Future Design-Based Risk Communication

Author Tetsusei Kurashiki

By Tetsusei Kurashiki

Risk Communication

The Great East Japan Earthquake and resulting tsunami that struck northeastern Japan in March 2011 caused major damage to petroleum complexes, and in particular a large tsunami that struck a storage facility caused a large oil spill, resulting in fires spreading and completely burning down sections of Kesennuma city. These types of industrial accidents triggered by natural disasters are referred to as Natural-Hazard Triggered Technological Accidents (Natech). The concept of Natech was first espoused in the United States in 1992 ("Natural Disasters as the Cause of Technological Emergencies: a Review of the Decade, 1980-1989" by Pamela Sands Showalter and Mary Fran Myers, Natural Hazards Research and Applications Information Center, *University of Colorado*, 1992), and in recent years research into this subject has gained momentum, especially in Europe. This has drawn attention to a new field of research that studies the connection between natural disasters and industrial accidents ("Assessing and Managing Natech Risks" by Atsuo Kishimoto, *Journal of Japan Society for Safety Engineering*, 2014, Vol. 53, Issue 4). There are a multitude of issues to research with regard to Natech, including what needs to be done to protect society and residents' lives, what extent of risk and risk response analysis is realistically possible, and what approaches should be taken over the short term and long term.

A report by the Ministry of Education, Culture, Sports, Science and Technology in 2014 pointed out that at the time of the Great East Japan Earthquake, scientific opinions collected by the scientific and technological community were not appropriately provided to government agencies and the general public, and the government and specialists were unable to release accurate information to the public because of existing scientific and technological limitations and inaccuracies, creating issues including a lack of dialogue with the public related to the risks involved ("Policies to Promote Risk Communication", Council for Safe and Secure Science and Technology and Social Cooperation). Local governments are implementing a variety of steps to release risk-related information, including releasing the results of potential damage estimates and distributing hazard maps, but this has not necessarily been sufficient for increasing risk awareness and appreciation of potential disasters among the public. Risk communication activities that share various information and viewpoints through dialogue, joint consideration, and joint action are a useful way to manage risks more appropriately.

An important aspect of risk communication is that it becomes a form of "communication that creates empathy" by enabling stakeholders to understand a broad range of positions and opinions, and is able to bring these together as respective changes in behavior. In a worst-case Natech scenario, however, risk communication flows among different stakeholders – the local government, companies, and residents – but does not flow smoothly because, for example, companies believe they only need to meet legal and regulatory requirements and barriers exist between different governmental jurisdictions, meaning that further research and development is needed in this area. In other words, if communication among various stakeholders does not function effectively, efforts to bring stakeholders together to identify and resolve future issues may not succeed. Another issue that has been raised is that risk communication should be an ongoing activity that deepens mutual relationships of trust among stakeholders, rather than a temporary activity.

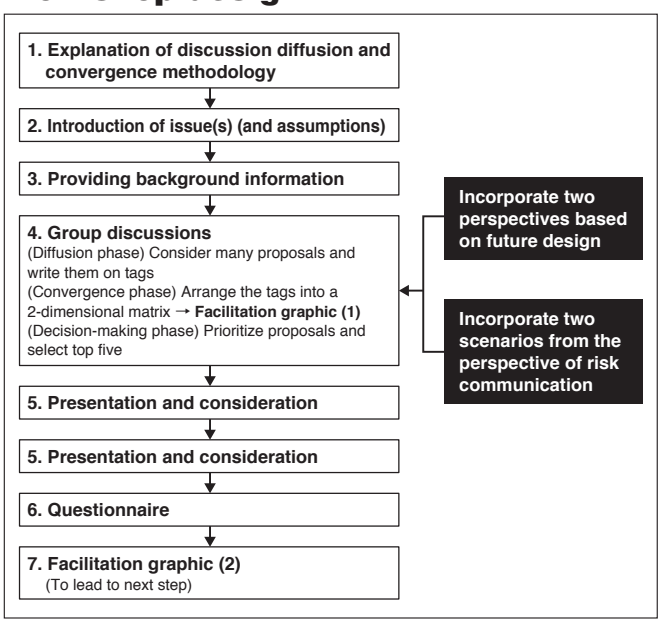
Given the above, I and other researchers have begun work on a new academic framework that incorporates Future Design (FD) and are studying workshop designs and facilitation graphics to establish a framework for ongoing risk communication that brings together a broad range of information to bring about changes in perspective and behavior.

Workshops Based on FD

We have created the workshop design method shown in *Chart 1* for the planning of workshops based on FD ("Validation of an Integrated Approach of Future Design and Scenario Planning – A Case Study of Disaster Prevention Workshop" by Yusuke Tateyama, Kenta Kurasawa, Tetsusei Kurashiki and Keishiro Hara, *Journal of the Japanese Society for Engineering Education*, 2018, Vol. 66, No. 2). This particular workshop envisions a time of 120 minutes, with eight groups of four or five persons each. We used the example of City A, which has a coastal industrial area, and designated the following assumptions and issues in consideration of future population changes and the effect of an earthquake in the Nankai Trough off Japan's Pacific coast (i.e. an industrial accident caused by a natural disaster).

- Issue: You are a resident of City A. Think about the facilities City A will need in 2060, and about what you would propose for a "(Proposed) 2060 Vision for City A" to be formulated together with the local government.

CHART 1
Workshop design



Source: compiled by the author

- Assumptions: Assume that in 2060 the population will have contracted and aged compared with today (the number of young people declines by 40%, the working-age population contracts by 30%, and the number of older residents increases by 20%). In addition, assume that an earthquake occurs in the Nankai Trough several years earlier (205x).

Each group deliberates using tags and parchment paper. Each group writes the many proposals being considered on the tags in the "diffusion phase", arranges the tags into a two-dimensional matrix in the "convergence phase" and then prioritizes the proposals by importance, selecting the five most important proposals in the "decision-making phase", to make it possible to "visualize" the thinking within the group.

Then, participants assume the role of residents of City A, and have two discussions from the following two perspectives.

(A) Present-generation group: Assume you are a resident of City A who is your current age and living today, and consider what proposals should be implemented for society in 2060.

(B) Future-generation group: Assume you are a resident of City A in 2060, and consider what proposals should have been implemented roughly 40 years earlier.

With regard to Natech, assume the following two scenarios for risk communication:

(I) Alternative scenario: Assume that an earthquake occurs in the Nankai Trough in 205x, and that the damage was within the extent predicted.

(II) Worst-case scenario: Assume that an earthquake occurs in the Nankai Trough in 205x, and that unforeseen events (in particular, tsunami-triggered fires) occur.

In the alternative scenario, even if the earthquake triggers tsunami, damage is limited to the areas shown on City A's hazard map as susceptible to flooding from a tsunami. In the worst-case scenario, however, there is a concentration of industrial parks in City A's coastal area, and the natural disaster causes an industrial accident (tsunami-triggered fire). Furthermore, City A's current hazard map does not consider the possibility of a tsunami-triggered fire.

Workshop Results

1. Workshop for University Technical Staff

The following are the results of a workshop held for university technical staff. The workshop had 31 participants (working in eight groups), all of whom lived in the Kansai region but none living in City A, or with relatives living in City A, giving them a third-party perspective of City A. Participants included both men and women of a wide range of ages, from their 20s to their 60s.

The following are the results of the questionnaire. When the group that addressed the worst-case scenario was asked "How many changes were made to the proposals in the first and second discussions?", there were no replies of "0" and there were changes in proposal contents and priority ranking when the perspective changed between present generation and future generation. In particular, "the future → present groups" that took the future generation first and present generation second had fewer changes in "priority ranking" than "the present → future groups". This suggests that the effect of future generation-proposals was greater.

Next, comparing by scenario, we surveyed the changes in the number of disaster-related proposals between the first and second rounds. The worst-case scenario saw a greater number of disaster-related proposals, suggesting that providing a worst-case scenario makes it possible to promote awareness of danger and risk perception in individuals. According to the results, even within the same group, the future generation discussions produced fewer disaster-related proposals. There was also a tendency for these proposals to take into account the long-term value to the city and its residents of the time and costs required.

In response to the issue of whether a present-generation

discussion alone was deemed insufficient, or whether a future-generation discussion alone was deemed insufficient for the worst-case scenario, there were more replies to the present-generation alone question that "It is difficult to produce proposals that involve costs." This suggests that it is difficult to take a long-term perspective, and that if costs are involved, the priority will be lower because there is less chance of the proposal being implemented. On the other hand, there were fewer replies that "It is difficult to produce proposals that involve costs" in answer to the future-generation alone question, hinting that discussions from a long-term perspective are possible. This indicates that even when considering policies for the future without regard for immediate benefit, incorporating a future-generation perspective is useful.

2. Workshop for Undergraduate and Graduate Students

The above workshop was carried out using the same parameters with undergraduate students who did not know about the concept of FD, and with graduate students who were well-versed in the concept. Initially, we hypothesized that it would be more effective to conduct the present-generation discussion first, and then change to a future-generation perspective that incorporates FD, but it turned out that that was not necessarily the case. Among young people in their 20s, there were instances where it was more effective to take the future-generation perspective first and then move to the current-generation discussion. Taking a future-generation perspective broadened their horizons to propose measures thinking of themselves at their current age in 2060, and then taking a present-generation perspective in which they think of themselves as in their 60s (the perspective of their own grandparents) in 2060 had a clear feature of encouraging them to reevaluate their initial proposals.

3. Workshop for High School and Technical School Students

As shown above, an FD approach in these workshops makes it possible to change an individual's perspective, and in particular indicates that in younger people a greater sense of affinity has a greater effect. The above workshop was also held with high school and technical school students to examine the incorporation of the opinions of these young people in government policymaking.

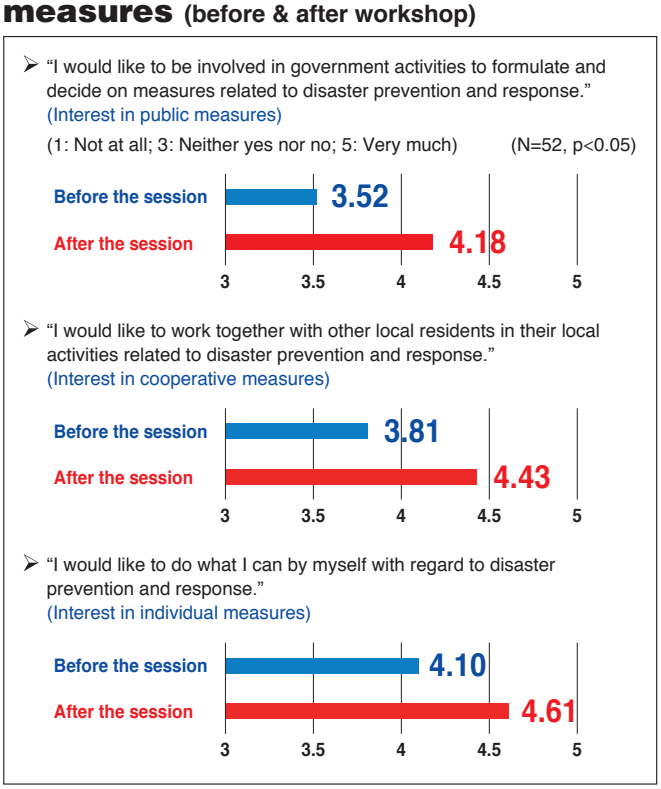
We carried out a questionnaire on disaster prevention and response measures from the perspectives of public, cooperative, and individual, corresponding to whether the measures were carried out by the government, cooperatively among a region's residents, or individuals. The same questions were asked before and after the workshop, and they are listed in *Chart 2*. The questionnaire used a 5-level Likert scale, and the numbers shown in the chart are the average responses. Before the workshop, items involving public and cooperative measures were ranked low, and although there was an awareness of their importance, there was a trend of indicating a lack of social experience. Nevertheless, when taking the future-generation approach, both public and cooperative measures were recognized as having greater importance, and significant changes in the questionnaire findings can be seen. The use of this kind of workshop based on FD can therefore be expected to raise awareness of individual and cooperative measures in risk communication for young people.

Possibilities for FD

We have created, carried out, and analyzed the results of FD- and scenario-based workshops incorporating two generations and two scenarios. Measures were examined from the perspective of

CHART 2

Questionnaire results regarding public, cooperative & individual measures (before & after workshop)



Source: compiled by the author

residents of City A, but by looking at the measures from the perspective of a hypothetical future generation we were able to confirm that by taking a future perspective these workshops facilitated a thought process that goes beyond the near-sightedness of humans, to a greater extent than with claims of government and corporate stakeholders. By taking the perspective of future generations, barriers among stakeholders can be overcome and constructive dialogue can be expected.

The effect of introducing a future-generation element suggests that there are differences among individuals based on participants' personal attributes. Then, introducing the concept of temporal perspective that is being studied in the field of psychology, we are researching the correlation between time orientation and disaster prevention and response awareness ("Time Orientation Verification of Disaster Prevention Workshop Using Future Design" by Yusuke Tateyama, Kenta Kurasawa, Masayoshi Hirayama, Tetsusei Kurashiki and Keishiro Hara, *Journal of the Japanese Society for Engineering Education*, scheduled for publication in 2019). For example, this may be a useful indicator when considering roles like having forward-oriented people take the role of future generations, and present-oriented people take the role of the current generation, in FD workshops. In addition, the results of discussions that incorporate FD show a significant effect in the questionnaire results of present-oriented students, and hold possibilities for disaster prevention and response education that raise awareness of disaster prevention and response.

The workshops also showed that initially taking a future-generation approach to widen perspectives and then following this with the same discussion from a present-generation approach and reevaluating the initial outcomes is useful. Based on this, Kaizuka city in Osaka Prefecture held workshops (July–September 2018) for residents regarding a project to build new government office buildings, and based on the FD method considered the concept for a new office building first from a future-generation perspective and then from a current-generation perspective looking at the city 40 years into the future. There were three specific types of workshops – "Life in Kaizuka in the past, present, and future", "Based on that life, the relationship between the people who live in Kaizuka and the city government" and "What the new facility should be, based on that relationship" – and the functions sought in the new government office buildings were examined.

We are also researching business strategies based on FD. There are cases when, after a company announces a vision for its business strategy, individual divisions manage their businesses based on that vision. There are also cases where the formulation of that vision includes workshops where prospective senior managers exchange opinions, or holding tests for salary increases, or internal training sessions. In those cases, even though they are in the same company, each division can be seen as a stakeholder. Many divisions face both issues of "Responding to a drastically changing business environment" and "Creating value and demand from existing resources that require time to change." Designating these as issues, we believe that FD can be suitable for responding to uncertainty in the business environment and discontinuity versus ongoing change in existing resources, and are studying workshop designs to consider future scenarios and strengthen resilience.

Photo: Author

A workshop in progress

In these ways, we expect FD to be applied in a broad range of fields, including Natech, policymaking (government's formulation of comprehensive plans), disaster prevention and response education, government office construction, and business strategies. We hope that education and research into FD will accelerate further, through cooperation among related parties in various fields and through industrial-academic cooperation.

Finally, I would like to thank Osaka University graduate students Yusuke Tateyama, Kenta Kurasawa, and Masayoshi Hirayama, who helped with the writing of this article.

JS

Tetsusei Kurashiki is a professor at the Department of Management of Industry and Technology, Graduate School of Engineering, Osaka University.