Risk Communication Discourse on Environmental Disaster: The Case Study of the 3-11-11 in Fukushima, Japan

Rei Whitworth

ABSTRACT

Post-disaster Fukushima encounters a growing confrontation and division between government, scientists, and affected population regarding communicating the scientific findings and data on the health impacts of radiation. The primary reason for this social discord is because the survivors and their communities have not received plausible explanations related to their health risks after prolonged exposure to radioactivity, while the physicians confine themselves to sharing the findings from their medical research in a manner that the general public is unable to comprehend. This results in a lack of mutual trust. This research analyzed post-accident Fukushima's Risk Communication (RC) practices articled by the World Health Organization (WHO) as part of discourse analysis. While identifying the current RC approaches, the study attempted to differentiate how various institutions and stakeholder groups have framed and communicated radiation health risks. In addition, this project examined the sociopolitical consequences of Fukushima's institutional RC on the affected communities. This research suggests the need for transparency and clarity in establishing radiation risk health policies.

KEYWORDS

Nuclear radiation, Post-accident Fukushima, Public health, Risk Communication and Discourse Analysis, the Great Tohoku, Japan Earthquake and Tsunami

INTRODUCTION

On March 11th, 2011, the Tohoku area of remote northeastern Japan experienced a significant natural and nuclear catastrophe. The Magnitude 9.0 Great East Japan Earthquake, as it came to be called, caused a major tsunami which grew to 40.5m in height (Steinhauser et al. 2014) and subsequently flooded the diesel generator at Fukushima Daiichi Nuclear Power Plant (FDNPP) and shut down all power sources of the plant. The disaster that followed became a major nuclear meltdown, second only to the 1986 Chernobyl nuclear accident. Without power, FDNPP experienced a significant radiological release, which broadcasted live on the global media came known as a "man-made" crisis (Dr. Rosen, Alex; Dr. Claussen n.d.). Although the amount of radiological dispersal from FDNPP is quantified to establish the underpinning on public health, the projected health impacts within Japan are said to be "significantly lower" than that of the Chernobyl's (Ten Hoeve and Jacobson 2012, Steinhauser et al. 2014).

Despite having completed the seventh year remembrance of the accident at FDNPP, the long-term impacts of both the psychological and physical consequences brought to the lives of those affected in Fukushima remain inconclusive and not well understood. This, in itself, has generated additional anxieties and frustration between the authorities, including the scientists in charge of the survivors' health, and those inadvertently exposed to the radiation. Rarity and the magnitude of the triple disaster, known as a chain of crises - the earthquake, tsunami, and nuclear meltdown - therefore, has revealed the lack of preparedness of the national emergency system for such an extreme circumstance. The enormity of the accident also exposed the absence of skillful risk communication and the inadequacy of early warning against the nuclear emergency, which could have saved people's lives and increased the survivor's health condition. Among the most controversial and feared by the affected communities are the widespread health impacts of the radiation, occurrences of thyroid cancer among the young children, and other issues related to birth effects.

In fact, the disseminated knowledge on health impacts with specific to protective measures against radiation followed by the nuclear accident seems to be inconsistent. Specifically, physical behaviors of carcinogens and the effects of chronic radiological exposure within parts of Fukushima and surrounding prefectures have been given importance and priority by the government and Fukushima Medical University (FMU). Although this is reflected in Fukushima's current RC practices (Fukushima prefectural government's website), inconsistencies in flow and

content of radiological information have caused physical and psychological burdens to the survivors of the disaster. Nonetheless, there seems to have changes in societal attitudes concerning how the post-accident society should receive the radiological communication. Additionally, societal perception towards the state of "radiation safety" under the normal tsunami-free, the radioactive-explosion-free condition has changed since the 3-11-11, the day of the nuclear accident. In particular, views on this issue between governing institutions and the community is being challenged and contested. Currently, a total of more than "400 communities in six municipalities in six different prefectures" (Dimmer 2017) are said to experience at least some levels of the latent health impacts caused by the radioactivity. More effective risk RC practices could have partially averted this.

As with many mega-scale accidents around the world, there are several viewpoints to debate and learn from this complex crisis. This paper, therefore, aims to answer two fundamental central questions: First I ask, how have the Japanese government and FMU communicated the health risks to the affected population. Second, to what degree has the RC met the conventional communication standards of the WHO, primarily the trust and transparency, which should be effectively utilized during the emergency? This study of RC through the discourse analysis assesses how stakeholder opinions and positions are framed and attempt to identify the health consequences of the affected populations. Understanding the level of communication regarding the radiological information and health risks necessitates first an assessment of the radiological emergency information has been distributed and circulated. Moreover, full comprehension of the current communication mechanism in Fukushima requires how the survivors and affected population have perceived and understood the information regarding health risks. This is paramount in improving readiness and raising awareness for the future disasters. Disaster RC in a democracy should encourage and enforce full participation of concerned citizens and stakeholders to legitimatize two-way communication (Fahlquist and Roeser 2015). This study may at least in part provide a door to more effective RC framework to reduce the disproportional voice and representation of the radiation-affected community in Fukushima, Japan, and beyond.

METHODS

Study site

More than seven years after the catastrophe, rehabilitation in the context of Fukushima includes not just distinct issues such as decontamination or economic impacts. The process of recovery and restoration also encompasses invisible consequences like persisting Thyroid cancers among small children and psychiatric distress across all ages (Bromet 2014, Karz et al. 2014, Kunii et al. 2016, Lieber 2017, Maeda and Oe 2017). Such disasters warrant multi-dimensional analysis, as examining this triple disaster through an RC framework is an integral part of the national recovery in order to learn lessons for future disasters. As of March 2016, the total death toll amounted to 15,894, while 2,561 people are still missing in "the three hardest-hit prefectures" (The Mainichi Japan 2017). However, quantification of the death toll is only a visible fraction of a disaster; what remains difficult, is to examine the sociopolitical consequences that could linger for decades.

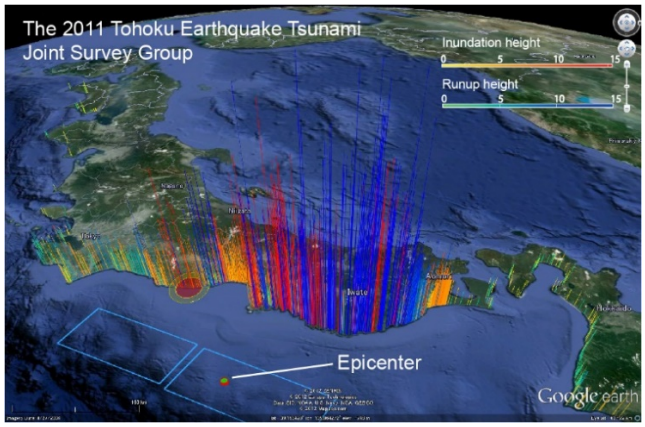

Fig. 1. Map. http://www.coastal.jp/tsunami2011/ Due to human reliance on nuclear energy for various purposes including power generation, medicinal and others, some of the undesirable health consequences of prolonged exposure to radiation have been well established and researched. Despite other unspecified grounds on human health, current science attests that the radiation is a known cause of cancer, cardiovascular diseases, some other physical issues, including genetic damage and transgenerational effects (Dr. Rosen, Alex; Dr. Claussen n.d.). In some cases, radioactive contamination might be a possible factor for setting off a shift in the sex ratio of the newborn (Dr. Rosen, Alex; Dr. Claussen n.d.).

Discourse Analysis

For the discourse analysis, I looked exclusively at the following three parties; the Japanese government both at the local and the national levels, Fukushima Medical University (FMU), and non-governmental organizations (NGOs) or not-for-profit organizations (NPOs) based in Japan, but primarily focusing on the Fukushima On the Globe, the NPO representing the voices of the affected communities. In particular, this analysis involved a review of textual resources as well as site observations during the summer of 2015, as well as the winter break of 2017-18. I used the World Health Organization (WHO)'s RC as a best practices standard to compare the current situation in Fukushima, as the WHO's RC framework, in general, can be regarded as universal, both oral and actionable epidemiological practices. I reviewed the RC strategies of the aforementioned institutions in order to identify their sociopolitical position concerning radiation health risks.

Textual Analysis

To analyze stakeholder positions on radiation health risk by the Japanese government, FMU, and FOG, I selected several academic articles and information from official stakeholder websites. The LexisNexis database yielded approximately a thousand articles that were associated with "Nuclear, Risk Communication" from March 2011 to March 2018. I then narrowed the results by selecting the samples within the context of "Fukushima." Aside from evaluating article that describes the position of the interested parties, I also examined books and local circulars written by the psychiatrist who has been practicing in Soma-City, Fukushima, as well as the representatives of NPOs or NGOs based in Tokyo, Kobe, Nagoya, and Fukushima. While the data and texts I examined were dated from the year 2013 to 2017, approximately two-thirds of them were available in English, and roughly a third was presented in Japanese.

Observation and Informal Interviews

To understand the core issues and carefully listen to the dialogue among the scientists, I attended the Prefectural Committee meeting on December 25, 2017, in Fukushima, Japan. Attending this particular meeting enabled to carefully listen to the debates between the scientists and the representatives of the media, but it also yielded a chance to conduct informal interviews with representatives of NGOs or NPOs who were also present. Since the media played the critical role in amassing genuine concerns of the affected community, questions of health issues raised by them during the press conference have much significance to this project. Thus, when needed, I referred to the recording of the Q & A of the press conference from the meeting.

I conducted a total of three separate site visits to Fukushima, including the first journey with Kobe International Sustaining Organization (KISO), a volunteer organization based in Kobe, Japan providing the support for social welfare that took place on July 19-21, 2015. Informal interviews I conducted included the followings: local community leaders, representatives of NPOs or NGOs, and other stakeholders who have worked in public health or related fields since or before March, 11th 2011, the day of the calamity at FDNPP. Before and after the prefectural committee meeting, I conducted informal interviews with two reps from Ajisai-Association, the NGO that reconnects mothers with children who are diagnosed with Thyroid cancer after the nuclear accident, and Fukushima On the Globe, the organization that empowers local communities. To better understand radiation health risks of the affected population, I also participated in a driving tour of the restricted zone on January 7, 2018. The journey allowed me at first-hand to examine the state of environmental and living condition, approximately 20 km radius of the FDNPP. Upon returning to California, I maintained communication with representatives from Ajisai-Association and Association to Help Chernobyl, Chubu-District via emails. The representative from the latter NGO was not present at the prefectural meeting, but he has been involved with NGOs or NPOs that are involved with improving the lives of affected communities in Fukushima. My attendance for the meeting also provided me an opportunity to review the 230 pages of medical documentation, including the preface which cautiously explained and warned the mannerism and etiquettes of each attendee for the remainder of the stay at the meeting. As of May, 5th, 2018, the in-print document made available to each attendee differs by volume (online document in English

version encompasses a total of 57 pages online, with a slight difference in layout and contents) available on FMU's website.

RESULTS AND DISCUSSION

I found that the key stakeholders had formulated the safety level of radiation dosage and communicated medical risks or consequences to the affected community differently throughout a disaster's progression timeline. Since the goals and tasks of each stakeholder varied between the national government, FMU, and NGOs or NPOs, the scope and frame of the language, as well as the roles and responsibility that came with it were also diverse. After comparing each stakeholder's position and argument with the WHO's communication standards as a baseline, I found that central idea or gist behind organizational linguistic choices and institutional etymological code as well as roles they played exerted a greater significance in societal responses. Moreover, the government and FMU's institutional power seemed to be in sync in which the post-crisis social structure reorganized itself to employ some levels of dominance over the affected population, the receiving end of the power. Consequentially, post-crisis society in Fukushima saw an increase in disaster vulnerability on one end and diffusion of responsibility and transparency on the other.

World Health Organization (WHO)'s Communication Standards

According to Gaya Gamhewage, a public health expert at WHO, the success, and failure of RC depends on two factors; 1) different perceptions of the same risks held by experts and the public; and 2) issues of the trustworthiness of the information and advice that is communicated (Gamhewage 2014). Gaya first points out to the difference(s) in perception held by the scientific versus affected communities which separate(s) the function and the position of the non-experts and the experts. This is based on opposed beliefs by the experts who consider that the risk is only great "when the hazard is great," while the non-experts such as general public consider the same risk as being immense "when their sense of emotional engagement is great, which involves psychological and cognitive processes" (Gamhewage 2014). During the ground research in

Fukushima, this difference(s) in perception, in fact, became apparent whenever the debates on radiation health risks took place. As explained later in the discussion of this paper, due to the lack of credibility of the information source and those who are distributing it, the difference(s) in perception and attitude towards health risks have consequentially altered the outcomes of social function in both epidemiological and political ways. This phenomenon revealed the significance of the conventional of transparency and trust, especially a few years followed by the Fukushima's nuclear-crisis when the radiation health issues have been monitored more systematically.

In addition, the purpose of the RC defined by WHO is to convey or transmit information "between interested parties about a range of areas including; 1) the levels of health or environmental risks; 2) the significance or meaning of health or environmental risks; 3) decisions, actions, or policies aimed at managing or controlling health or environmental risks" (Lang et al. 2001). Furthermore, for the RC to be effective, communication of the complexities and uncertainties of health risk should encompass purposes, given the fact that information is disseminated in transparent, timely, objective, factual, relevant, and accurate manner (Sinisi 1988; International Atomic Energy Agency 2012). "Well-managed efforts will not only ensure that urgent messages are constructively formulated, transmitted and received," but also they correspond and connect to "actions perceived to be meaningful and justified" (Sinisi 1988).

Based on the discourse analysis and observation from the site visits, Fukushima's present RC seems to emphasize more of the mechanical values of the factors mentioned above without a consistent and stable base of the level and consequence of the health risks. In fact, there was a growing distrust toward experts and scientists who elicited the RC which lacked technical skills. Thus, a split difference in the risk perception topped off with stakeholder's institutional confinement seemed to be the causes for the top-down RC in current Fukushima (Beecher et al. 2005, Gamhewage 2014). Looking toward the future, without two-way, transparent dialogues between governed theories or academic fields and affected community converging towards a consensus may be difficult (Taki 2011).

Table 1. Summary of the structure of risk communication by three stakeholders.

	Structure of Risk Communication
Japanese Government	Top-down governance; more concerned with economic revitalization and closure
Fukushima Medical University (FMU)	Top down, closed-door-policy, and elitist in nature; Focused on medical conventions and not on answering community concerns
Fukushima On the Globe (NGO)	Bottom-up in support of the community.

Position of the Japanese Government, including the local, state, and national levels

Role

- Identify the unsafe region and determination of "restricted zone"
- Designate of the area to store decontamination waste
- Determine the amount of compensation intended to cover loss and emotional damage of survivors, (in-)voluntary evacuees, and his and her family
- Provide funding for research and hiring of a committee to oversee scientists

Solution

- Provide funding for research at FMU
- Put the Prefectural committee in place to oversee scientists at FMU
- Rely on the national patients' privacy law to protect raw medical data from an external inquiry

Risk Communication by the Japanese Government

While the government has designated the area of the evacuation zone, determined the amount of compensation payment, and published the medical data produced by FMU, one of the imminent governmental RC challenges was loss of trust after experiencing redundancy in sharing the information based on the System for Prediction of Environmental Emergency Dose Information (SPEEDI). In fact, the SPEEDI the critical information on radiation dispersal during the acute phase of the crisis (Committee n.d.) was to be immediately utilized for the residents so that they could safely relocate and avoid additional radiation exposure ("SPEEDI report deepens suspicions | The Japan Times" 2012). Unfortunately, this centralized governing system of the information dissemination and communication system experienced 12 days of delay (Committee n.d.) followed by the nuclear accident, thus having to breed further panic and confusion. Among the national and local governments, some local municipalities were said to initiate evacuations without the

scientific facts and knowledge from SPEEDI, while others waited for the orders from the national government (Committee n.d.). As the national government provided no clear instructions due to lack of preparedness in the nuclear emergency, 3-11-11's evacuation led to an increase in the survivor's additional exposure to radioactive contaminants (Committee n.d.). This was because the Japanese government appears to have overlooked the RC issues pre and during the emergency, and therefore failed to have made the best use of SPEEDI (Committee n.d., "SPEEDI report deepens suspicions | The Japan Times" 2012). Although accountability mechanisms have held some officials responsible for the mismanagement of the disaster, the considerable amount of communicative strains has built up with time. Nonetheless, the loss of trust in governments on all levels has generated this sociopolitical division which seems to persist today within a triangular relationship between the government, scientific committee members primarily consisted of researchers and medical professionals at FMU, and the scientific community at FMU, and the affected population. Hence, the level of transparency, demonstrated by powerful institutions, seemed to deplete the citizens' trust while decreasing societal resilience in Fukushima altogether (Becker 2011; Observation).

The current goal of the Japanese government appears to revitalize the local economy in an attempt to move onto the next phase of recovery (Dr. Rosen, Alex; Dr. Claussen n.d.). With the lifting of evacuation zones, the government could successfully reduce the scope of compensation payment and simultaneously negate other financial and political obligations (Committee n.d.). Moreover, Fukushima prefecture was chosen as one of the sites to host baseball and softball games during 2020 Tokyo Olympic (Berkman n.d.), a move intended to hasten the process of local economic independence while promoting the "safety" of Fukushima. This political process, however, might be set to diffuse some levels of moral responsibility of the government (Svedin 2012). It can also be viewed that infrastructure upgrades in the tsunami-affected regions were predetermined as venues for public life to rematerialize (Dimmer 2017), as a healthy civil society after the crisis should reflect people's stronger ties to the community in which depopulation may be replaced by physical infrastructure that is more sustainable, adaptable and enabled for recreation of the new human sphere (Dimmer 2017).

Another purpose for a revitalization of Fukushima was venues for having the advisory or oversight committee. Although the committees might have served the needs of Japanese bureaucracy, unless the government explicitly identifies "what is and what is not working in an

administrative system (Svedin 2012) and responds to the population's legitimate concerns on their health risks, the condition might further aggravate the sociopolitical splitting between crisis decision-makers, those preach the nuclear science, and the public.

Position of the Fukushima Medical University (FMU)

Role

- Monitor the affected population's health via Fukushima Medical Health Management (FMHM)
- Offer thyroid screenings and share the scientific findings at the prefectural committee meetings

Solution

- Made scientific results available on the website for the use of other researchers
- Continue to research on health effects and publish the results, based on FMHM
- Communicate with the local and national media at the press conference 3-4 times per year without involving the voice of the actual member of the affected population
- Confine itself to medical research and stays away from any public policy issues

Risk Communication by FMU

FMU researchers and committee members presented their data and new scientific findings at the 29th Prefectural Committee meeting strictly adhering to a medical research's standpoint. This manner emphasized their segregated confinement, which can be viewed as elitist in nature. First, although the meeting was open to the general public, attendees were not allowed to ask questions or interrupt discussion to slow the process of the meeting. At the entrance, each attendee was given a page full of "etiquette" or things not to do for the remainder of the meeting. The FMU allocated approximately an hour of Q and A between the scientists and the media, which took place during the press conference. The discussion between the media and the scientists often seemed to become confrontational where the media pointed out their inconsistencies in the process of the RC and lack of access to raw data. Second, transparency, mandatory apparatus in RC, appeared to become dissipated whenever the limited amount of sharing the data and findings were presented. This was due to patient's privacy law (Informal interview with FOG). Whenever the media expressed their concerns about health risks on behalf of the community, the media's representative stressed that "[Scientists were] hiding behind the bureaucracy of the law," (Observation) instead of providing

access to data for others including the independent scientists to reexamine the case (Informal interviews with FOG).

In short, while the committee has been successful with conducting the prefectural meetings and publically making the results of Fukushima Health Management Survey (FHMS) available on the website, in reality, the public had no access to raw data and received no reassurance. Since FMU is a prefectural institution that is financially supported by the national government, members of the committees are viewed as civil servants who are not to be trusted, regardless of scientific findings, or even more so because of findings.

Position of Fukushima on the Globe

Role

- Share the lessons of Fukushima with the world
- Empower the local community by voicing their opinions

Solution

- Keep communicating with other NGOs or NPOs for networking
- Encourage citizen scientists to produce their own data
- Publish information or findings and speak out on behalf of the victims

Risk Communication by Fukushima on the Globe

According to the informal interviews with the rep of Fukushima On the Globe (FOG), the affected communities in Fukushima are still waiting for more definite answers as to what constitutes a "safe" radiation level and what exactly are the health risks associated with radiation. For example, the government claims that nobody died because of radiation (Committee n.d.). However, such statement not only ignores the fact that many people died from disaster-related consequences but also misleads the general public, since radiation impacts are more of long-term health concerns. In the eyes of FOG and community, seven years is not enough to conclude medical findings after inadvertent, prolonged exposure to radiation. Besides the future thyroid screening, longer-term effects of radiation on human health have to be continuously monitored. Without the clear-cut answers by the government and scientists, trust from the FOG has eroded to the point where there exists a climate of suspicion, which generates further splits between the scientists, the government, and the NGOs (Observation). Anti-trust sentiments have aggravated a sense of

uncertainties against bureaucrats – but contestation seems to be far from over, which is observed within the close-knit network of NGOs throughout Fukushima. In many cases, these NGOs promote the findings of studies by citizen scientists on health risks (Fukushima on the Globe's website). Although a long road ahead, FOG plays the role of the social medium in which advocacy takes place for greater Governmental transparency and better recognition of the issues faced by the victims.

Final Conclusion and Remarks

One of the most environmentally harmful manifestations of the nuclear accident in Fukushima is the resulting physical and psychiatric impacts on human health. In fact, clarification of such incidences should have two different audiences. One is the lay people who may or may not have been affected by the radiation, and the other is the expert such as nuclear researchers, physicians, scientists, and the government authority. While the ideal process of the RC should continuously flow from the latter to inform the former, there seemed to be several distinct deficiencies in the way that subsequent health risks was communicated during and after the inadvertent radiation exposure. First, the information was not explicitly and legitimately aimed at the targeted population, second, there were frequent changes in establishing a safe level of exposure by the government. Third, there seems to have little or no efforts by the medical experts to explain the data or findings into a language that is easier for the affected population including the general public to comprehend. Lastly, there seems to be a legal system in place of the raw data by the government for the independent scientists not to have access to conduct their own research.

Moreover, specific differences in risk perception have induced further sociopolitical schisms and fragmentation, which surfaced and resurfaced in the form of linguistic, as well as often trauma-driven psychological interpretations of health risks. As a result, disproportional voices of the survivors and affected population seem to be reflected as mistrust and antagonism toward these powerful institutions (Observation). Unfortunately, this persisting unclosed communication gap has left the current RC and the level of transparency to be utterly ineffective in Fukushima (Covello and Sandman 2001; Lofstedt 2003; Covello 2010).

Because trust is "the currency of transaction" when communicating the risk of public health emergencies (Gamhewage 2014), it is critical that scientists including those at FMU learn how to tactfully and compassionately manage multifaceted social concerns caused by the additional radiation exposure. The communication skill is not to be aimed at avoiding controversy but rather, at finding an equilibrium in their social positioning ("Poor communications could scupper new nuclear" 2012, Kulkarni 2012). Overall, a thorough reassessment of the RC seems to be the prerequisite to preparing for the next disasters such as the case with 3-11-11. A crisis can serve as a pivotal point to transform for a safer, more fulfilled society, but first, we must begin to "realize important changes or realignments in the workings of the democratic state and the relationship between the government and the governed" (Svedin 2012).

LIMITATION

Although I had an opportunity to attend the actual Prefectural Committee Oversight Meeting in Fukushima prefecture, given the circumstances my attendance was one-time only. Also, my observations of the meeting were limited by my own knowledge of medical terms in the Japanese language thereby bound for my own bias. Additionally, as the discussion on the RC in such large-scale accident will have to continue to evolve, I believe that research focused in dual languages such as Japanese and English alone may underestimate the magnitude of the complex political issues and may prevent the RC analyses from moving constructive way forward. Lastly, my choice of articles from electronic database may not have reflected an accurate representation of each stakeholder.

BROADER IMPLICATIONS AND FUTURE STUDY

The theme of nuclear energy in the post-nuclear accident in Japan remains debatable and is open to further policy development and research, as nuclear power will continue to provide the future energy source in Japan, as well as other global cities hosting a nuclear power plant. Regardless of geographical location, despite the small likelihood, a nuclear accident is most likely bound to happen. Therefore, health risks will remain a controversial theme in Fukushima, Japan, Europe, US and beyond. However, any disaster but especially the one involving radiological

impacts should adopt more inclusive sociopolitical landscape for further policy improvements. As alternative solutions for the Japanese government on all levels, FMU, and NGO, a few suggestions are as followed;

1) Offer training of RC aimed explicitly for the government officials and scientists
2) Consider possible exceptions to the national patient's privacy law
3) Create a democratic environment that invites citizen participatory process
4) Promote the healthy debate for future policy change

RC is an iterative process which necessitates "participatory democracy" as means of resolving environmental dilemmas (Chess 2000). By keeping the general public homogeneously informed with accurate, easy-to-understand scientific language, together, cities hosting the nuclear power can and should reach future revised model.

CONCLUSIONS

No national institutions like to consider economic and political devastation in the wake of unwelcomed disasters, but the RC and the stakeholder discourse analyses at least in part should identify the legitimatization of the illegitimate public communication practice by minimizing the risk and not by maximizing additional exposure to radiation health risks. As Fukushima's reconstruction period anticipates regeneration in coming years, the rehabilitation of the most impacted regions of Fukushima prefecture will not be a whole, unless there is a new growth of understanding and learning that can take place from the mistakes and the socio-political issues in which the triple disaster imposed on all those affected.

ACKNOWLEDGEMENTS

This past March, Tohoku region in Japan commemorated the seventh anniversary of 3-11-11. My deepest and sincerest sympathies to those who have lost their lives and continued to experience challenges, stigma, and health damages after the radioactive meltdown. For this project, I have conducted a small scale, grants-free, individual-based research for approximately three

years to understand the actual conditions of the affected regions and communities. While my intention for this project is purely academic and never to repurpose the fellow citizens' bereavement, my time spent in Fukushima seemed too short to fully engage with actual survivors who underwent the sociopolitical fragmentation. At the same time, the process of digesting all the bold facts and collection of data proved too defiant. However, I would like to continue to keep my windows open for debates that center around such controversial radiation health issues, which I hope may lead to improvements in preparing for the next nuclear emergency, in particular, the RC in emergency sector. In addition to an entire team at ESPM 175, especially Kurt Spreyer, Alison Ecker, Patina Mendez and Leslie McGinnis, I thank all the professors including Jeremy Brinker, Hiroaki Tomita, M.D., Masaharu Kawata, psychiatrist Dr. Ryoji Arizuka, Kenneth Nollet, M.D., leaders of NGOs, Not-for-Profit Organizations (NPO) based in Fukushima, Nagoya, Kobe, and Tokyo, and finally, my friends and family who have spent their time with me during the course of preparation for my project. Your poise, leadership, and dedication to a higher cause continue to push me forward. Thank you.

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APPENDIX A: Abbreviations

FDNPP – Fukushima Daiichi Nuclear Power Plant

FHMS - Fukushima Health Management Survey

FMU – Fukushima Medical University

FOG – Fukushima On the Globe

NPOs - Not-for-Profit Organizations

RC – Risk Communication

SPEEDI – System for Prediction of Environmental Emergency Dose Information