role in the discussion of nuclear risk, initiating debate with local and national government institutions on the health effects of radioactivity. According to Slater (2011), women, and mothers in particular, enjoy a strong foundation from which to speak about some nuclear issues, as a result of their position in the core of Japanese society and polity. This position, as the perceived eternal mother role, has become increasingly politicized. Women as mothers are charged with the political task to have and nurture babies and to maintain the dwindling population; this political task forces but also entitles them to protest against nuclear threats (ibid).

Moreover, Slater (2011) reveals another dynamic that leads to an increase in legitimacy for the case of the mothers of Fukushima: Women as mothers, as a result of the politicized expectations that underlie gender, are able to channel their individual emotions and frustrations into legitimate sources of political action, whereas men are not allowed to express certain emotions or anxiety. As discussed above, men have, as a result of their position in society, different frames and strategies with regard to nuclear risk. Being unable to use emotion as a strategic tool in political activity, men will have to resort to more formal, 'expert' claims to enter the debate, which Beck (1992) shows to be a greatly contested ground.

As a result, different expectations of public representation on the basis of gender shape the focus of the debate surrounding nuclear risk. In addition, these expectations dictate the eligibility and strategies for individuals to approach the debate around nuclear risk. Protest against nuclear power plants and acceptable radiation levels is led by mothers; their protest is based on health risks to mothers and children. Corporate interests and government policies are projected as detrimental to the gendered, important political task of raising of healthy children. If women's political role as mothers is central to Japanese society and polity, their claim carries priority over the productive, economic claims of such corporations and governments. Women are privileged but also expected to frame their political activity in terms of the health of future generations. Conversely, men are nudged away from the debate around health risks of nuclear energy and are expected to frame their concerns and strategies on the basis of employment and economic production.

As such, it is not surprising that mothers and nuclear workers have been the focus of public

and academic debate on nuclear risk in post 3.11 Japan. For nuclear workers, proximity to the source of radiation raises ample concern over the health and wellbeing of these individuals. However, as discussed later on, the perception on their health risks differ from the perception on risks to women and children. On the other hand, due to their perceived central role in society, mother's groups are particularly capable of generating political action. More so than other political groups, which have to position themselves outside of society (Slater 2011).

Since the concerns of these mothers are more concrete than the abstract, general concern over risk of urban organizations, the potential for political action is greater (ibid). If we look at political action of other political groups or nongovernmental organizations directly after the 3.11 disaster, we discover that a great amount of rallies and actions focus on the case of vulnerability of women and children (SEEDS Asia 2011; FoE Japan 2011; Greenpeace Japan 2011; Green Action Japan 2011). Whereas environmental NGO's traditionally view abandoning nuclear power as an end in itself, for the mothers in Fukushima this is only a means to an end. Such a claim results in greater legitimacy, and as a result other groups start to frame their protest in line with the protest of women as mothers.

Subsequently, the focus of these gender roles – economic productivity as masculine, child raising as feminine – affects the definition and perception of nuclear risk for these two groups. Whereas the importance of healthy future generations evokes the call for protection of involved mothers and children, contribution to the abstract welfare of a society inspires a discourse of heroic sacrifice with reference to men. Risk of radioactivity is framed in terms of risks to health for mothers and children, regardless of dose. For men, the acceptability of a certain level of radiation exposure is taken for granted; their health risks are only concerned once this accepted level is exceeded.

However, it is necessary to note that there are differentials in vulnerability to nuclear radiation. Health effects of radiation, with relation to cancer, are more severe for women and children than they are for adult males (NIRS, 2011). Although Slater (2011) reports that the differential risk is not limited to cancer, the NIRS briefing paper only states that there exist other forms of radiation harm, which do not necessarily carry the same differential in vulnerability. Nevertheless, those differentials do exist. Busby (2011) shows that children are more vulnerable to radiation induced heart disease. Although no dose of radiation can be considered safe for a particular individual (NIRS 2011; Stephens 2002; NAP 2006), given the higher vulnerability of women and children with regards to cancer and heart diseases, the perspective on the differential in vulnerability is understandable. As a result, it is no surprise that women were very active in the citizen organized measurements of radiation.

Nevertheless, not all differences in perspective are a result of a difference in vulnerability; it is precisely here that social expectations around gender further influence the perspectives and outcomes on risks. The NIRS and organizations that base their activities on its findings perceive women to be more vulnerable to radioactivity with regards to reproduction. The NIRS (2011) reports that it is known that reproductive tissue is more sensitive to radiation damage. Moreover, they state that, although increased harm to women is not fully understood, females have a larger mass of reproductive

tissue than males, and therefore, under the principle of precaution, should be protected even before this difference in harm is studied.

This pre-emptive protection from harm, which cannot be calculated solely on the basis of tissue mass, is only applied to women. The fact that radioactivity causes more damage in reproductive tissue does not trigger an alarm with regards to men who are to be subjected to higher degrees of radioactivity – which follows from the lowering of permissible rates for females only – and, instead serves to reinforce an already constructed pattern of vulnerability and need for protection. For women, who through their politicized gender role of the having and nurturing of babies are more easily associated with the future generations of a society, the need for protection seems more apparent than for men, even though their health also plays an equally important role in the health of future generations. Whereas Beck shows how risks/hazards arise out of uncertainty from the expert driven mind-set of researching first, protecting second, the definition of differences in risk arises out of uncertainty from the 'public' driven mind-set of "protect first, study second".

For women, this 'privilege' to protest under the banner of health effects on future generations has two effects. On the one hand, the legitimacy of their claim enables them to generate more political activity than other movements would have. On the other hand, their specific claim on the health of children, as well as their specific role in securing the rights to that claim, isolates them from the greater public as well as the government. Since men are not expected to generate political activity based on their social role as a father, protest against safety levels with regard to children's health is framed as an issue of motherhood, rather than an issue of parenthood. Morioka (2015) shows that men as fathers have even been targeted as subjects of legal manipulation for the acceptance of nuclear energy. In effect, the potential for political activism for the goal of limiting health risks of nuclear radiation is halved.

Furthermore, the opposition between the economic, productive focus as a masculine task and childrearing as a feminine task creates friction within the family. Especially when we take into account Aldrich's (2005) account of the central government's political pressure to make employment and infrastructure – which are the main focus of the 'masculine' economic perspective - conditional on acceptance of nearby nuclear power plants. As a result, interests within the family come into conflict (Morioka 2015, p.193). The plight of the mothers becomes particularly clear where their husbands have an active interest in local economic activity. The experience of one middle aged mother of two high school students from Tomioka clearly shows the conflict of perspectives within the family.

> "This is the first time that my husband has ever been so far away. I explain it to him, the situation [of radiation]…. I cannot tell if he does not understand or does not care. I know he is a good husband, a good father—a good person—but he just says, "My job is to take care of the farm. That is how I can take care of the family." Or, "If we

> cannot sell anything, then I cannot take care of you." Or he said that I had to overcome my worries, for the sake of everyone. That is the responsibility of the wife. This is the first time he has ever talked like that, about my "responsibility," but I understand what he says, and of course, he is right. I am the wife of the family (yome). That is my role. But how can I do it now?" (Slater, Morioka & Danzuka 2014, p.495)

Simultaneously, there is the conflict between the roles embodied by the mother. Mothers in affected areas find themselves struggling to balance their roles as wives and their roles as mothers. As one woman notes:

> "There are times, I guess, when being a good wife and being a good mother are not always the same thing. Usually, it is a situation of young women struggling to be good at both, but now, with all of this, some of us feel we have to choose. I know that [the protective measures I take] cause problems to my husband and the family, but in the end, my real role [yakuwari] is as a mother who needs to protect her children. It's not like this is something that I am just doing by myself. It is as a mother that I worry." (Slater, Morioka & Danzuka 2014, p.496)

Such tension is also visible in the relation between women in their role of mothers and the wider community. The importance of high GDP, and the role of nuclear power in the generation thereof, has been stressed repeatedly by the government to ensure support for the siting of nuclear power plants. As discussed earlier, Aldrich (2005) provides an overview of the social and economic tools used by governments in the placement of these facilities. Placement is framed in terms of the 'greater good' of increased productivity and diminished dependence on foreign sources of energy. Again, the conditionality of improved infrastructure on the acceptance or tolerance of nuclear power plants shifts the interests of the host communities towards an acceptance of the status quo.

Within affected communities in the voluntary evacuation zones, this tension translates into a view of health concerns being detrimental to the 'more important' task of reconstruction. In terms of Beck's analysis, this indicates a conflict of interests within 'the public'. In addition to the struggle against expert, governmental institutions, the women of Fukushima also have to combat the economic incentives of other members of their community. As one woman notes:

> When I returned, I was surprised at how everyone accepted switching over to reconstruction. They were all really motivated for reconstruction and were willing to continue living on this land. I understood that reconstruction was important, but the thing was that when I mentioned our children's safety, there was an overall tone of "you're getting in the way of reconstruction" or "just shut up already." (Slater, Morioka, Danzuka 2014, p.493)

Outside of the affected areas, the isolation of mothers and their political agenda takes on another form. Women's protest groups face a general apathy as they inform people on the health risks in Fukushima (Women of Fukushima 2012, 00:11:30). The debate on the risks of nuclear radiation is more abstract. Interestingly, political activists, as opposed to the mothers as portrayed by Slater, Morioka, and Danzuka, do make the claim of gender based perspectives explicit. In addition, political activism does rely on the moral claim of the obligation towards future generations:

> The nuclear power plants were built by men. Men who say that money is important (…) we are fighting to show that there are more important things than money." (…) "The most important things are life, health, and raising healthy children. We don't need nuclear power for this." (Women of Fukushima 00:09:00)

Consequently, the isolation of the political agenda of mothers, along with the framing of nuclear risk in terms of health risks to vulnerable groups, drives women as mothers to devise strategies that will reduce the exposure of nuclear radiation to their children. For those with limited economic capacity, the mother accompanies the children to another part of the country. If parents do not have the resources to move as a family, the diverging gender roles drive mothers and children to safer places, whereas men stay to work in order to support their family. Since the objective is to safeguard the health of vulnerable groups, these arrangements can be thought of as the only option. Moreover, as the influence of the politically established 'voluntary' evacuation zones constrains people from moving away, the financial dependency of people on their current jobs increases.

As expectations of conduct on the basis of gender influence the way radioactivity is perceived, two strategies of dealing with nuclear risk emerge. From the perspective of viewing radioactivity as a risk to health of vulnerable groups, mothers attempt to escape radiated zones with their children or persuade the government to perform decontamination work. From the expected breadwinner role of the man follows a focus on reconstruction of economic activity in affected areas. As a result of these strategies, whenever possible, mothers leave the radiated zones with their children, whereas fathers or men in general, stay behind. In the literature on post 3.11 Japan, there is ample discussion on the detrimental effects to the health of children and mothers as a result of a husband's insensitivity to the risks of nuclear radiation. However, as a result of this insensitivity to the health risks of nuclear radiation, men also act to the detriment of their own health. Yet, at the same time, as a result of these same gendered perspectives, as well as the isolation of the political agenda of health risks as a mother's task, the deteriorating health of these men is not perceived as important. In this way, after adaption strategies with regards to nuclear risk have been devised, men face a higher degree of exposure to radiation, as well as a lower degree of health monitoring.

For men who work in the male dominated nuclear energy sector, health risks as a result of radioactivity are brought under attention, albeit in a different way from the discussion on health of women and children. Jobin and Hasegawa (2013) identify a couple of problems with regards to

nuclear decontamination work. First, there is the problem of health risks of contract workers. Second, the working conditions of regular workers are insufficient and hamper reconstruction.

Jobin and Hasegawa, in their appeal towards the Japanese government, describe the situation in which the workers have function. These people work and live in a radiated area, and return to cold, abandoned homes after work. They question whether these workers can continue to function properly if they are not facilitated by their companies, as workers are expected not to take proper care of themselves after work. "To cut costs in these areas displays in extreme form a complete disregard for the health and wellbeing of workers." (Jobin & Hasegawa 2013, p.2). In addition, wages are portrayed as insufficient, even for those with seniority dating from before the accident.

Moreover, the issue of worker replacement is raised. Experienced workers who reach their limit of radiation exposure are replaced by those with no nuclear experience. Instead Jobin and Hasegawa (2013) argue that "we should guarantee their employment during the five years it takes to reset their levels by using them to educate new workers and man conventional thermal power plants in order to preserve these human resources" [Emphasis added].

Subsequently, the importance of the plea is stressed, which further clarifies the intentions and frames of risk of nuclear radiation for workers.

> Precisely because workers are irradiating themselves in order to complete this job for us, we must closely safeguard their wellbeing. (…) It is the duty of each and every one of us to guarantee a stable work environment for those who perform this job for us, so that they can work proudly, knowing that they are doing their part to stop our environment from becoming even more polluted than it already is. (…) "to guarantee that each and every one of them will see their proper wages restored and their work environments improved" (Jobin & Hasegawa 2013)

The image of workers willingly/knowingly sacrificing their health for the greater good – "for us" - is evoked. In return, it is the duty of everyone else to make sure these workers have a stable work environment and can work in relative wellbeing and proper wages. The fact that these workers are exposed to radiation, even if it is within the 'permissible range', is not taken into account in this calculation of their wellbeing. The irradiation of these workers is seen as completely permissible and unavoidable; as long as they are able to carry out this (dangerous) work in relative wellbeing, 'we' have done enough for them. Furthermore, although the continuity of knowledge surrounding nuclear power plants is important, this proposal aims to have experienced workers work elsewhere and train other workers to operate in the nuclear facility, after which they will probably go to this nuclear facility again.

Rather than the protection of individual health and wellbeing, this part of the plea promotes a more efficient use of the work and knowledge of these individuals. These people and their knowledge comprise the 'human resources' that are aimed to be preserved; as long as these people are

compensated for it properly, there is no shame in sending them to radiated spaces. The extraction of these human resources is deemed acceptable, and the individuals whom it concerns are expected to deliver their work with pride. The health of these workers is not necessarily seen as a vulnerability, but rather as a resource that can be tapped into, provided that these workers are compensated sufficiently and live in relative comfort.

In an interview with one of these nuclear workers, David McNeal (2011) examines what drives people to work in such a dangerous environment. The interviewee, who worked for TEPCO before the disaster as well, revealed that after a short evacuation, every employee was given a choice to return and help dismantling the plant, ”although there was, inevitably, unspoken sympathy for the married men with children.” (ibid). When asked for his reasons for going back, the interviewee notes that not everyone can do this job; as he is single and young, he feels that it is his duty to help out. Although men within general society are expected to prioritize work, it is somewhat encouraging to hear that at least on the work floor, they are expected to prioritize the health and wellbeing of their families. Nevertheless, for young, single men, who do not carry this responsibility, there only remains the heroic or tragic duty towards society or the nation.

Moreover, this duty towards the nation is framed in terms of sacrifice. The main concerns with which the interviewer confronts the interviewee are framed in terms of health effects, family life, and remuneration. The interviewee is portrayed as someone who sacrificed all hopes for marriage, a normal life and possibly good health. Interestingly, the interviewee explains that in abandoning the prospect of marriage, he expects concerns of a potential partner over the health of their children (McNeal 2011, p.2). The damage to his capacity to have and raise healthy children is not seen as a vulnerability, but as a capacity that he ‘of course’ has to sacrifice.

In addition to such a duty towards the nation, McnNeal (2011) distinguishes bravado as a second motivation for these workers. The interviewee, for example, “compares himself to the young wartime kamikaze pilots who saw themselves as the last line of defence against invasion and disaster.” (McNeal 2011, p.2). In newspapers as well (JapanTimes 2011; 2014), the risks faced by those who initially stayed at the power plant when the disaster occurred are described as heroic and necessary sacrifices. The actions and lives of these men, who later became known as the ‘Fukushima 50’ are framed in terms of sacrifice towards a national duty; they are often described in militarized terms. It is interesting to note, the admiration for these Fukushima is more strongly voiced in overseas media than in local English or translated Japanese news channels. Overseas, the Fukushima 50 are also portrayed as the heroes who ‘battled the Fukushima meltdown’ and who have not received enough praise and support by the government (The Economist 2012; The Guardian 2013; CNN 2013).

For actions by evacuation personnel, which consist of Self Defense Forces (SDF), firefighters and police forces, such heroic and militarized narrative is even stronger. In a series on reports on the actions of rescue workers, the Asahi Shimbun (2013), describes the difficulties and risks faced by these people. Their reports include numerous technical details and facts regarding the battle capacity

of the participating regiments, which are in general irrelevant to the rescue activities for which evacuation personnel have been sent out. Overall, these rescue workers are described as a masculine, professional, technical, task-oriented group, ready to face unknown dangers for the sake of the country.

Of course, this work is not written to doubt the intentions or actions of these workers, who did indeed manage to rescue many people out of the evacuation zone. Nevertheless, both the rescue workers, as well as the general nuclear workers employed under TEPCO, who are described in such heroic terms, were not exposed to the highest degrees of radioactivity. According to an official survey, none of the involved police officers, fire fighters, and SDF members were exposed to a dose above the 100 millisievert (mSv) limit; the highest reading was 10.8 millisievert for a SDF serviceman (Asahi Shimbun 2015). Employees under TEPCO received an average dose of 21.57 millisievert, with one outlier of 670 millisievert (ibid).

Moreover, it is necessary to remember that these doses are significantly higher than the 1 mSv annual limit for civilians. After the outbreak of the Fukushima disaster, the Japanese government raised the acceptable levels for radiation workers. The level of acceptable radiation for radiation workers that is enforced by the government in Japan is 250 mSv per five years (Prime Minister of Japan and his Cabinet, 2011). Before the disaster, this level was set at 100 mSv per five years, with an additional limit of 50 mSv per year. In addition, there is a limit of 5 mSv per 3 months for women (ibid), which reflects the increased physical and perceived vulnerability of women to the hazards of radiation.

Nevertheless, it is not the rescue workers nor the regular workers who receive the highest levels of radiation exposure. Contract workers in service of subcontractors are structurally exposed to more radiation than their regular employee counterparts (Jobin 2011). Even within the group of contract workers, there are different degrees of radiation exposure. On-site unskilled labour, which mainly consists of the cleaning of radiated rooms or tools, results in the highest exposure to radiation. Traditionally, these jobs have been performed by the poor or the burakumin, Japan's lowest social class (Higuchi 1995).

Although poor oversight in terms of radiation measurement results in few figures on actual radiation exposure, these unskilled workers are still facing the greatest share of radiation exposure (Jobin 2013). Whereas the regular workers in power plants are sent into radiated zones by an appeal to their courage and sacrifice, these contract workers are used like tools and subsequently discarded. In addition, for those who perform the most dangerous tasks, information about risk is scarce. These contract workers are often poor, uneducated, and poorly informed by their subcontractors. For them, these jobs are not necessarily accepted with full knowledge of the sacrifice they are going to make. Especially if we take into account that radiation levels in some parts of the disaster site can constitute a certain lethal dose in as much as 45 minutes (The Japan Times 2015). As Higuchi notes, some of these workers trust

the reassurances of safety, as nuclear power plants are affiliated with big companies and the government (1995).

Although this structure of distributing dangerous jobs according to class has been an integral part of the Japanese nuclear industry, academics and journalists alike are considering the health risks that are faced by this group, which hopefully leads to improvement. Yet, the focus on these workers, although they are of course at higher risk of illness and death, masks the dangers that are faced by normal nuclear workers. Health risks to nuclear workers only becomes an issue once acceptable levels of radiation are exceeded. Below the acceptable levels, risk is accepted and masked as a sacrifice; above the levels, risk is finally acknowledged. Nevertheless, these accepted levels of risk as faced by regular nuclear workers are still twenty to a hundred times higher than the 'unacceptable' levels for civilians, which shows that gendered expectations on public roles and duties result in relatively higher exposure rates for males.

Conclusion

As technologies and social institutions become more complex, risks become increasingly difficult to manage. However, risk as a result of these modern institutions is not necessarily universal. Risk as a potential source of destruction looms over entire societies and perhaps over the entire world. However, if we study risk of nuclear energy from the perspective of disaster, we can observe that the effects of risk are limited in space and actively distributed throughout society; vulnerability to potential agents of destruction diverges widely.

By considering the case of the Fukushima nuclear disaster of 2011, this work identified a couple of political and social mechanisms that distribute risk unevenly across society. First of all, political powers actively situate risks in the weakest communities. In addition, political definitions of safety and subsequent measures of evacuation divide the population in terms of vulnerability, capacity to protest and exposure to radiation. The politics of evacuation, along with social expectations on gender provide women as mothers with a privileged yet isolated place within the debate. Furthermore social expectations, along with the isolated political position of mothers dictate the perception of risk in terms of vulnerability to health of nuclear workers, women, and children. As a result, strategies to cope with or escape from radiation leave men relatively more exposed to radiation. And finally, within the within the group of nuclear workers, class determines exposure to radioactivity. In these ways, risk of nuclear radiation is stratified along lines of gender and class. Although patterns of outcomes with result to risk are possibly bound to a certain cultural and social configuration of a given society, the

structures that produce these patterns are not specifically bound to one society. In the case of economic factors, for example, the degree to which the population can escape from contaminated areas that are deemed safe by the government is dependent on their financial capabilities. Which groups specifically have the capacity to escape is perhaps specific to Japan, yet the premise that it is easier to evacuate from a contaminated zone if one has more financial capital holds in all capitalist regions.

Of course, there are limits to this argument. As this work deals mainly with health effects as a result of air and soil contamination, indirect distribution of nuclear radiation is not taken into account. One example would be irradiation as a result of eating contaminated food, which is distributed through the market. The distribution of internal radiation is subject to different political processes and requires further research. Although the distribution of contaminated food is also mediated by governmental legislature, identifying the politics of resource management in times of nuclear catastrophe goes well beyond the scope of this work. Furthermore, this work only considers English sources and translations of Japanese materials, which will of course limit the scope of materials that can be used. Having access to more first-hand experiences in the Japanese language will result in more accurate picture of perspectives to risk.

Moreover, although a binary distribution of gender is problematic in assessing the experiences of people in any given society, the perspective of a binary distribution of gender is of instrumental value in the case of risk assessment in post 3.11 Japan. As governmental policies and propaganda, as well as public political activism makes use of this binary distinction, and as this paper deals with the discourse of risk as it shapes experience, this distinction is a part of the analysis. The effects on the inadequacy of strict binary perspectives on gender with regards to perceived social roles and the distribution of risk will make an interesting case study for further research, however, this work only concerns the effects of public debate as it has been immediately after the 3.11 disaster.

Finally, as the second objective of this paper is to provide a critical assessment of Beck's theory, the analysis of the case of the Fukushima disaster according to his theory is slightly limited. As nuclear risk is not created within decentralised market institutions, the link between nuclear radiation and global risk will require more analysis. On the other hand, since nuclear power plants are created and placed through the influence of political power, the organized irresponsibility hypothesis does not hold, and there can be an effective debate on responsibility of radioactive risk. Also, as people lose faith in government instead of the rationale of science and technology, this introduces the possibility of researching the link between legitimacy of political structures and modes of democratic decision-making with regards to risk.

Bibliography

Aldrich, Daniel P. 2008. “Site Fights; divisive facilities and civil society in Japan and the west.” Ithaca: Cornell University Press

Asahi Shimbun. 2013. PROMETHEUS TRAP/ 'Shadow units' (1): Secret rescue mission at the Fukushima plant. Retrieved on 02-12-15 from http://ajw.asahi.com/article/0311disaster/fukushima/AJ201303040001

Asahi Shimbun. 2015. Survey: 38% of Fukushima emergency workers exposed to 1 millisievert in March 2011. Retrieved on 8-12-15 from http://ajw.asahi.com/article/0311disaster/fukushima/AJ201510260046

Beck, Ulrich. 1992. Risk Society; towards a new modernity. Los Angeles: Sage

Busby, Chris. 2011. “Fukushima Children at Risk of Heart Disease.” *The Asia-Pacific Journal* Vol 9, Issue 39 No 4, September 26.

CNN. 2013. Man who battled Japan's nuclear meltdown dies. Retrieved on 08-12-15 from http://edition.cnn.com/2013/07/10/world/asia/japan-yoshida-death/

Economist. 2012. Meet the Fukushima 50? No, you can’t. Retrieved on 05-11-15 from http://www.economist.com/blogs/banyan/2012/10/japans-nuclear-disaster

FoE Japan. 2011. Violation of the Human Rights of the Children of Fukushima. Retrieved on 6-12-15 from http://wayback.archive-it.org/2438/20131014182855/http:/www.foejapan.org/en/news/110819.html

Gill, Tom, and Steger Brigitte. 2015. ”The 3.11 Disasters,” in *Japan copes with Calamity*. Edited by Tom Gill and Brigitte Steger, Oxford: Peter Lang

Gill, Tom. 2015. “This Spoiled Soil,” in *Japan copes with Calamity*. Edited by Tom Gill and Brigitte Steger, Oxford: Peter Lang

Greenpeace Japan. 2011. Fukushima women peacefully protest nuclear. Retrieved on 25-11-15 from https://www.youtube.com/watch?v=fnnloSF1ZqQ&feature=youtu.be

Green Action Japan. 2011. Protect the Children of Fukushima. Retrieved on 6-12-15 from http://fukushima.greenaction-japan.com/2011/07/01/petition-02-protect-the-children-of-fukushima/

Hecht, G. 2013. "Nuclear Janitors: Contract Workers at the Fukushima Reactors and Beyond," *The Asia-Pacific Journal*, Vol 11, Issue 1, No. 2, January 14

Higuchi, Kenji. 1995. Nuclear Ginza (Documentary). Retrieved on 22-10-15 from https://www.youtube.com/watch?v=92fP58sMYus&feature=youtu.be

Ikeda, Yoko. 2015. "The Construction of Risk and the Resilience of Fukushima," in *Japan copes with Calamity*. Edited by Tom Gill and Brigitte Steger,Oxford: Peter Lang

Japan Atomic Industrial Forum. 2015. Current Nuclear Situation in Japan. Retrieved on 02-11-15 from http://www.jaif.or.jp/en/slides/current-nuclear-situation-in-japan/

Japan Times. 2011. Crews driven by sense of mission. Retrieved on 8-12-15 from http://www.japantimes.co.jp/news/2011/04/03/national/crews-driven-by-sense-of-mission/#.VmcnIk3ltfw

Japan Times. 2014. Four days later: 'Fukushima 50′ recount start of nuclear crisis. Retrieved on 8-12-15 from http://www.japantimes.co.jp/news/2014/09/28/national/four-days-later- fukushima-50-recount-start-nuclear-crisis/#.Vmcm303ltfw

Japan Times. 2015. Deadly 9.4 Sieverts detected outside Fukushima reactor 2 containment vessel; checks stop. Retrieved on 06-12-15 from http://www.japantimes.co.jp/news/2015/10/30/national/deadly-9-4-sieverts-detected-outside-fukushima-reactor-2-containment-vessel-checks-stop/#.VmRtFU3luzk

Jobin, Paul. 2011. "Dying for TEPCO? Fukushima's Nuclear Contract Workers." *The Asia-Pacific Journal* Vol 9,Issue 18 No 3, May 2

Jobin, Paul, and Hasegawa, Sumi. 2013. "An appeal for improving labour conditions of Fukushima Daiichi workers." *The Asia-Pacific Journal*, Volume 11, Issue 16 No. 1, April 22, 2013

Kingston, Jeff. 2011. "Ousting Kan Naoto: The Politics of Nuclear Crisis and Renewable Energy in Japan." *The Asia-Pacific Journal* Vol 9, Issue 39 No 5, September 26

Kingston, Jeff. 2012. 'Mismanaging Risk and the Fukushima Nuclear Crisis,' *The Asia-Pacific Journal*, Vol 10, Issue 12, No 4, March 19

McNeill, David. 2011. "A young man sacrificing his future to shut down Fukushima." *The Asia-Pacific Jour*nal: Japan Focus. Retrieved on 25-11-15 from http://japanfocus.org/events/view/107

Meeting with public officials. 2011. Retrieved on 02-12-15 from https://www.youtube.com/watch?v=oqzsWv9bL6Q

Minami Soma City. 2011. SOS from Mayor of Minami Soma City. Retrieved on 10-11-15 from https://www.youtube.com/watch?v=70ZHQ--cK40

Mythen, Gabe. 2004. Ulrich Beck; a critical introduction to the risk society. London: Pluto Press

NAP. 2006. Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2: 259- 311. Retrieved on 3-12-15 from: http://www.nap.edu/read/11340/chapter/13#266

National Diet of Japan. 2012.The Official Report of The Fukushima Nuclear Accident Independent Investigation Commission https://www.nirs.org/fukushima/naiic_report.pdf Retrieved on 14-10-15

NIRS. 2011. Atomic radiation is more harmful to women. retrieved on 03-12-15 from http://www.nirs.org/radiation/radhealth/radiationwomen.pdf

NRA Japan. 2015. Extension Site of Distribution Map of Radiation Dose, etc.,/Digital Japan. Retrieved on 08-11-15 from http://ramap.jmc.or.jp/map/eng/map.html

Oliver-Smith, Andy. 2002. "Theorizing Disasters: Nature, Power, and Culture." *in Catastrophe & Culture; The Anthropology of Disaster*. Edited by Susanna M. Hoffman and Andy Oliver-Smith Santa Fe: School of American Research. Advanced Seminar Series

Oliver-Smith, A., and Hoffman, Susanna M. 2002. Introduction: "Why Anthropologists Should Study Disasters." in *Catastrophe & Culture; The Anthropology of Disaster*. Edited by Susanna M. Hoffman and Andy Oliver-Smith. Santa Fe: School of American Research. Advanced Seminar Series.

Paine, Robert. 2002. "Danger and the No-Risk Thesis," in *Catastrophe & Culture; The Anthropology of Disaster.*" Edited by Susanna M. Hoffman and Andy Oliver-Smith. Santa Fe: School of American Research. Advanced Seminar Series

Penney, M. 2012. "Nuclear Nationalism and Fukushima." *The Asia-Pacific Journal*, Vol 10, Issue 11, No 2, March 12

Pickett, Susan E. 2002. "Japan's nuclear energy policy: from firm commitment to difficult dilemma addressing growing stocks of plutonium, program delays, domestic opposition and international pressure." *Energy Policy* 30: 1337–1355

SEEDS Asia. 2011. In Depth damage report by affected cities and children. Retrieved on 25-11-15 from http://www.seedsasia.org/hp/EJET/Rep2.pdf

Slater, David H. 2011. Fukushima women against nuclear power: Finding a voice from Tohoku. http://japanfocus.org/events/view/117

Slater, David H., Morioka, R., and Danzuka, H. 2014. Micro-politics of radiation, Critical Asian Studies, 46:3, 485-508, DOI: 10.1080/14672715.2014.935138

Slater, David H., Nishimura Keiko, and Love Kindstrand. 2012. “Social Media, Information, and Political Activism in Japan's 3.11 Crisis,” *The Asia-Pacific Journal*, Vol 10, Issue 24, No 1, June 11

Smith, Aileen, M. and Selden, M. 2011. “Bringing the Plight of Fukushima Children to the UN, Washington and the World.” *The Asia-Pacific Journal* Vol 9, Issue 41 No 4, October 10.

Statistics Bureau – Ministry of Internal affairs and Communication, Japan 2012. Table I - Labor Force Survey. Retrieved on 3-12-15 from: http://www.e-stat.go.jp/SG1/estat/ListE.do?lid=000001106144

Stephens, Sharon. 2002. “Bounding Uncertainty: The Post-Chernobyl Culture of Radiation Protection Experts,” in *Catastrophe & Culture; The Anthropology of Disaster*. Edited by Susanna M. Hoffman and Andy Oliver-Smith Santa Fe: School of American Research. Advanced Seminar Series

The Guardian. 2013. Fukushima boss hailed as hero dies. Retrieved on 08-12-15 from http://www.theguardian.com/world/2013/jul/10/fukushima-plant-boss-hero-dies

The prime minister of Japan and his cabinet. 2011. Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety - The Accident at TEPCO's Fukushima Nuclear Power Stations – Chapter VII - Situation regarding Radiation Exposure , retrieved on 8-12-15 from http://japan.kantei.go.jp/kan/topics/201106/iaea_houkokusho_e.html