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Toward Achieving Broad Public Engagement with Science, Technology, and Innovation Policies: Trials in JAPAN Vision 2020

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Abstract

Science communication is becoming a larger field, including not only the approach known as public understanding of science (PUS), but also public engagement with science and technology (PEST). In this paper, we discuss what "broadly" and "incorporating public opinions in policy making" means and argue that it is important to investigate participants' segments using the third generation of segmentation method to ensure the broadness of the project. When incorporating public opinions into the STI policy-making process, dealing with the process substantively, not instrumentally and including a channel to a policy-making process is crucial. Next, we propose that the vision phase of policy making, i.e., the future vision, could be an arena where diverse potential, but unclear, stakeholders could interactively communicate toward a common goal, or produce policy options linked to the future vision and an new PEST tool called Interactive Public Comment. Finally we showed some examples of interactive public comment trials in Japan.

Keywords: public engagement, future vision, interactive public comment, dialogue, science communication.

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Consiguiendo una Mayor Participación Pública en Ciencia, Tecnología e Innovación: Ensayos en JAPAN Vision 2020

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Abstract

La comunicación científica se expande, incluyendo no sólo el modelo de Public Undertanding of Science (PUS), sino también el de Public Engagement with Science and Technology (PEST). En este artículo, describo qué significa "incorporar opiniones públicas en políticas" de manera general y defiendo, además, la importancia de investigar con las personas participantes mediante la tercera generación de métodos de segmentación para asegurar el alcance de este tipo de proyectos. Para ello, defiendo los procesos substanciales, y no instrumentales para incluir canales fijos participativos en la creación de políticas. Además, propongo que la fase de visión en la creación de políticas (ej. futuras visiones) podría ser un lugar donde diversos grupos sociales se comunicasen con un objetivo, o donde se crearan opciones políticas ligadas a visiones futuras mediante una nueva herramienta de PEST llamada Comentario Público Interactivo. Al final, muestro ejemplos de ensayos de este modelo en Japón.

Palabras clave: participación pública, visión futura, comentario público interactivo, diálogo, comunicación científica

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Science communication is becoming a larger field, including not only the public understanding of science (PUS), whose purpose is increasing the public's scientific knowledge and public appreciation of science (Lewenstein, 1992), but also public engagement with science and technology (PEST), whose purpose is improving the quality of decision making on S&T as well as making communities more accepting and satisfied with those decisions through public participation (Priest, 2010, p.603). For example, in the UK, which is one of the developed countries of science communication, there is a PUS tradition. A good example is the course of six lectures on the chemical history of a candle by Michael Faraday in 1861 (Faraday & Crookes, 1861). Science communities such as the Royal Society have supported high-quality science education and PUS activities led by scientists[1] and have provided opportunities to achieve skills in communicating science[2]. However, since the 1980s UK bovine spongiform encephalopathy scare, the public perception of the reliability of scientists has decreased and the PUS approach was thought to be limited in improving the complex relationship between science and society (House of Lords, 2000). Therefore, PEST approaches such as participatory technology assessment (pTA) (Hennen, 2012) have attracted attention in improving the relationship between science and society.

Science Communication in Japan

In such a global trend of science communication, the Japanese government has also promoted science communication. In 1995, the Japanese government enacted the Science and Technology Basic Law to promote science and technology (S&T). In accordance with this law, a Science and Technology Basic Plan is developed by the Cabinet every 5 years. The first Science and Technology Basic Plan from Fiscal Year (FY) 1996 to FY2001 (Ministry of Education, Culture, Sports, Science and Technology in Japan, MEXT, 1996), in terms of science communication, indicated the future direction of PUS activities. Therefore, since then, formal or informal science education has been promoted in Japan. For example, in 1996, a national program facilitating

interactions between universities and high schools started. In 1998, a consensus conference (Einsiedel, 2001) on gene therapy trials was held[3].

The second Science and Technology Basic Plan from FY2001 to FY2006 (MEXT, 2001) indicated the importance of promoting not only PUS, but also researchers' understanding of society and the need for science communicators to facilitate the relationship between the public and scientists. Therefore, in 2005, a science communicators training program started or was prepared at three universities (Hokkaido University, The University of Tokyo, and Waseda University) supported by the Japanese government and two national science museums (National Museum of Emerging Science and Innovation and National Museum of Nature and Science). Therefore, 2005 is considered the first year of science communication in Japan (Kobayashi, 2007).

The third Science and Technology Basic Plan from FY2006 to FY2011 (MEXT, 2006) referred to the importance of promoting proactive participation of the public in S&T from a PUS perspective. In 2006, led by the Science Council Japan, Science Cafés, a casual public dialogue format, were held across Japan during the Science and Technology Week. This triggered a Science Cafés movement and over 100 Science Cafés organizers have produced Science Cafés across Japan. Although the purpose of Science Cafés was to promote PUS, Science Cafés also played an important role in the PEST because many Science Cafés organizers realize an interactive communication between scientists and the public. In 2006, a consensus conference on GM crops in a restricted local area was held[3], and in 2009, a deliberative poll-like activity, World Wide Views in JAPAN, was held[5]. The foundation of PEST was established in this era.

Near the end of the third Science and Technology Basic Plan, on March 11, 2011, the Great East Japan earthquake occurred at Fukushima and nuclear power plants and radiation became big issues. In response to these issues, the Japanese government postponed publishing the fourth Science and Technology Basic Plan and revised the drafted plan. Through that process, the fourth Science and Technology Basic Plan from FY2011 to FY2016 (MEXT, 2011) was published in August 2011. This plan clearly indicated the need for not only PUS, but also PEST from the perspective of policy development with the support of society. According to the fourth plan, in 2011, MEXT started the "Science for RE-designing Science, Technology and

Innovation Policy (SciREX)" program. This program aims to prepare a system and foundation for the realization of evidence-based policy formation because "in the complex interrelationship between S&T and society, it is necessary to carry out a science, technology, and innovation (STI) policy with more understanding, trust, and engagement from the public to ensure beneficial outcomes for society and the public good[6]." In addition, Arimoto and Sato (2012) insisted the need for rebuilding public trust in science for policy making because the public perception of the reliability of scientists has decreased after the Great East Japan earthquake.

In this environment in 2012, we started a project called the "Framework for Broad Public Engagement in Science, Technology and Innovation Policy (PESTI) [7]," where 18 members including the author from different research fields such as science communication, science education, marketing research, S&T policy, psychology, information science, business science, communication science, industry-academia-government collaboration belong to, as a SciREX research and development project for a research-funding program. The research-funding program, "Science of Science, Technology and Innovation Policy[8]," was funded by the Research Institute of Science and Technology for Society (RISTEX)[9], and the Japan Science and Technology Agency (JST)[10] to realize objective evidence-based policy forming.

So far, RISTEX and JST have funded projects to implement PEST activities. For example, the Deliberation and Cooperation between Citizens and Scientists project (funded from 2007 to 2012) developed a new method of pTA (Hirakawa, 2012) and the Innovation and Institutionalization of Technology Assessment (I2TA) project (funded from 2007 to 2011) has implemented many technology assessments in various fields such as energy, medicine, and food (Shiroyama, 2012).

In this paper, we will discuss how to implement more effective and efficient PEST activities to reflect public opinions about STI policy and problems to be resolved using our PESTI project. First, we will discuss what "broadly" means in the following sentence, "the nation should promote activities broadly taking public opinions to form policies" (MEXT, 2011, p.41) from the fourth Science and Technology Basic Plan. Second, some examples of trials in Japan are shown. Finally, current issues and future prospects toward broad public engagement in STI policy are discussed.

What Does "Broadly" Mean?

As noted above, the Japanese government has been promoting activities to incorporate broad public opinions into STI policies and our PESTI project has been trying to achieve this goal. However, what does "broadly" mean in this context? In this section, we discuss some possibilities to ensure "broadness" in public opinion.

If possible, the easiest way to ensure "broadness" is to make the whole population participate in these activities. However, this is obviously impossible. Therefore, we should produce a representative model of the whole population. How do we make this model? Social and marketing surveys can be used to produce this model.

In the field of marketing research, segmentation methods are often used to separate the whole population into several groups (segmentations) (Smith, 1956). In the history of marketing research, the first generation of segmentation methods was to segment people using demographics such as age, sex, resident area, or job (Asano, 2010). For example, we see an activity as biased when the majority of participants are male and elderly. Therefore, PEST methods such as deliberative polls[11] or consensus conferences have taken care to avoid bias. For example, in deliberative polls, organizers randomly identify representative candidates using factors such as gender, age, and residential area in the first step. This is a reasonable strategy. However, in the second step, candidates could decide whether to participate in the deliberative poll. As a result, the group of participants tends to differ slightly from the expected representative sample. For example, in 2012, deliberative polls on future energy and environment options were held in Japan. The report of the independent committee following the polls showed that more elderly and less women participated in the second step (Independent Investigation Committee on the Deliberative Poll on options for future energy and environment, 2012). This type of method, selecting a population randomly and then accepting participants from the population, appears to be common in PEST activities. Therefore, the biases seen in deliberative polls could be a common issue when implementing other PEST activities such as consensus conferences.

However, are there any strategies other than taking a representative demographic sample? The second generation of segmentation methods, based on the lifestyle or values of people, can be used to reconsider "broadness." In the 1970s, the second generation of segmentation methods was created because marketing researchers found that people who share demographics do not always share the same tastes. Therefore, researchers have sought factors that are more closely related to consumer needs and identify the lifestyle or values of people (Asano, 2010).

In the field of science communication, a representative example was the Public Attitudes to Science in UK since 2000. So far, the survey has been performed five times (2000, 2005, 2008, 2011, and 2014). These surveys have shown that the British population could be segmented into, e.g., six distinct categories of similar attitudes to science, "Confident Engagers" "Distrustful Engagers," "Late Adopters," "Concerned," "Disengaged Sceptics," and "Indifferent" (Castell et al, 2014, p.134). These segmentations were made by using a cluster analysis on the data from these surveys. Using this technique, we can find profiles of segmentations. For example, "Late Adopters" are "They did not enjoy the science they studied at school, nor find it useful later in life. However, they now take a strong interest in science, and are interested in becoming more involved in public consultations on science," (Ipsos MORI & Department for Business, Innovation and Skills, 2011, p.77). These profiles show that, in the second generation, the demographic information can be used to make profiles. The paradigm shift from the first to the second generation is a consequence of changing the use of demographics as an objective variable to an explanatory variable.

These surveys also show that the transition of population over time, e.g., the percentage of "Late Adopters," "Disengaged Sceptics," and "Distrustful Engagers" increased and "Concerned," "Indifferent," and "Confident Engagers" decreased from 2011 to 2014. In this way, using the second generation of segmentation methods, we can further understand the population.

However, there is a limitation to the second generation of segmentation methods, i.e., we cannot identify to which segment a person belongs. It seems strange, but this is because of the limitations of cluster analysis. The cluster analysis method can be used to divide a large-scale data set into distinct

groups, but it cannot be used in case of a single sample data set, and a model fitting the results of the analysis is usually complex although, in some cases, it is not impossible to make a model to predict which segment a person belongs to when using a computer. For example, Kawamoto et al. (2013) made a model to segment a person into four distinct clusters, "Inquisitive," "Sciencephiles," "Life-centered," and "Low interest," when analyzing the 10 questions.

The third generation of segmentation methods overcomes the demerits of the second generation, i.e., it can easily segment a person into distinct groups with similar lifestyles, values, or attitudes to science using a decision-tree technique. A representative example of the third generation is seen in Australia. In Australia, an example of PUS activities was the launch of Science Circus in the early 1980s to raise public awareness of science and this activity is still run as a part of the Master of Science Communication Outreach degree at the Australian National University[12]. PEST activities have also been started by universities and governments because global issues such as genetically modified (GM) crops and foods, climate change, or nanotechnology products have become obvious to society.

In 2007 and 2011, the state government of Victoria in Australia performed surveys on attitudes to S&T (Victorian Department of Innovation, Industry and Regional Development, 2007, 2011). The survey reports showed that the Victorian population could be segmented into six distinct groups. To derive these segments, the researchers had three different approaches. In 2007, the report said that "a third approach taken was to attempt to derive a set of more behaviourally oriented segments using a less exploratory method." (Victorian Department of Innovation, Industry and Regional Development, 2007, p.149) Finally, they decided to use the third behaviorally oriented segmentation, which was based on the third generation of segmentation methods because it met the government's needs for making the segments easier to identify and target for communications purposes. Specifically, the following three questions were identified for the segmentation (Victorian Department of Innovation, Industry and Regional Development, 2007).

> Q1: Can you please tell me how interested you are in science?
> Q2: Do you actively search for information about science and/or technology?

> Q3: When you have looked for information about science and technology in the past, have you generally been able to find what you were looking for?

A person's segment can be determined using a decision-tree technique (Table 1). Therefore, the Victorian segmentation method can be applied easily to similar surveys. In 2012, we used the same questions (translated into Japanese) and conducted a large-scale Web-based survey (n=3519) adapted to the demographics in Japan. As a result, we found the segment sizes of the Japanese population in 2012 were: segment 2 (13%), segment 3 (22%), segment 1 (17%), segment 6 (4%), segment 4 (28%), and segment 5 (16%) (Table 1). We also found that the Japanese population having higher-engagement segments in S&T (segments 2 + 3 +1 = 52%) was much lower than in the Victorian population (72%) (Kano 2012). One of the advantages of the third generation segmentation method is that it is easy to compare the results between countries or surveys.

Table 1
The decision tree of the segmentations and population in Victoria and Japan.

Q1	Q2	Q3	Segment	Segment of Victorian population (%) in 2011	Segment of the Japanese population (%) in 2012
Very or quite interested	Yes	Yes, easy to understand	2	37	13
Very or quite interested	Yes	Yes, difficult to understand No, I can't find it	3	16	22
Very or quite interested	No	—	1	19	17
Neutral, not very, or not at all interested	Yes	—	6	6	4
Neutral	No	—	4	9	28
Not very or not at all interested	No	—	5	13	16

We have conducted surveys on participants during science communication events such as Science Cafés or science festivals. So far, we have obtained segment data from 46 S&T events. As a result, we found that the majority of participants in all of the events were higher-engagement segments on S&T (segments 2+3+1). In 19 of the 46 events with themes focusing on S&T and where the settings were more like Science Cafés, the maximum percentage of lower-engagement segments (segment 6+4+5) was found to be 14%, which is much less than the general Japanese population (48%). Furthermore, the percentage were zero in 10 events (Kano et al., 2013). We also found that more lower-engagement segments participated (however, the maximum was 40%) when picking up the themes relevant to their lives such as medicine, providing alcoholic beverages, or cross-disciplinary themes such as science and art (Kano et al., 2013). Cormick (2012) has also reported that lower-

engagement segments, which he called unengaged people, had different values or beliefs and were more interested in things relevant to their lives. Our findings are consistent with his findings.

However, we felt it was difficult to "broadly" approach people for the purpose of either PUS or PEST and it was necessary to develop an approach for unengaged people. To tackle this difficult issue, we tried to improve the Victorian segments to target unengaged people. Using the participant surveys, focus group interviews, and Web surveys, we found that some unengaged people were interested in topics relevant to their lives (Kano 2012). Based on those findings, we proposed further segmentation of Unengaged segments based on Victorian segments, by dividing unengaged people into two segments, "potentially interested" and "indifferent," using an additional question: "Q4. How interested are you in (specific keyword)?" (Figure 1).

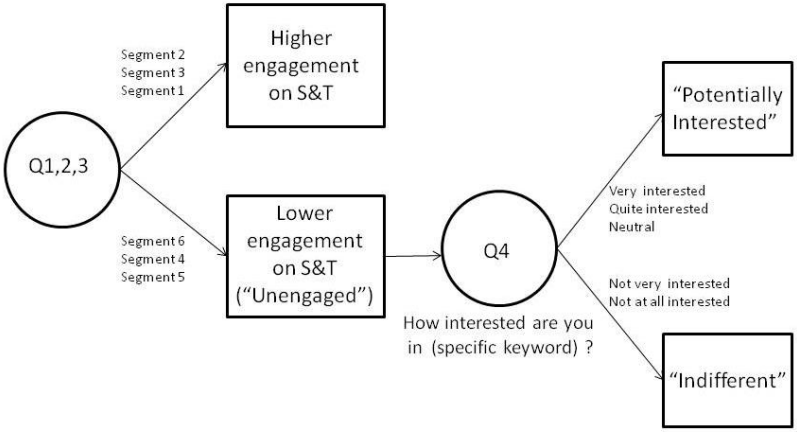

Figure 1. Further Segmentation of "Unengaged" Segments

For example, in the field of regenerative medicine, which is popular in Japan as an expected next-generation medicine because a popular Japanese scientist, Prof. Yamanaka, won the Nobel Prize in 2012, we found that 34.5% of the Japanese population was "potentially interested" and 13.3% "indifferent" out of the 47.8% unengaged Japanese population (Kano 2012). Thus, people who were not interested in S&T in general, but specifically interested in a field,

e.g., regenerative medicine, could be identified and we felt that methods could be developed to approach those people such as using a content with less S&T and more relevancy to their daily lives.

We could ensure "broadness" if we could approach all of the segments. This appears to be difficult, but should be attempted to obtain better PUS or PEST.

Incorporating Public Opinions in Policy Making

The impact on decision making is one of the key principles for good engagement (Cormick, 2012). However, this is easy to say, and hard to do. In this section, we will identify the advantages or disadvantages of some systems or methods.

We think that there were two purposes considered when incorporating public opinions in STI policy making. One is consensus building or interest management and another is a brainstorming or future session.

Traditional PEST methods such as deliberative polls or consensus conferences are more consensus-building oriented. These methods tend to be used policy means phase of policy structures (Figure 2), where a complex web of stakeholders exists, to produce consensuses mainly from the public. We think that one of the advantages of these methods is the production of consensuses from a diverse range of perspectives on an issue.

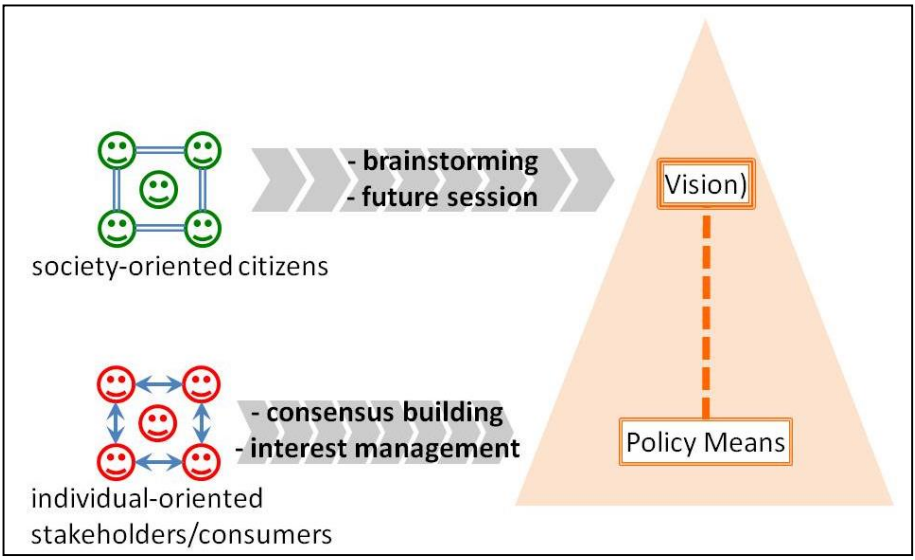

Figure 2. Vision phase and Policy Means phase of policy structures.

Contrarily, however, producing a consensus could be a disadvantage when including consensuses in policy-making processes. Although, ideally, producing consensuses from the public should not be a democratic disadvantage, in reality, the following two cases would occur (Independent Investigation Committee on the Deliberative Poll on options for future energy and environment, 2012). When public consensuses do not agree with the government line, it would not be easy to achieve a consensus between the two. On the other hand, when public consensuses are the same as the government line, public consensuses are considered to be "instrumental," which means the public consensuses are used to increase the government's reliability. In 2012, the results of a deliberative poll on options for future energy and environment in Japan showed that more people supported a "zero scenario," where there should be 0% nuclear power plants by 2030 compared with a "15% scenario" or a "20–25% scenario." These results were considered by the former government, but not by the current government. These issues may be caused by governments that did not announce officially how to use public consensus in making policy before consensus building (Independent Investigation

Committee on the Deliberative Poll on options for future energy and environment, 2012).

Producing a "policy menu," in which policy options with policy contents and their economic and social impacts are written, as a result of PEST could work in real-world policy-making processes (Center for Research and Development Strategy, JST, 2011, p.33) because governments could choose an option from the policy menu. However, in this case, when choosing a policy option, the government should explain it was chosen and why the others were rejected. In terms of forming a policy menu, it is not necessary to build consensus and be more brainstorming oriented because different ideas can be the source of different policy options. In this process, gathering public opinions could be more "substantive," which means incorporating diverse knowledge, values, or experiments into making better policies.

For example, future centers can be one of the methods or systems to produce a policy menu. Future centers are known as facilitated working environments that help organizations think freely about future improvements and innovations (Lugt 2007). They can be broadly categorized into three groups: corporate business-oriented future centers, public future centers, and regional future centers (Dvir 2006, Lugt 2007). Public future centers in particular are established by a public organization such as a ministry or government agency to catalyze future development in specific domains at a national level (Dvir 2006). I think this future center system is better for PEST because "future vision" can be an arena where potential stakeholders could collaborate because the direct impact on their personal or organizational lives was less than in the policy means phase of policy making.

Our PESTI project focused on "future vision" to incorporate public opinions into a STI policy menu. On this occasion, we put existing dialogue-based science communication activities such as Science Cafés to practical use because they are popular in Japan and there are over 100 Science Cafés organizers. However, these dialogue-based activities have not always connected to a channel to policy making because these activities are usually PUS oriented. Therefore, we aimed to combine the advantages of PUS-oriented and PEST-oriented activities (Mizumachi et. al., 2014). In doing so, we paid attention to the public comment system. Public comments are "the procedure that national administrative agencies use to publish in advance their

proposed orders to invite the public to offer their opinions about them[13]." We have proposed a new PEST method called "Interactive public comment," which was developed in cooperation with a civic group established by the practitioners of the preceding interactive public comment methods. In this method, participants express opinions in a dialogue-based activity on a specific issue such as their future vision for Japan. The organizer of the dialogue-based activity then delivers them to policy makers as public comments. Dialogue-based activities could be more like workshops or face-to-face interviews. We have tried to access broad segments of the population by utilizing the findings described in section "What Does "Broadly" Mean?". We think it would be possible to incorporate public opinions into STI policy making process more substantively by a mixed method of brainstorming-oriented future centers, dialogue-based activities, public comments, and approaching broad public segments.

Trials of Interactive Public Comment

This section explores two trials of interactive public comment. The first is a field trial for the Kyoto city master plan from 2011 to 2021 performed by volunteer-based citizens under the supervision of the local government in Kyoto in Japan in 2010. This trial was not designed for STI policy making. The second is a greenhouse trial in 2013 by the PESTI project for producing a future vision for Japan through to 2020, when the Olympics and Paralympics will be held in Japan, and until 2030. This trial does not appear to be related to STI policy making, but in Japan, sports and STI have been dealt with by the same ministry, the MEXT, so this theme is partly related to STI policy making.

Interactive Public Comment on the Kyoto City Master Plan from 2011 to 2021

In 2009, supervised by the Kyoto local government, 16 volunteers aged under 35 years old were invited to form a better city master plan from 2011 to 2021. These volunteer citizens made suggestions to improve the public comment system in the city master plan better and more attractive to the broader public

by 2010 and target all segments of the population from those who are not aware of the public comment system to those who have already used the public comment system. Therefore, they invented new approaches such as setting up public comment boxes at subway stations or holding dialogue-based events in shopping malls or outreach to high schools to obtain public opinions from as broad a public sample as possible (Under 35 Kyoto, 2011). As a result, 628 (71%) of the 890 public opinions were submitted through their activities. A successful case of incorporating public opinion into policy making was that building an animal care center was included in the master plan. The public comment requiring animal care was taken from the outreach to a high school. This experience led to our proposed interactive public comment method and to a new citizen group and our partner, Public Comment Promotion (PCP) Group. This practice appears to be good for making better policy options, but the evidence appears weak because segmentation methods were not used to identify the population or public opinions were not linked to policy options.

Interactive Public Comment on Future Vision through to 2020 and toward 2030 in Japan

In 2013, the International Olympic Committee announced that the Olympics and Paralympics in 2020 would be held in Tokyo, Japan[14]. Therefore, the minister in charge of the Olympics and Paralympics in 2020, who is also the minister of MEXT, launched a committee for producing "JAPAN Vision 2020[15]." Our PESTI project collaborated with members of the committee and planned to use our interactive public comment method on JAPAN vision 2020.

We held three-part series of dialogue-based events monthly from September to November in 2013. The first was for a better understanding of the STI policy-making process, the second was for brainstorming for producing JAPAN Vision 2020, and the last was to organize ideas from both the public comment and MEXT officers. We surveyed the participants in the series. As a result, we found that all participants except one belonged to higher-engagement on the S&T segment, i.e., the participants were biased. It is important to identify bias in public opinions when sharing them with MEXT officers. However, we should try to reduce the bias. In this case, we thought

that the Olympics and Paralympics in 2020 looked attractive to the unengaged population in the S&T segment. However, in the first of the three-part series, we put STI policy to the fore so much that it resulted in higher-engagement population. Unfortunately, we were required to deliver results to the MEXT officers by early December 2013; therefore, we did not have another opportunity.

We took 74 public opinions from 25 citizens although they showed bias in the second dialogue-based event. MEXT has collected opinions from different professional areas including MEXT itself independently. Therefore, we incorporated 45 opinions from the officers of MEXT, which were collected at that time. In the last dialogue-based event, participants tried to organize these 119 opinions (ideas) in total. After that, PESTI project members produced four different values: "Ties with others and diversity," "safety and security," "Japan pride," and "comfort, efficient, and convenient society," from the opinions by reference to the results of the last event. We also linked technologies, which were predicted to be realized in 2020 by Delphi surveys done by the National Institute of Science and Technology Policy, to the values or opinions. Finally, in collaboration with the MEXT officers, these four different values were organized into three future visions: "Inspiration," "Dialogue," and "Maturity." These future visions were linked to the values, opinions, and technologies; therefore, we consider them as a STI policy menu.

The STI policy menu was officially announced by the MEXT minister in January 2014[13] (Figure 3) and the officers of a committee on producing JAPAN Vision 2020 have tried to process public comment policy means phase of policy making.

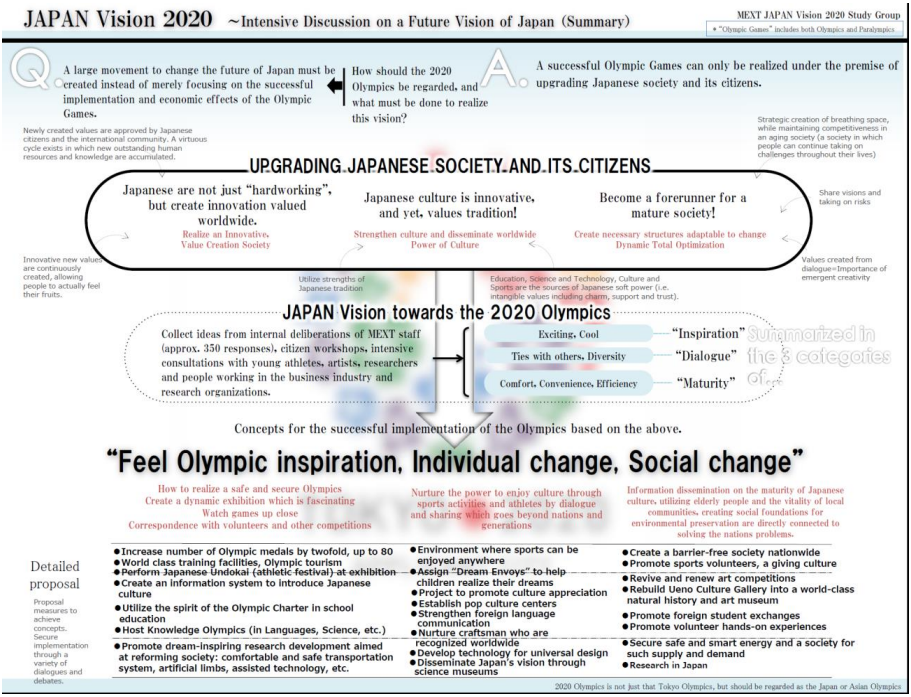

Figure3. Summary of JAPAN Vision 2020

Toward Broad Public Engagement in Science, Technology, and Innovation Policy

In this section, I will briefly conclude with some recommendations how to improve broad public engagement in STI policy based on the above discussion.

First, we should investigate participants' segments using the third generation of segmentation method. When specific segments are biased such as higher engagement with S&T, we should target the other segments and develop better approaches to them. If we could not approach specific segments, we should report the bias of the samples when considering their opinions in the policy-making process.

Second, when incorporating public opinions into the STI policy-making process, we should deal with the process substantively, not instrumentally. The government should announce how public opinions should be handled before requesting public opinion, or the traceability of the process should be independently observed and a report published.

Third, when incorporating public opinions, we should include a channel to a policy-making process. If we include a channel to the policy-making process, participants in dialogue-based activities were more motivated to express their views.

Fourth, the vision phase of policy making, i.e., the future vision, is an arena where diverse potential, but unclear, stakeholders could interactively communicate toward a common goal, or produce policy options linked to the future vision. Instead, in the policy means phase of policy making, the purpose of dialogue tends to be for consensus building and public opinions are not always respected in reality because clear stakeholders tend to use their influence to go against public opinion.

Last, we should maintain an appropriate distance from the government. If we are too close to the government and put public opinions into policies aggressively, we ourselves would be a stakeholder. We should be independent of both the public and the government.

Acknowledgments

I would like to thank all the members of the PESTI (Framework for Broad Public Engagement in Science, Technology and Innovation Policy) project and Public Comment Promotion Group. This work was supported by Research Institute of Science and Technology for Society (RISTEX), Japan Science and Technology Agency (JST).

Notes

[1] See https://royalsociety.org/education
[2] See https://royalsociety.org/training/
[3] See http://stsnj.org/nj/essay97/consensus.html (in Japanese)
[4] See http://web.archive.org/web/20110817071552/ and http://www.pref.hokkaido.lg.jp/ns/shs/shokuan/gm-con05.htm (in Japanese)
[5] See http://www.wwviews.org/

[6] See http://www.jst.go.jp/crds/scirex/en/
[7] See http://en.pesti.jp/
[8] See http://www.ristex.jp/stipolicy/en/
[9] See http://www.ristex.jp/EN/index.html
[10] See http://www.jst.go.jp/EN/
[11] See http://cdd.stanford.edu/polls/
[12] See http://cpas.anu.edu.au/study/degree-programs/master-science-communication-outreach
[13] See http://www.e-gov.go.jp/help/about_pb.html
[14] See http://www.olympic.org/2020-host-city-election
[15] See http://www.mext.go.jp/a_menu/yumevision/index.htm (in Japanese)

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