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"Research and Trial Studies on Sharing Intelligent Information between Legislative Bodies and Academia"
Result Report

Proposal Toward Achieving Co-Creation of Policies Between Diet Members and Scientists

August 2020

THE ENGINEERING ACADEMY OF JAPAN
Project for the research and trial studies on sharing intelligent information between legislative bodies and academia
(Leader: Hiroshi Nagano)

July 7, 2020
THE ENGINEERING ACADEMY OF JAPAN

The Engineering Academy of Japan (EAJ) is a non-profit, non-governmental organization established for the purpose of contributing to the advancement of engineering and technological sciences in Japan. Its members are leading engineers in industry, academia, and government. EAJ has several project teams that tackle various issues fully utilizing its broad network and abundant experience and knowledge of its members. With these project teams playing the core roles, EAJ promotes investigation and proposal activities, also with the cooperation of external people and organizations. EAJ summarizes the outcome of its activities, and proposes leading and creative policies to the public agencies, legislative bodies, industry, academic societies, research institutions, etc. in terms of the direction the society shall head for, and provides support for the proposed policies to be socially implemented.

In view of the current situation where legislative bodies and academia have no practical systematic relationship pertaining to important policy making even though Japan is facing complex social issues, the team for the **"Project for the research and trial studies on sharing intelligent information between legislative bodies and academia"** studied where the problems lie and which direction reforms shall take, and summarized what EAJ shall do. The team drafted a report summarizing the results of its study, which was reviewed by the Policy Proposal Committee, examined by the Council, and finalized. Accordingly, the Council of EAJ decided to release the final version of the report. We hope you find this report informative and useful.

This report summarizes and publishes the results of the research and trial studies on sharing intelligent information between legislative bodies and academia conducted by the Engineering Academy of Japan.

THE ENGINEERING ACADEMY OF JAPAN
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Summary

Legislative bodies play a vital role in the formation and implementation of policies based on science and technology. However, in Japan, a systematic channel has not been established to appropriately deliver the intelligent information created by academia to legislature, which is a body that represents all citizens. Even in response to the current COVID-19 pandemic, the relationship between the government and experts has not been made clear, and we can say that this situation has not been meeting the expectations of the citizens of Japan. In this research study, we have contemplated feasible measures from the academia side and conducted some trials in order to realize methods of sharing scientific information relevant to policy creation with the legislature.

The measures needed to be taken and the future outlook is as follows:

(1) Measures calling for immediate attention

① Information sharing with relevant investigation departments to the Diet and the National Diet Library

In order to communicate objective scientific information to the overall legislation, the first realistic measure is to enable the Academy to systematically provide comprehensive information related to themes desired by departments offering scientific information to individual Representatives, such as investigation departments of both houses and the National Diet Library. This should make it easier for individual Representatives to acquire comprehensive information relevant to themes they are interested in.

To make this possible, we hope that the Academy and investigation departments of both houses, and the relevant departments at the National Diet Library will be able to regularly exchange opinions and interact with each other on themes of interest. If possible, it is preferable to have all parties meet at the same time to interact.

② Sharing information with Diet members

Instead of creating a large-scaled system of cooperation toward the House of Representatives and the House of Councilors, we aim to steadily increase contact points with individual Diet members. We want to establish a place where conversations can take place freely on a daily basis, in order to break down the walls between Diet members and scientists. Cooperation with younger Diet members, who have more interest in scientific information, will be the first step in making this possible.

The issues Diet members usually face are not simply science and technological issues, they need to explore ways to resolve social issues by applying science and technology. This means that there will not only be one answer provided by scientists, as there will naturally be alternative ways to resolve a problem. An immediate issue for EAJ is to incorporate the broad interest of legislators in advance in selection of themes by policy advocacy for close examination from larger perspectives, and catering towards the diverse interests of Diet members as much as possible.

Sharing opinions and understanding through daily interaction between legislators and scientists is expected to give birth to optimal measures at sudden occurrences of events with risks exceeding governmental predictions, such as large-scaled natural disasters, nuclear accidents and new infectious diseases.

③ Establishing a cooperative position (such as theme proposals, introducing people for reference) towards the House of Representatives Special Committee on Promotion of Science and Technology, and Innovation.

④ Early establishment of Science & Technology Policy Fellowships such as those in the American Association for the Advancement of Science (AAAS), or pairing schemes such as those seen in England or the European Parliament. For the time being, incorporating an interview system like the one conducted by the EAJ Gender Committee is an option.

(2) The next issues to be addressed

After (1) is conducted and the relationship of cooperation with the legislation progresses, we can set our sights on the following activities as the next step. The policy literacy of scientists and the science literacy of Diet members will both be boosted by creating opportunities for direct contact with academia and Diet members. So,

① Academy and relevant departments in the legislation should co-host a meeting for Diet members and scientists, to discuss issues and exchange opinions on themes which many Diet members are interested in. It is preferable to hold these meetings in the Diet Member's Office Building.

② Literacy should be boosted on both sides in the long run by having the Academy plan and host programs that offer opportunities for Diet members to directly interact with young researchers/graduate students on-site at universities and laboratories, and provide these programs to the legislation.

③ Diet members, particularly in the House of Representatives, are always aware of dissolution after being elected. This results in many Diet members not being able to deeply think about important issues. To resolve this, EAJ should provide a curriculum to boost scientific literacy for budding politicians, such as at schools for political parties and other political schools.

④ EAJ should gather young-generation researchers and engineers from industry - university - government fields to hold policy advocacy exercise lectures at which policy creation is simulated. This will also work to enhance political literacy.

⑤ The probability of establishing a Science Media Center like one in Europe within Japan in the near future is extremely slim. We believe that boosting the Academy's fundamental ability to communicate is vital as the first step. Furthermore, interaction and cooperation with existing scientific departments in Japan's media is the first priority of the Academy.

(3) Conclusion

Interaction between legislators and scientists should be enhanced naturally by a steady build-up of these activities. This will widen the scientists' perspectives toward society and increase the interest of legislators for science. We can expect both sides to communicate opinions in their own special fields (legislation and science) for mutual advice if this can be achieved. This should not be described as giving science advice, but should instead be called co-creation of policies by legislators and scientists. That is why the sub-title for this report is **"Proposal toward achieving co-creation of policies between Diet members and scientists"**, and we look forward to achieving this as soon as possible.

Please note that the EAJ cannot answer for all of the wide range of themes in society. Acquiring the interest of the media while disseminating the purpose of this report widely to academia such as study societies and the media, and deepening cross-sectoral collaboration between diverse academic organizations is necessary to realize goals.

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1. Project

Research and Trial Studies on Sharing Intelligent Information between Legislative Bodies and Academia

2. Overview

Legislative bodies play a vital role in the formation and implementation of policies based on science and technology. However, in Japan, a systematic channel has not been established to appropriately deliver the intelligent information created by academia to legislature, which is a body that represents all citizens. In this research study, we will contemplate feasible measures from the academia side and conduct trials in order to realize methods of sharing scientific information relevant to policy creation with the legislature. We will also investigate the overseas situations as necessary.

3. Implementing body and period

- Implementing body: The Engineering Academy of Japan
  Senior Executive Director Hiroshi Nagano
- Implementing period: April 2019 to June 2020

4. Objective, background and problem awareness

(1) Objective

Legislative bodies representing people hold important positions in planning and implementing science and technology policies. It is expected that they will become more important in the future. However, currently, we cannot say that there are close information exchanges, systematic information exchange in particular, between legislative bodies and academia that produces intelligent information about science and technology.

It would be wise to assume that causes of the issue are present in both the legislature and academia sides. Issues of the legislature side should primarily be deliberated at the legislature side, and it is inappropriate for parties other than legislative bodies to meddle with them. Meanwhile, considering its social roles, it is natural for the academia side to autonomously consider measures to expand information exchanges with legislative bodies.

The Engineering Academy of Japan (EAJ) is a unique organization that comprises engineering-related leading individuals in the industry, academia and government and whose operation is free of any public funding. Therefore, EAJ is able to gather thoughts and requests of various quarters from a neutral standpoint without representing interests of certain parties, and is actively promoting policy proposal activities for various matters including new social systems. One specific example is the project entrusted by the National Diet Library in fiscal year 2017, which is described later.

This research and trial studies are conducted based on the outcome of the project entrusted by the National Diet Library to investigate the cooperative relationship between academia and legislative bodies in major countries. In addition, for this occasion, as a task for EAJ itself, regarding what kind of efforts the academia side shall make to activate information exchanges between the academia and legislative bodies, this research and trial studies aim to investigate cases particularly focusing on activities of organizations called **academies** in advanced countries with the cooperation of academia-side relevant institutions and persons, and to uncover issues and specific measures referencing the results.

In this report, the following main terms are to be used under the definitions below.

The word "**scientists**" refers to researchers and specialists engaged in activities that create new knowledge, or in the use and application of scientific knowledge, in all fields ranging from humanities and social sciences to natural sciences, referencing the definition by the Science Council

of Japan[1]. It automatically includes engineers.

The word "**academy**" refers to an authoritative organization whose members are leading human resources in science or art and that engages in activities for academia or society, independent of legislature, administration, and judicature. An academy selects its new members through strict examination of entrance qualifications by existing members. Meanwhile, the word "**academia**" means the scientific (academic) world in a broad term, either ambiguously referring to individuals and organizations related to a scientific world or used as a collective term for them.
The word "**science advice**" refers to provision of advice by scientists or their group based on their special knowledge so that policy makers can form an appropriate policy or make a decision about a specific issue, referencing the definition of "scientific advice for policy making" by Arimoto and others[2].

In addition, we propose a new concept "**co-creation of policies**." This refers to 'providing policy options by scientists and policy makers in various standpoints drafting evidence-based options that form the foundation of deciding new policies while exchanging information and opinions' through bidirectional cooperation of scientists and policy makers, developing from the word "science advice" which indicates something unidirectional.

(2) Problem awareness about information exchanges between legislative bodies and academia

The major problem awareness during the preparation period of this research and trial studies was what kind of effects the academia side's efforts to promote mutual information exchanges would produce. The problems pointed out can be roughly divided into (1) 'information exchanges' and (2) 'policy option presentation.' To reflect on organization and analysis of results of this research study, the problems were organized and numbered as below, attaching J ('information' is '**j**oho' in Japanese) to the former and S ('policy' is '**s**eisaku') to the latter.

① For the academia side

- **(J1)** Even when they thought of providing legislative bodies with scientific information, they have no idea which department of relevant academic society to use to take action, and as a result have fallen into a state of being unable to do anything. Systematic establishment of a contact window with legislative bodies may enable smooth provision of information to legislative bodies.
- **(S1)** Policies are decided by legislative and administrative bodies. The main role of the academia side is presentation of policy options. By accumulating experience in presenting options, the academia side may have an increased number of contact points with policies as well as an increased number of opportunities for all of academia to think what the ideal society should be like, and may become able to more deeply recognize the roles academia shall play in society. In addition, in the long run, it may lead to improving social acceptance and appreciation of activities of academia.

② For legislative bodies

- **(J2)** If there are academia-side contact windows/departments corresponding to legislative investigation department, they may become able to smoothly make inquiries about scientific information. Apart from the National Diet Library, committee-assisting departments in the legislature do not have staff with a science or engineering background, and therefore this kind of measure may be particularly effective.
- **(J3)** As sometimes information discrepant with scientific facts is artfully passed around, also for

[1] Code of Conduct for Scientists http://www.scj.go.jp/ja/info/kohyo/pdf/kohyo-22-s168-1.pdf: 'the word "scientists" refers to researchers and specialists engaged in activities that create new knowledge, or in the use and application of scientific knowledge, in all academic fields ranging from humanities and social sciences to natural sciences, regardless of which institution they belong to.'

[2] Scientific Advice for Policy Making https://scirex.grips.ac.jp/newsletter/5-2017-03/03.html: 'Scientific advice for policy making is the provision of advice by scientists (including engineers, physicians, and scientists in the fields of humanities and social sciences) or their group based on their special knowledge so that policy makers can form an appropriate policy or make a decision about a specific issue'

Diet members, if there is a department on the academia side where they can question whether the information at hand is true or not, it may help reduce the chance of Diet members obtaining false information.

- **(S2)** Legislative bodies decide on new policies by exchanging opinions with the administration and in a form both parties understand and agree. In this case, if there is a proposal of options from the academia side, legislative bodies may be able to ensure more appropriate judgment.

③ For administrative bodies

- **(S3)** Currently, what is involved with policy decisions more specifically is administrative bodies. Even for administrative bodies, when deliberating with Diet members, having objective policy options being presented may facilitate rational policy decisions.

④ For society in general

- **(J4)** Information sharing with legislative bodies means nothing but communicating with the people behind the Diet members. Regular information sharing between legislative bodies and academia may help prevent social movements based on false information.
- **(J5)** Even if a social movement affected by false information rises, if there is a foundation to disseminate correct information, expansion of any misled social movement may be suppressed.
- **(S4)** If opinions about policy decisions are exchanged between legislative and administrative bodies based on alternative options, policies may become more transparent and rational, and it may become easier for society as a whole to accept the policies.

We promoted this research and studies with the aim of finding specific answers and solutions to problem awareness like those above.

5. Past initiatives related to the objective of this research and trial studies

These research and trial studies aim to extract problems and specific measures regarding what kind of efforts the academia side shall make to vitalize activities to generate a flow of information from academia to legislative bodies, with the cooperation of academia-side relevant institutions and persons, while referencing cases in advanced countries.

Past initiatives referenced from this viewpoint are briefly described below.

(1) Masahiro Sugiyama, Yuya Kajikawa; "Scientific Advice for the National Diet"[3]

Sugiyama and Kajikawa stated the need of science advice for the National Diet of Japan, and considering its importance, proposed establishing a science advice organization within the National Diet to summarize matters to be judged by politicians through Japan-US comparisons, etc. In addition, the authors pointed out that a focus shall be placed on the ideal state of scientists and scientist communities in science advice, which is an important indication related to this research and trial studies. That is, as the authors said, it is crucial for all scientists to be aware of the role of the scientist side in solving problems and to create opportunities for scientists with role awareness to play the role.

However, the authors made no reference to the fact that the Science Council of Japan is not an agency to give advice to legislative bodies under the Science Council of Japan Act, and has an administrative agency-like nature which sets it apart from what we call scientific academies that meet international standards (this point will be described in detail later). As a result, the authors failed to mention scientists and their groups that shall be in charge of information exchanges with legislative bodies.

(2) Science and Technology Research Project 2017 Report "Policy Decisions and Scientific Literacy"[4]

In fiscal year 2017, entrusted by the National Diet Library, EAJ investigated the cooperative relationship between legislative bodies and academia in major countries, and summarized the findings in a report titled "Policy Decision and Scientific Literacy." In this investigation, we looked into activities of the legislature side as well as related activities of the scientist or academia side.

In the report, EAJ summarized what kind of information is communicated between legislative bodies and academia by what kind of channels and what kind of relationship they are under in each country, in the era of post-truth. The investigation confirmed the presence of activities by the initiative of legislative bodies as well as various forms of cooperative activities initiated by the academia side.

In this entrusted investigation, EAJ primarily investigated bodies that investigate scientific facts inside legislative bodies, so-called parliamentary technology assessment bodies, in advanced countries, like STOA[5] in the European Parliament, and discovered that various activities are taking place ranging from selection of investigation subjects to utilization of investigation results. Meanwhile, also about the academia side, EAJ found that some entities engage in investigation activities very actively at the request of public institutions, like the National Academy of Science in the US. In the case of Japan, there was nothing particularly noteworthy on either side.

If anything, one case that can be considered as an activity by Japan's legislature is the National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission, but this was established as an extremely rare case. Also, follow-up of the activities by the National Diet is not sufficient.

What kind of systems are to be established inside the legislature is a problem that needs to be solved by the legislature itself. On the other hand, how information is to be communicated to legislative bodies is something the academia side shall give consideration to, but EAJ pointed out that the academia side didn't seem to have had such problem awareness.

(3) Lecture Meeting "Policy Decisions at National Diet and Scientific Literacy" jointly hosted with the National Institute of Science and Technology Policy (NISTEP), Ministry of Education, Culture, Sports, Science and Technology (MEXT) July 19, 2018, MEXT

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[3] Journal of Science Policy and Research Management Vol. 27, No.3/4 (2012), p.226 https://doi.org/10.20801/jsrpim.27.3_4_226

[4] Research and Legislative Reference Bureau, National Diet Library March 2018 https://id.ndl.go.jp/bib/028915413

[5] Science and Technology Options Assessment: https://www.europarl.europa.eu/stoa/en/home/highlights

As part of the follow-up for the investigation entrusted by the National Diet Library, in July 2018, EAJ held a lecture meeting "Policy Decisions at National Diet and Scientific Literacy" at MEXT, jointly hosted with NISTEP, where EAJ gave a presentation about the content of the report and exchanged opinions with the attendees.

Many people attended the lecture meeting, which indicated strong interest on the matter and, in particular, high expectation being placed on having discussions about what shall be done to change the situation of extremely little information being exchanged between academia and legislative bodies.

6. Implementation items and method

To respond to the objective above, we established the research system below and conducted research and trial activities.

(1) Research system

① Representative: The Engineering Academy of Japan
Hiroshi Nagano, Senior Executive Director
② Secretariat: EAJ Academy Staff (Chief Secretariat Kotaro Inoue)
③ Co-researchers[6]: as mentioned on page i
④ Research cooperators[7]: as mentioned on page i
⑤ We established a committee comprising co-researchers, and deliberated various matters including how to promote this research study, how to summarize the outcome, and how to compose a report. Committee meetings were held on the dates below[8].
i) May 8, 2019 1st committee meeting
ii) September 4, 2019 2nd committee meeting
iii) January 27, 2020 3rd committee meeting

(2) Specific implementation items and method

① Literature review and interview surveys about ideal ways of giving science advice to legislative bodies in Japan
We investigated the current situation of related activities carried out by academic societies, in addition to the Science Council of Japan. In addition, to gather knowledge and opinions about ideal ways of giving science advice, we conducted interview surveys below to relevant persons including specialists in relevant fields.
i) April 8, 2019 Takashi Inutsuka, Counselor, Science Council of Japan
ii) April 8, 2019 Shinichi Kobayashi, Visiting Professor, Hiroshima University
iii) April 9, 2019 Tateo Arimoto, Adjunct Professor, National Graduate Institute for Policy Studies
iv) April 23, 2019 Yuko Yasunaga, Head, UNIDO Investment and Technology Promotion Office, Tokyo
v) May 9, 2019 Shunsuke Ikeda, Professor Emeritus of Tokyo Institute of Technology, Adviser of EAJ
vi) May 27, 2019 Akira Morita, Director-General, Research Institute of Science and Technology for Society, JST
vii) July 1, 2019 Atsushi Sunami, Executive Director at Sasakawa Peace Foundation, Executive Advisor to President at the National Graduate Institute for Policy Studies
viii) July 3, 2019 Masaharu Yagishita, Visiting Professor at Sophia University, Institute for Dialogue of Environmental Policy
ix) July 24, 2019 Nobuo Tanaka, President of Sasakawa Peace Foundation, former Executive Director at the International Energy Agency
x) August 2, 2019 Yuko Fujigaki, Professor, Graduate School of Arts and Sciences, The University of Tokyo
xi) March 24, 2020 Sayaka Oki, Professor, Graduate School of Economics, Nagoya University
② Literature review and interview surveys about the current situation of investigation activities inside legislative bodies
Through the interview surveys below and other investigations, we gathered information about

[6] To co-researchers, we also conducted interviews by visiting them individually.
[7] To research cooperators, we asked them to attend meetings of committee comprising co-researchers, and also conducted interviews by visiting them individually.
[8] Details of discussions held at the committee meetings are omitted in this translation for editorial reasons.

the situation of activities by the secretariat of standing committees related to science and technology both at the House of Representatives and the House of Councillors, in addition to the Research and Legislative Reference Bureau, National Diet Library.

i) April 10, 2019 Daisuke Sawada, Unit Chief, National Diet Library
ii) June 7, 2019 Kunji Akiya, Director, Planning and Coordination Office, House of Councillors
iii) July 3, 2019 Ikuko Yoshida, Director, Research Office of Education, Culture, Sports, Science and Technology, Lower House Research Bureau, National Diet of Japan
iv) August 8, 2019 Hironori Kamezawa, Director, Third Research Office of the Special Committees and the Research Committees, House of Councillors

③ Literature review and interview surveys about cases in advanced countries where activities are taking place

③-1 Selection of countries to be investigated

We decided to conduct interview surveys about the current situation in the UK, Germany, France, Switzerland, and Austria, for their unique characteristics. We also conducted literature review about the system in the US which is extremely vigorous about investigation activities by academies and other institutions. As for EU, we utilized the results of the investigation entrusted by the National Diet Library.

③-2 Selection of institutions to be investigated

We obtained valuable information about where to visit from the people below through interview surveys.

i) May 10, 2019 Professor Chris Tyler, University College London. He is very knowledgeable about the situation of science advice in various countries.
ii) August 7, 2019 Yuki Kobayashi, Research Fellow at Sasakawa Peace Foundation. He is very knowledgeable about the relationship between the science and technology fields and legislative/administrative bodies in France.

In addition, we requested interviews to academies in various countries with which EAJ has been communicating.

Based on the information, we visited the institutions below for investigation and surveys.

Table 1 List of Institutions Visited for Investigation in Europe

Institution visited	Overview
The Parliamentary Office of Science and Technology (POST), UK[9]	A parliamentary institution founded in 1985, which assists members of parliament with effective investigation on science and technology matter. It assists members of parliament with policy making by composing documents, holding events, and assisting committees in the House of Lords and the House of Commons, in addition to independently investigating policy issues related to science and technology. It releases regular publications such as "POSTnotes" focusing on the issues related to science and technology, with the aim of forecasting policy implications.
UK Parliament House of Commons Library[10]	Founded in 1817. A parliamentary library. The main users are members of the House of Commons and its staff. One of offices of the House of Commons. It provides information services such as material loaning and copying, and investigation services by specialist staff on request.
The Royal Society, UK[11]	Established in 1660. The oldest fellowship of scientists in the world. Its mission is to promote excellence in science and to encourage the use of science for the benefit of humanity and for the Earth. Its main activities include support for scientists including financial support, support for mathematics and science teachers, provision of science advice to policy makers, holding science-related events, and publication of science journals.

[9] Parliamentary Office of Science and Technology : https://post.parliament.uk/
[10] House of Commons Library: https://www.parliament.uk/commons-library
[11] Royal Society: https://royalsociety.org/

Science Media Centre[12]	A UK nonprofit organization founded in 2002. For the purpose of providing clear and evidence-based information about complicated matters that are controversial and may lead to false reporting, it implements initiatives to bridge specialists and media regarding news in the fields of science and technology.
Office of Technology Assessment at the German Bundestag (TAB)[13]	Established in 1980. Its objective is to provide the German Bundestag and its committees with advice on research- and technology-related matters. The secretariat is independently operated by an institution that won 5-yearly competitive tender.
German National Academy of Sciences Leopoldina[14]	Created in 1652. Appointed as the national academy of sciences in 2008, it is externally regarded as an academy representing Germany. It consists of four classes: Mathematics, Natural Sciences and Engineering; Life Sciences; Medicine; and Humanities, Social and Behavioural Sciences. It is particularly strong in medicine and natural sciences.
Berlin-Brandenburg Academy of Sciences and Humanities (BBAW)[15]	Established in 1700 as the Royal Prussian Academy of Sciences. It consists of four classes: Humanities; Social Sciences; Mathematics and Natural Sciences; Biological and Medical Sciences; and Technical Engineering. Its main activities are long-term research projects centering on humanities, research projects for summarizing knowledge and findings on interdisciplinary matters, and promotion of science-society dialogs. In 2008, it announced the guidelines for providing policy advice.
German National Academy of Science and Engineering (acatech)[16]	Established in 2003 as an independent nonprofit organization to represent the thoughts of German engineering. In 2008, it started to receive financial support from the federal and state governments. It aims to provide advice on future matters from technical viewpoints, a place of communications between science and economy, support for young successor human resources (in engineering), and internal and external dissemination of voices of engineers. It also created the Industry 4.0 implementation proposal jointly with an advisory body of the Federal Ministry of Education and Research.
Science Media Center Germany[17]	Inaugurated in 2015. Its duty is to provide information on science that contributes to public welfare from a neutral standpoint. It provides journalists with correct information and knowledge. Established pursuant to the intention of late Klaus Tschira, one of the founders of SAP AG, it maintains its neutrality mainly sponsored by the Klaus Tschira Foundation.
The Parliamentary Office for Scientific and Technological Assessment (OPECST), France[18]	Established in 1983. It aims to inform Parliament of scientific and technological options in order, specifically, to make its decisions clear. Initially it placed importance on objective evaluation and assessment by external experts, but the deliverables became mere collections of opinions of experts, and were not directly useful for decision making. For that reason, it expanded the roles of members of parliament who are OPECST members and called rapporteur, and members of parliament started to directly be involved with analysis and preparation of reports.
National Academy of Technology of France (NATF)[19]	Established in 2000 (legally in 2006). The number of members is 330. It maintains thorough communication with OPECST. It takes the role of secretariat for the European Council of Applied Sciences and Engineering (Euro-CASE), a group of 23 European engineering academies led by EU.
TA-SWISS[20]	Established in 1992 based on the decision made by the Federal Council and Assembly. Initially it was established in the Swiss Science and Technology Council, an advisory body for the Federal Council. In 2016, it was established as an independent public-service corporation by the Association of Swiss Academies of Arts and Sciences. Its objective is to provide advice to the Assembly and the Federal Council, as well as to encourage discussions by organizing debate forums involving citizens.
Institute of Technology Assessment (ITA), Austria[21]	Inaugurated in 1988 as the TA Department of the Austrian Academy of Sciences (AAS). In 1994, it was renamed to ITA and became one of the 60 institutes of AAS. It gives advice to the administration, legislature, labor unions, Economic and Social Committee, European Commission, etc.

Source: Prepared by this research study.

[12] Science Media Centre: https://www.sciencemediacentre.org/
[13] Büro für Technikfolgen-Abschätzung beim Deutschen Bundestag: https://www.tab-beim-bundestag.de/en/
[14] Nationale Akademie der Wissenschaften Leopoldina: https://www.leopoldina.org/en/leopoldina-home/
[15] Berlin-Brandenburgische Akademie der Wissenschaften: http://www.bbaw.de/
[16] Deutsche Akademie der Technikwissenschaften: https://en.acatech.de/
[17] Science Media Center Germany: https://www.sciencemediacenter.de/das-smc/gesellschafter/
[18] Office parlementaire d'évaluation des choix scientifiques et technologiques: https://www.senat.fr/opecst
[19] National Academy of Technology of France: https://www.academie-technologies.fr/en/
[20] TA-SWISS, the Foundation for Technology Assessment: https://www.ta-swiss.ch/en/
[21] Institute of Technology Assessment: https://www.oeaw.ac.at/en/ita/

③-3 Dates of visits

We visited the institutions to be surveyed on the dates below[22]. For surveys other than those in September, an opportunity of visiting the country to be investigated for a different purpose was used.

i) May 20, 2019 Office of Technology Assessment at the German Bundestag (TAB)
ii) September 16, 2019 The Royal Society (RS) and Royal Academy of Engineering (RAEng)
iii) September 16, 2019 Science Media Centre
iv) September 17, 2019 UK Parliament House of Commons Library
v) September 17, 2019 The Parliamentary Office of Science and Technology (POST), UK
vi) September 18, 2019 German National Academy of Science and Engineering (acatech)
vii) September 18, 2019 Berlin-Brandenburg Academy of Sciences and Humanities (BBAW)
viii) September 19, 2019 TA-SWISS
ix) September 20, 2019 Institute of Technology Assessment (ITA) of the Austrian Academy of Sciences (AAS)
x) September 23, 2019 The Parliamentary Office for Scientific and Technological Assessment (OPECST), France
xi) September 23, 2019 National Academy of Technology of France (NATF)
xii) November 26, 2019 Science Media Center Germany
xiii) November 28, 2019 German National Academy of Sciences Leopoldina

③-4 Flow of legislature science advice and information exchanges in countries

Examples of legislature science advice in advanced countries give us many invaluable suggestions. Also, in countries other than Japan, we can clearly see the flow of legislature science advice from academia that is linked to policy making. To visualize that, we illustrated the flow of legislature science advice using diagrams for the UK, Germany, France, Switzerland, Austria, as well as the US, EU and Japan which were investigated through literature, etc., taking into account the differences in their political systems (Figures 1-1 to 1-8 in following pages). All diagrams include the flow of science advice within the parliament as well, where known. The flow of funds is complicated and omitted from the diagrams.

(In the diagrams, arrows are used for the meanings below.)
Black: Flow of science advice involving policy making
Gray: Flow of other science advice
White: Flow of people encouraging the exchange of scientific information

Bidirectional: Requests and responses to the requests
Unidirectional: Relatively one-sided provision

Detail analysis is to be described later, but the countries develop information exchanges between the academia and legislative bodies (including science advice from academia), according to the state of affairs on the country. In contrast, it is evident that there is no systematic information exchange between academia and legislative bodies (including science advice) in Japan.

[22] Details of interviews are provided in relevant Materials. (omitted in this translation).

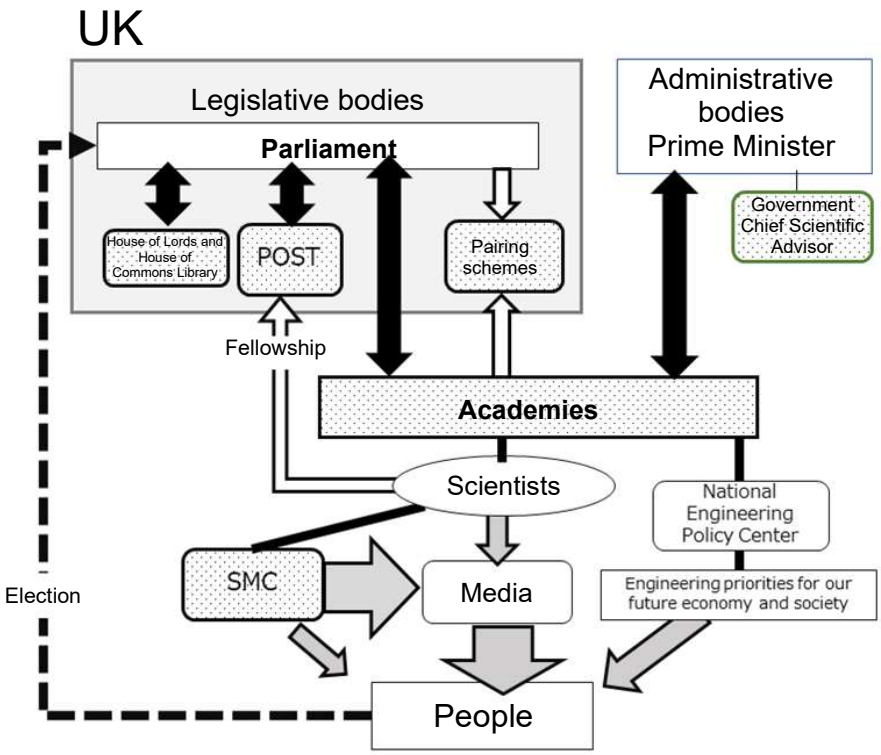

Figure 1-1 Flow of legislature science advice in the UK

Source: Prepared by this research study.

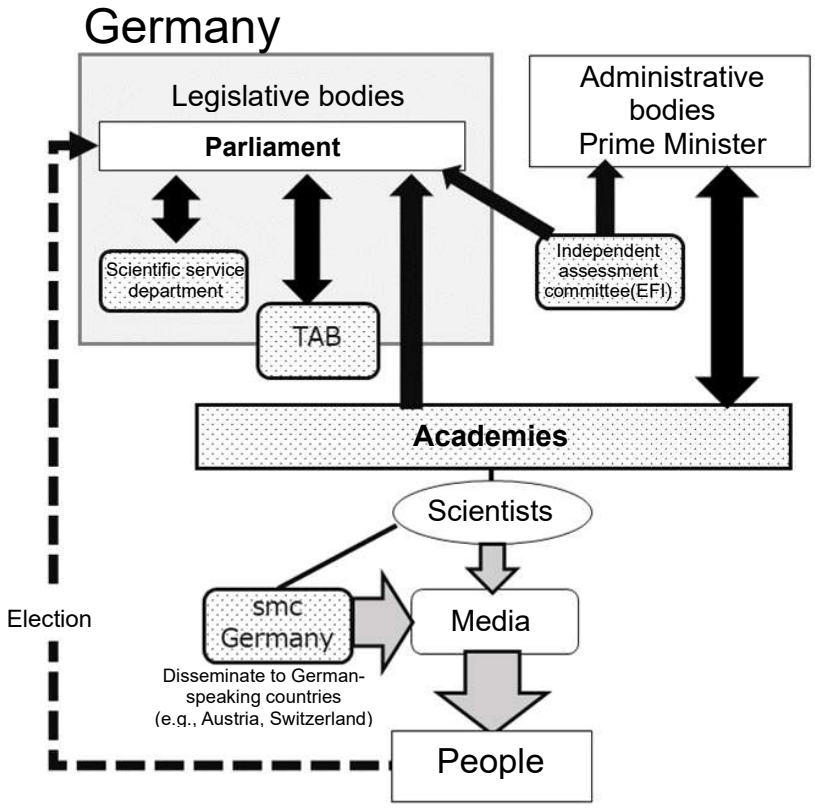

Figure 1-2 Flow of legislature science advice in Germany

Source: Prepared by this research study.

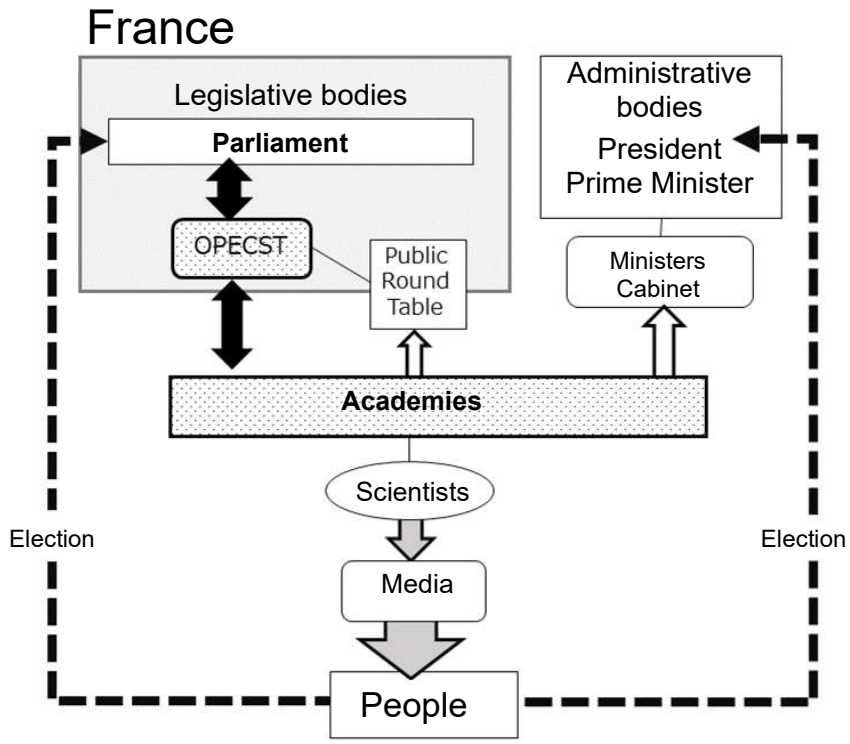

Figure 1-3 Flow of legislature science advice in France
Source: Prepared by this research study.

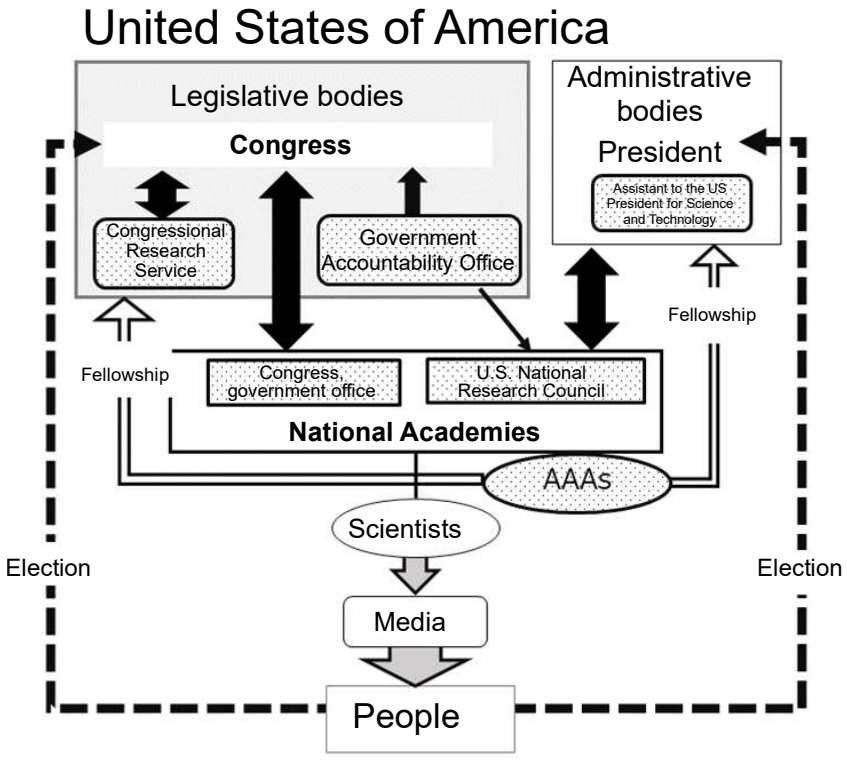

Figure 1-4 Flow of legislature science advice in the US
Source: Prepared by this research study.

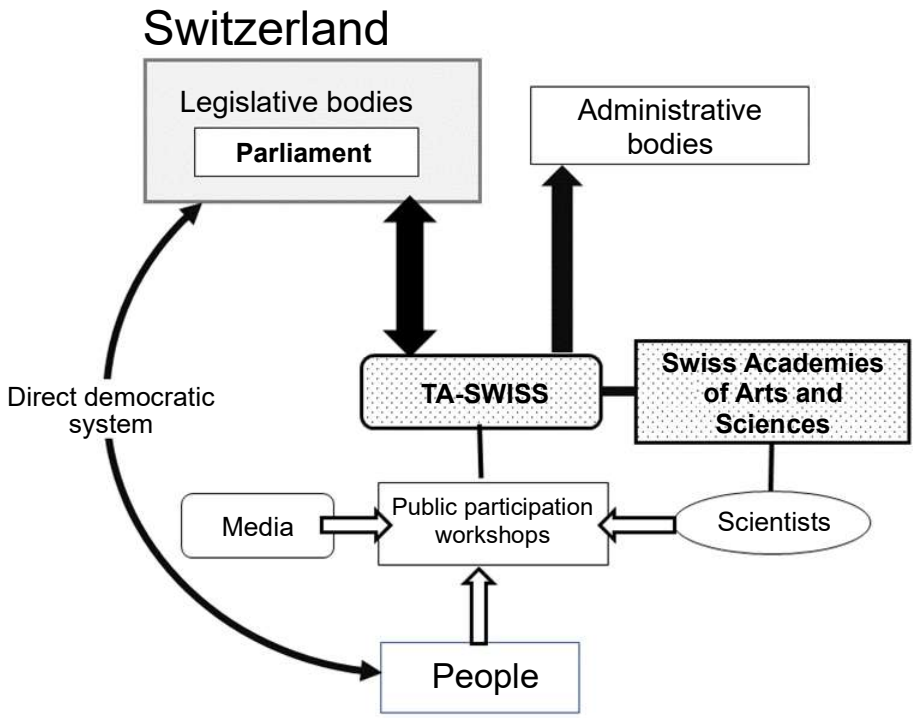

Figure 1-5 Flow of legislature science advice in Switzerland
Source: Prepared by this research study.

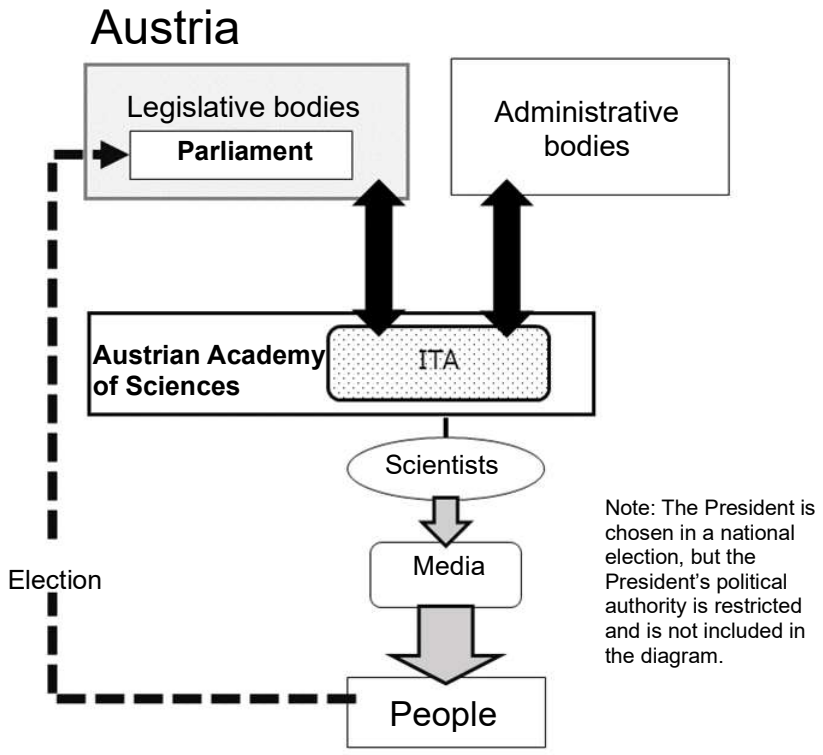

Figure 1-6 Flow of legislature science advice in Austria
Source: Prepared by this research study.

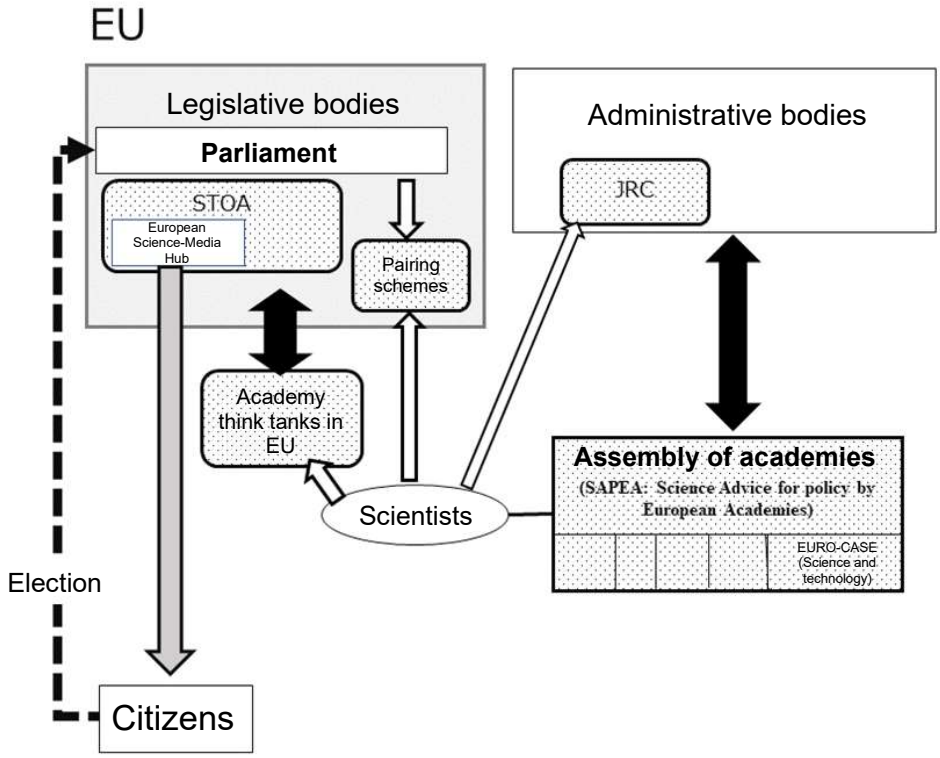

Figure 1-7 Flow of legislature science advice in EU

Source: Prepared by this research study.

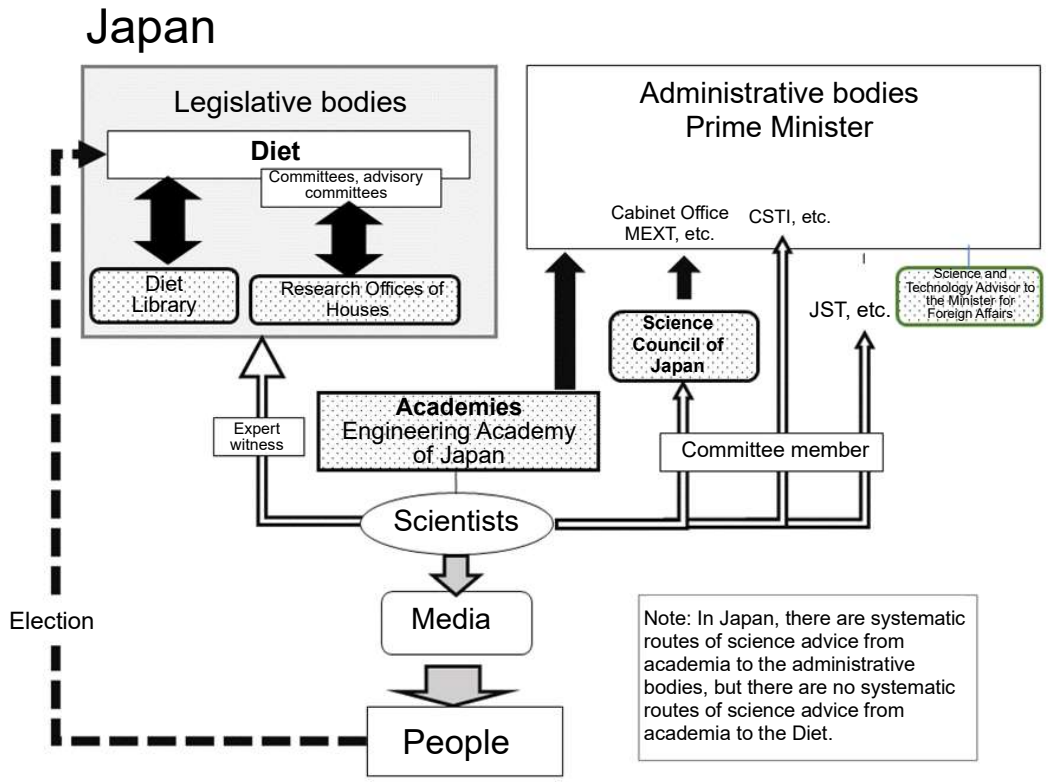

Figure 1-8 Flow of legislature science advice in Japan
Source: Prepared by this research study.

④ Opinion exchange toward trial interaction with Diet members

Based on interviews with specialists and Diet members very interested in making science and technology policies about which part of legislative bodies shall be used for contacting and what kind of occasions of exchanges shall be established, we studied what kind of channels can be built between academia and legislative bodies.

i) June 17, 2019 Izuru Makihara, Professor, Research Center for Advanced Science and Technology (RCAST), The University of Tokyo
ii) July 10, 2019 Ryohei Kanzaki, Director, RCAST
iii) August 2, 2019 Izuru Makihara, Professor, RCAST
iv) August 7, 2019 Yoshimasa Hayashi, member of the House of Councillors
v) September 3, 2019 Shinichi Isa, member of the House of Representatives
vi) October 25, 2019 Hideki Niizuma, member of the House of Councillors
vii) October 28, 2019 Yoshimasa Hayashi, member of the House of Councillors
viii) November 22, 2019 Atsushi Oshima, member of the House of Representatives
ix) January 15, 2020 Wakako Yata, member of the House of Councillors
x) February 4, 2020 Keitaro Ohno, member of the House of Representatives
xi) February 18, 2020 Kan Suzuki, former member of the House of Councillors
xii) March 12, 2020 Keisuke Tsumura, member of the House of Representatives
xiii) March 16, 2020 Shinichi Isa, member of the House of Representatives
xiv) May 26, 2020 Shinichi Isa, member of the House of Representatives
xv) June 10, 2020 Atsushi Sunami, Executive Director at Sasakawa Peace Foundation, Executive Advisor to President at National Graduate Institute for Policy Studies
xvi) June 12, 2020 Shinichi Isa, member of the House of Representatives
xvii) June 24, 2020 Keitaro Ohno, member of the House of Representatives

⑤ Interaction between scientists and Diet members (trial implementation)

Based on the opinion exchanged above, we arranged opportunities for scientists and Diet members to interact as below, with the cooperation of Diet members who were interested in this subject.

⑤-1 Laboratory visit by Diet member

On January 27, 2020, in response to the plan and proposal by EAJ, Yoshimasa Hayashi, member of the House of Councillors visited laboratories at RCAST, The University of Tokyo, and exchanged opinions with relevant people including young researchers. This project was realized with the thought that it would be helpful in searching the directionality of this research study, since RCAST covers a broad range of research activities from humanities to sciences and enables opinion exchanges between the miniature-version scientific world and Diet member.

Young researchers offered many opinions about a support system and other matters. In the opinion exchange including RCAST Director Kanzaki held in the end, Diet member Hayashi stated that "If there are opportunities for Diet members to meet engineers like in the case of Royal Swedish Engineering Academy, Diet members may join such gatherings."

⑤-2 Workshop "What Happens When Politicians Are Mixed With Researchers?" (Building Relationship Between Diet Members and Academia)[23]

• Objective of discussions

i) Some democratic nations have a system for members of parliament to obtain knowledge pertaining to the relationship between technological sciences and society through interactions with neutral organizations (not only from individual specialists), and utilize the obtained options in policy making. Maybe Japan also has to create such a system in a medium- to long-term view?

ii) To that end, what is required of the academia side? (For example, what is required of EAJ when it comes to engineering matters?)

iii) What are the measures to improve the policy literacy of the scientist and engineer side and the science literacy of Diet members?

Panel discussions were held for the common problem awareness:

• Panelists: Shinichi Isa (House of Representatives, Komeito Party), Keitaro Ohno (House of Representatives, The Liberal Democratic Party of Japan)
• Moderator: Atsushi Sunami, President of Sasakawa Peace Foundation, Executive Advisor to President at National Graduate Institute for Policy Studies
• Emcee: Hiroshi Nagano, Adviser of Engineering Academy of Japan
• Date and time: Thursday, June 25, 2020 11 am to noon
• Venue: Large Conference Room, Members Building No.1, House of Representatives
• Host: Engineering Academy of Japan
• Number of participants: 75
  • Breakdown: 36 Fellows, 2 Corporate Members, 13 journalists, and other (persons from the National Diet Library, Planning and Coordination Office of House of Councillors, National Graduate Institute for Policy Studies, Sasakawa Peace Foundation, etc.)
• Summary of statements by Diet members

i) When managing a nation, the balance of legitimacy and rightness is required, and for that, appropriate systems, their operation, and awareness need to all be present and circulate. I would like to expect to hear from academia the rightness seen from scientific points of view.

ii) Response to climate change, medical issues, and pension systems. They need to be handled according to science advice, but many are just unable due to political reasons. Also, if some scientifically correct things are made not known to the government or legislature, that would be opportunity losses for the people.

iii) Science and politics are both related to all events in society. But in Japan, communication between the two is very weak, which is very regrettable. Both science and politics have their own legitimacy and rightness. It would be ideal if they can build a good relationship while

[23] A report of the workshop featured in "Ronza" on Asahi Shimbun is included in the Materials. (omitted in this translation)

maintaining that.

iv) Young researchers getting some experience in the legislative bodies for a certain period of time may be beneficial for both politicians and scientists.

v) When our party selects knowledgeable persons, we consult ministry departments. But there is a sense of fear that persons favorable to the government come forward.

vi) I wonder if there was a situation where the Council for Science and Technology was cleverly used by the administration. Including the issue of utilizing nuclear energy, directly linking legislative bodies and academia will have significant meaning.

vii) I don't think there is a body that represents academia in Japan. We have to seriously think about what kind of system can be created in Japan.

7. Summary of results of research and trial studies

(1) Europe and the US, after the U.S. Office of Technology Assessment (OTA), which was a pioneer of science advice activities at legislative bodies

The Office of Technology Assessment inaugurated in 1972 greatly affected the relationship between the parliament and specialists in science and technology in Europe. OTA was a pioneer of evidence-based policy making, that had a relatively large budget and organization and was very active in its actions, but was discontinued in 1995. It is said that the Republican Party didn't like it having been overly active.

However, the concept of OTA spread to Europe, and European states started to establish a system to systematically input science and technology information into the parliament although the systems considerably differ from state to state. In the US, a movement to revive OTA is ever present, and in 2004, the General Accounting Office (GAO) was reformed to the Government Accountability Office (GAO; same abbreviation) and started to evaluate government's activities including science and technology. One may say a part of the functions of OTA have been revived by this reform.

(2) Situation of discussions about science and technology at the National Diet of Japan

Discussions on science and technology at the National Diet of Japan seem to have slowed down since the reorganization of the central government ministries and agencies in 2001. Because standing committees of the National Diet are established corresponding to the ministries and agencies of the government, a standing committee handling science and technology corresponding to the Science and Technology Agency of the Prime Minister's Office was present both at the House of Representatives and the House of Councillors prior to the reorganization, and the standing committees had had reasonably active deliberations twice a week on regular days during a session. After the reorganization of the government in 2001, the functions of the former Science and Technology Agency were split into MEXT and the Cabinet Office (CAO), deliberations about science and technology were to be held at the Committee on Education, Culture, Sports, Science and Technology and Committee on the Cabinet, respectively. However, the Committee on Education, Culture, Sports, Science and Technology primarily deals with education, and the Committee on the Cabinet handles various subjects including economy and finance, and therefore opportunities to discuss science and technology have become fewer.

In January 2011, the House of Representatives established the Special Committee on Promotion of Science and Technology, and Innovation. However, it is a special committee, not a standing committee, and for that reason the number of meetings held is low. As a side note, the said Special Committee agreed to establish an advisory board consisting of knowledgeable persons, but such an advisory board is yet to be established.

In response to the Fukushima Nuclear Power Station Accident, the National Diet of Japan enacted the Act on the National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission[24], and established the National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission (NAIIC) consisting of external knowledgeable persons. It was an epoch-making event where a committee consisting of external knowledgeable persons was given legal grounds to prepare reports and submit them to the National Diet.

In July 2012, the NAIIC compiled the investigation results into a report. In the report, the NAIIC proposed "In the National Diet of Japan, the Nuclear Energy Temporary Investigation Committee <tentative name> is to be established as a third-person organization independent of nuclear operators and administrative agencies and consisting of specialists primarily from the private sector. In addition, a system is to be created where the National Diet of Japan can launch such an independent investigation committee for each issue, and investigations and studies are to be continued without adhering to previous ways of thinking." However, this has not been realized yet.

(3) The key points derived from the investigations for the advanced countries

In the systems pertaining to the promotion of science and technology in advanced countries, as for methods of funding and research evaluation, the countries have relatively similar methods through benchmarking, etc., and communication and interaction among researchers is becoming easier. However,

[24] Act No. 112 of 2011

when it comes to a system of science advice for legislative bodies, amazingly, the countries show completely different complexions. This is probably because the political systems are different and diverse in the countries reflecting the differences in the social and historic background. Though they have such differences, the advanced countries are making various attempts for sharing information between legislative bodies and academia, especially activities for sharing information between organizations. At the same time, they also conduct activities not only to improve science literacy of members of parliament but also to raise policy literacy of the academia side, anticipating a synergistic effect of the two to vitalize information exchanges between legislative bodies and academia. However, in Japan, while there may be some personal movements, there are little to no systematic activities. We can see a clear difference between advanced countries and Japan in terms of science advice.

① International comparison of systematic sharing of scientific information

Figure 2 shows whether such systematic activities are conducted by the initiative of the parliament side or by the academy side, created by categorizing and arranging information obtained by the research study.

The figure teaches us that advanced countries have systematic activities at the parliament, and, in addition, they have various systems for the science and technology side, especially academies, to get involved. An academy is generally an organization comprising leading human resources in science or art and its members are elected according to a certain recommendation system and engage in activities for academia or society indefinitely. This concept is broadly shared by academies in various countries, including the US, UK, Germany, France, Sweden, and China. Academies are socially recognized as organizations representing scientists, and energetically conduct activities to make proposals to outside the academies, including the government and legislature. We can see that the parliament and academies are also conducting activities to deepen mutual cooperation and to improve literacy about each other (this point will be discussed in detail in ② below).

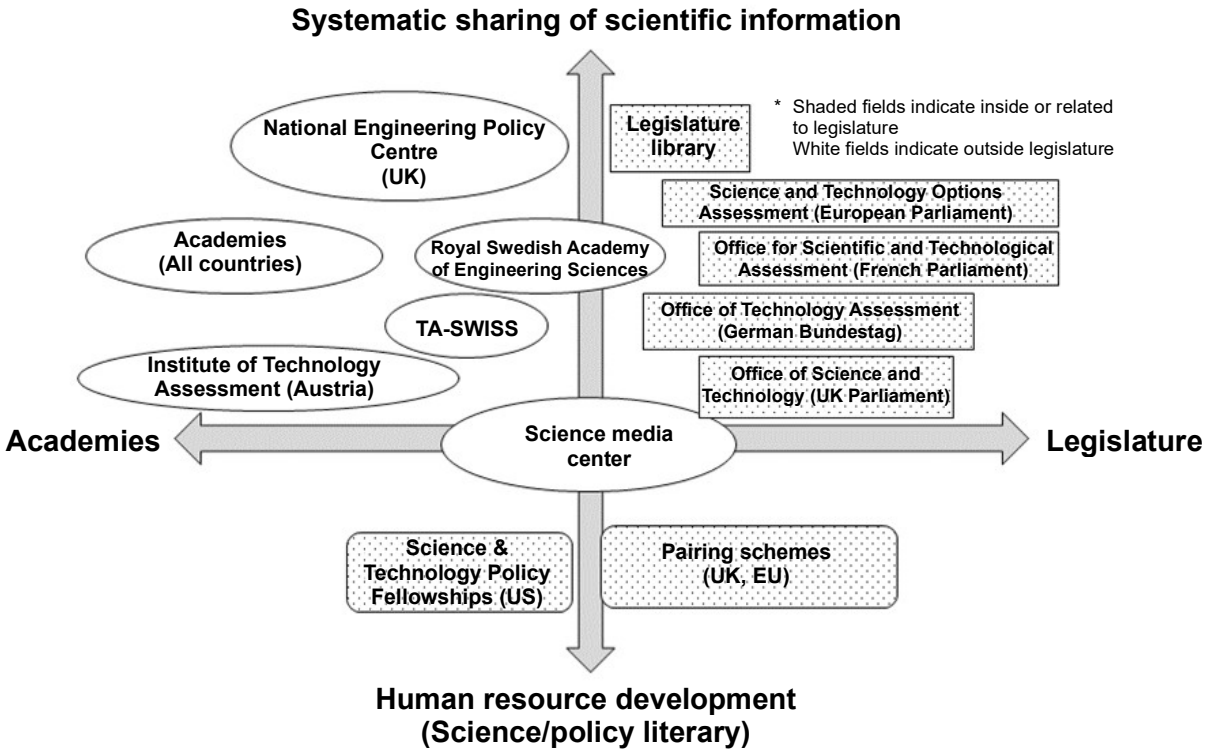

Figure 2 Provision of scientific information to parliament and human resource development (Europe, US)

Source: Prepared by this research study referencing the Science and Technology Research Project 2017 Report "Policy Decisions and Scientific Literacy" March 2018 (National Diet Library).

In Japan, what the government has named an academy is only The Japan Academy. Its predecessor is the Meirokusha founded by Arinori Mori and others in 1873, which was renamed in 1947 as The Japan Academy (Japan Academy Act[25]). Aiming to afford preferential treatment to highly distinguished academics, The Japan Academy is to conduct business necessary for contributing to the advancement of sciences. It is functioning as an honor awarding institution so to speak, but it does not conduct policy proposal activities nor contact legislative bodies.

Another well-known institution in Japan is the Science Council of Japan (SCJ), which has been established as a special institution of the Cabinet Office and sometimes called the "Diet of scholars." SCJ participates in international meetings of academies in other countries as a representative of Japan. However, the basis of its foundation, the Science Council of Japan Act[26] tells us that SCJ's nature is different from the academies in advanced countries. For example, SCJ members have a tenure of six years. Also, members are not necessarily scientists that represent academia of Japan; scientists that meet the appointment criteria at the time of taking the post are eligible to be members. In addition, the duties of SCJ are to make proposals and give advice to the government as stipulated in the SCJ Act, and a relationship with legislative bodies is not part of its duties.

Like these, both of the institutions that represent Japan in the field of science, The Japan Academy and SCJ, do not have systematic relations with the National Diet of Japan. As a result, provision of scientific information to Diet members in Japan is done personally by individual scientists or specialists or through administrative bodies, and there are no channels for directly and systematically conveying diverse opinions present at academia to the National Diet of Japan.

[25] Act No. 27 of 1956
[26] Act No. 121 of 1948

② International comparison of literacy improvement measures

Interest in improving policy literacy of scientists and science literacy of Diet members is extremely lacking in Japan. Meanwhile, the US, UK, and European Parliament are very interested, and are making their own efforts to improve literacy.

In the US, since 1973, the American Association for the Advancement of Science (AAAS[27]) has been taking the core role in promoting the Science & Technology Policy Fellowships system in cooperation with over 30 science and technology organizations. This is a system to send young researchers to federal government agencies or the Congress in the capital Washington, D.C. for one year. The number of Science & Technology Policy Fellows sent to the Congress is about 30 per year, and young researchers become staff to the Congress or Congress members and directly feel and experience the field of Congress, including preparation of legislative proposals and communication with citizens in the electoral district. Stories of young researchers' experience are published in academic journals, where they positively talk about their intense experience.

The fellowship attracts many applicants, and after the training many young researchers leave research and become a member of Congress, work at Congress, or become a government official to build their career. It is said that only about one third of the young researchers go back to doing research.

In Europe, a pairing system that originated in the UK has become a universally accepted method. This is a system to call for applicants from members of Parliament, government staff, and researchers, and for them to form partners, undertake one week of general training called the Westminster Week, and become partners for one year to mutually experience each other's workplace. The implementing and recruiting organization is The Royal Society. Approximately 30 partners are formed each year, and about half of them go to the Parliament and the remaining partners go to governmental agencies. In addition to The Royal Society, there also exist institutions that implement their own schemes of pairing with members of Parliament.

It seems the European Parliament has adopted the UK method in general, but pairing is managed by the Science and Technology Options Assessment, a standing committee of the European Parliament. It started in 2007, and pairing has been implemented seven times to date. In 2018, 15 pairs were formed. In the case of the European Parliament, it will be pairing across state borders.

We have to say, for specialists in science and technology, whether a matter is scientifically correct or not is almost automatically known, but whether it is politically relevant is difficult for them to discuss or judge, or at a completely different level. However, when giving explanations to members of parliament, the members may not be convinced unless the person giving the explanation has the ability to explain whether the matter is politically relevant or not, in addition to about it being scientifically correct. In order for specialists in science and technology to share scientific information with members of parliament in the true sense, it is extremely important to hone this explanation ability. The Science & Technology Policy Fellowships in the US and the pairing system in the UK and the EU Parliament may be effective for academia human resources to improve their policy literacy as well as for members of parliament and the general public to improve their science literacy.

(4) Idea of scientific information exchanges with legislative bodies is spreading globally

Legislature science advice is becoming a common topic of conversation in the world. In November 2018, a workshop to discuss the current status and issues of science advice to legislative bodies was held targeting every country, including developing countries, as part of the International Network for Government Science Advice (INGSA) conference held in Tokyo.

In the workshop, 36 persons from 17 countries participated. A thorough questionnaire survey to uncover the issues in countries was implemented in advance, to which 183 persons from 50 countries responded and submitted 254 issues. As examples of the issues, Table 2 shows the top ten questions raised.

[27] American Association for the Advancement of Science: https://www.aaas.org/

Table 2 The top ten types of legislative science advice (LSA) that experts would be most interested to learn

1	Whether legislative use of scientific evidence improves the implementation and outcome of social programs and policies
2	Under what conditions legislators and staff seek out scientific information or use what is presented to them
3	How different communication channels - hearings, face-to-face meetings, email, social media, etc.) affect informational trust and use
4	How legislators and their staff assess the credibility of scientific information
5	Under which conditions the use of scientific information changes the framing of policy debates
6	What role intermediaries and research brokers play in getting scientific information before legislators and their staff
7	The factors that legislators weigh in deciding whether to accept or reject a scientific recommendation
8	How the design of new structures, processes, and systems can increase legislative capacity for science use
9	How the formal and informal practices of legislatures influence the consideration and use of scientific information
10	How policymakers and researchers work together in defining problems and processes for generating evidence

Source: Karen Akerlof et al., "A collaboratively derived international research agenda on legislative science advice," Palgrave Communications, 5:108, 2019.

This preliminary survey enabled deepening mutual understanding about what are the interests and issues in legislature science advice in the countries in the world. At the same time, the workshop was very successful as it allowed us to gain mutual recognition that scientists involved with legislature science advice are highly active in many countries and that legislature science advice is an internationally common subject of interest. The survey results are summarized and published in a peer-reviewed paper titled "A collaboratively derived international research agenda on legislative science advice[28]." In the paper, the authors categorized the submitted issues into "Evidence use," "Policymakers," "Communication," "Intermediaries and brokers," etc. and analyzed what the most questioned issues were, and what kinds of issues in different fields were combined to be raised as a question.

(5) Opportunity losses by not having systematic information exchange

Through this research and trial studies, we received a question from a Diet member getting at the heart of the matter, "What kind of opportunity losses would there be if we think there is no systematic information exchange between academia and the National Diet in Japan?" We gave considerations to this question based on the outcome of the research study.

- **Opportunity loss 1: The National Diet is unable to appropriately address interdisciplinary social issues.**

In modern society, it is difficult to address any issue using knowledge from one special field of study, and cross-social and interdisciplinary responses are required. However, measures set forth by the government tend to be a compilation of individual policies in the ministerial sectionalism although the Cabinet Office works as a control tower. This makes it difficult to verify whether the measures have thoroughly taken into account overall optimality for society. The National Diet can take approaches free of a compartmentalized government structure, and timely problem raising through collaboration with various specialists from the viewpoint of overall optimization for society may enable verifiable and better responses to social issues.

[28] https://www.nature.com/articles/s41599-019-0318-6 Research Representative Hiroshi Nagano is one of the co-authors.

• Opportunity loss 2: Discussions about options at the National Diet will become lacking.

There is asymmetry in information ownership between the administration and the National Diet in Japan. The administration has systems to automatically gather information, but the legislature has little to no systems to independently gather information.

This reality raises a concern that if the National Diet relies on the government as the source of information, the information may be limited to those that backs up the thought of the government. Deliberation on policies at the National Diet is a process to judge the optimal one from several options through discussions, but under the current conditions there is a possibility of it simply following specific options presented by the government. In the case of individually obtaining information from scientists and specialists, there is a limitation of usually being able to know only the person's thoughts.

If the academies comprising various individuals in leading positions and the legislature exchange information, it may significantly improve this situation. If the National Diet holds discussions about options, that may make it easier for the general public side to understand what the problem is and improve the transparency of policy decisions.

• Opportunity loss 3: Opposition members fall short of information and discussions become inactive.

Japan has adopted a parliamentary cabinet system, where the Diet appoints the Prime Minister and the Prime Minister appoints ministers usually from the Diet members. Therefore, the distance between the ruling parties and the administrative bodies is minimal. On the other hand, opposition members are not directly linked to the channels to obtain information from the administration.

If the entire Diet systematically interacts with academies, it will be easier for opposition members to obtain objective information than they currently can. If ruling and opposing Diet members can obtain objective scientific information, it may also vitalize evidence-based discussions between the ruling parties and opposition parties.

(6) Problem in legislative bill preparation process

For a large majority of laws enacted in Japan, having taken a parliamentary cabinet system, drafts are prepared by administrative bodies. A ministry or agency prepares a draft after listening to opinions from specialists, etc. through committee meetings and other meetings established by it, coordinate with the ruling parties, and submit it to the National Diet as a bill after Cabinet decision.

Committees may be objectively hearing opinions, but if the ministry or agency elects committee members, the members may become partial, or it may lay the foundation to raise doubts about their impartiality even if they are not actually partial.

In addition, discussions held during coordination with the ruling parties are not disclosed specifically. For these reasons, there is a problem in the transparency, as in how evidence has been taken in and from what kind of options deliberations were made and the decision was reached.

(7) Needs for interaction for scientific information at legislative bodies

As a result of giving considerations to the current situations in Japan based on the example cases in advanced countries, the specific needs or honest opinions from the legislature side as recognized in this research and trial studies are summarized below.

① Needs of Diet members

Diet members require specialty to have discussions at the National Diet on equal terms with administrative bodies. In general, Diet members are eager to acquire knowledge on science and technology, and studious. However, the House of Representatives tends to stop its activities during the period of election, and it is difficult to maintain continued interest. Meanwhile, the tenure of members of the House of Councillors is six years, and it may be easier for them to study and discuss things, some said.

Diet members vary in their attributes and career, such as the House of Representatives or House of Councillors, ruling or opposing party, senior or younger member, with an academic background in humanities or medicine or sciences (though extremely rare), metropolitan or local, and from a line of

politicians or not. Accordingly, their needs vary and are diverse.

Generally,

- opposition members are very interested in gathering information from organizations independent of the government, like the National Diet Library; and,
- younger Diet members appear to be more interested in the actual movement and utilization of science and technology and innovation, be it the ruling party or opposition; young Diet members have a stronger desire for reforms, and it may be automatic for them to become interested in the future of their generations.

② Needs of legislative bodies

At both the House of Representatives and House of Councillors, standing committees have a research office (Research Office for Education, Culture, Sports, Science and Technology, Research Bureau for the House of Representatives, and Research Office for Committee on Education, Culture and Science for the House of Councillors), and research offices assist Diet members in terms of the content of deliberations.

Research offices have no time or resources to spare for maintaining networks with external knowledgeable persons because they are always busy handling research requests with short answer time and they have little to no staff with knowledge in science and technology. Even with such a problem, research offices are working diligently every day. When considering candidates for a question-and-answer session with an expert witness, making inquiry to the government may draw a question about the objectiveness, and therefore they may believe that the use of a neutral institution that can assist in considering candidates is a desirable option.

③ Needs of National Diet Library

The Research and Legislative Reference Bureau, National Diet Library has the Science and Technology Research Office in the Education, Culture, Science and Technology Division that carries out thorough literature review spending a certain period of time at the request of a Diet member. Requests from Diet members cover multiple fields of study, and so they may believe that cooperation with neutral organizations is meaningful.

A Diet member also commented that, when she requests an investigation to the National Diet Library, if the National Diet Library gives her a referral to a neutral organization like the Engineering Academy of Japan depending on the matter, then it would be easier for her to directly contact such organizations.

(8) Awareness of scientists

To begin with, this research and trial studies place the focus on what the academia side can do to realize information sharing between legislative bodies and academia. Of which, the most important subject is improving policy literacy of scientists.

The aforementioned Science & Technology Policy Fellowships and pairing schemes have their own triggers. The trigger in the US was recognition on the importance of communication of scientific information to legislative bodies after the Sputnik crisis in 1957, and that in the UK was a reduction in the people's trust in science that occurred by the bovine spongiform encephalopathy (BSE) crisis in the 1990s.

It is not that there has been no demand for improving policy literacy of scientists in Japan. The National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission (NAIIC) after the Fukushima Nuclear Power Station Accident was the first case in Japan for the National Diet to receive results summarized by a wide range of knowledgeable persons based on a law enacted by the National Diet. However, its continuation is not going well. Also, it is true that the National Diet has hardly ever asked academia as an organization for their opinions at the initiative of the National Diet side.

However, this does not give the scientists side grounds for taking no action. The scientists side also requires human resources that can tell what the current politics and policies want, what will make the people convinced, and if the science advice is "politically relevant." Even compared with advanced countries, we would say Japan is the country that is in need of improving policy literacy of scientists the most.

(9) Roles of media

In recent years where fake news is rampant, measures to prevent Diet members from being misled by inaccurate information are also important.

In 2000, the UK Parliament advocated swiftly providing accurate and evidence-based information about science and engineering via media and, in particular, taking action against headline news that causes confusion and misinformation. Without delay, in response to the advocacy, the Science Media Centre (SMC) to facilitate easy access to the best sciences and scientists by journalists when a science-related topic is of particular interest was established in 2002, funded by public foundations including the Wellcome Trust and media companies.

SMC has a function to immediately refer media to the best scientists who can give explanations on diverse opinions for any sudden and unexpected event. It also actively responds when the Parliament calls for opinions. By these, SMC is trying to prevent the spread of fake news, including to members of Parliament. The concept of SMC has spread to six countries, including Germany.

In the European Union, the European Parliament established the European Science-Media Hub, which monitors what is reported by media about science, and disseminates accurate information at an appropriate timing when incorrect information is found to be spreading concerning urgent matters. When information deemed not correct emerges like fake news, the European Science-Media Hub actively releases information to counteract it.

Japan should also build systems to effectively suppress spreading of fake news by effectively utilizing existing resources, but in this research this matter shall be left as raising a problem.

(10) Summary of points Japan should focus on

As above, we mentioned the comparison with advanced countries where a system of information exchange between legislative bodies and academia has been established, the world's movement to build information exchange systems in the future, opportunity losses in Japan for not having an information exchange system, and the needs of legislative bodies, changing awareness of scientists, and roles of media about information exchange.

Finally, based on the findings obtained in this research and trial studies, we summarize below the points Japan should focus on from the viewpoints of:

- sharing scientific information;
- providing policy options; and,
- improving literacy.

① Sharing scientific information

- The duties of the Science Council of Japan (SCJ) are to make proposals to the government, and a relationship with legislative bodies is not assumed under the SCJ Act.
- When individual academic societies (same in the case of individual research institutions) provide information or advice, that could lead to pork barreling.
- Neither the National Diet of Japan nor academia has a systematic window of contact.
- Academia, who shall release scientific information, is not prepared to provide information.
- The National Diet members are always busy, and when a Diet member wants to obtain scientific information immediately, in most cases, the ruling parties ask the governmental agencies, and the opposing parties ask the research offices of the Houses and the National Diet Library.
- The research offices of the House of Representatives and the House of Councillors have few staff members that are in charge of the science and technology field, and it is no exaggeration to say that they have no staff with a scientific background. The number of staff members with a scientific background is also limited even at the National Diet Library.
- When a research office investigates candidates for an expert witness, both Houses do not have neutral third-party institutions to make inquiries. For that, they have problem awareness to expand the channels and networks of information gathering.
- Diet members do not have opportunities to regularly receive information or freely exchange opinions about the trend of science and technology.
- In the case of ruling parties, they have many opportunities to hear opinions of individual specialists and various organizations in various fields through party meetings.

② Providing policy options

- In advanced countries, various initiatives and systematic cooperation for sharing information between legislative bodies and academia are promoted, and in which academies are playing extremely important roles.
- In these countries, it has become natural for academies to present multiple options and the administration and legislative bodies make policies based on them.
- In the UK and Germany, a system has emerged where an intermediary between media and academia like the Science Media Centre immediately refers to scientists and specialists who can provide accurate explanations when a topic related to science and technology arose in society, and intermediaries have grown to play an important role for the purpose of suppressing distribution of fake news and providing well-balanced scientific information not only to policymakers but also to the general public.
- In Japan, there are no actual examples of organizations providing policy options like the above.

③ Policy literacy and science literary

- Even if the issue is about science, "scientifically correct" alone is not convincing enough. The viewpoint "politically relevant" is necessary. The science and technology side lacks human resources that can tell what the current politics and policies want, what will make the people convinced, and about feasibility as a policy.
- In Japan, it's not that there are no individuals (scientists, Diet members) with such problem awareness, but specific systematic activities to break through the situation are rare.
- The scientist side has few opportunities to voluntarily improve policy literacy, as a result of "along with the fact that the thought 'politics is opposite to science' has deeply taken root, scientists are unable to find meaning in contacting Diet members, or worse, they tend to avoid doing so" and "scientists cannot find meaning in contacting Diet members since they have never had any contact with Diet members before, and they are unable to imagine any specific topic to talk about with Diet members."

④ What the Diet member side may be feeling about the same issues.

- From the Diet member side, it is difficult to feel that a lack of systematic opportunities of opinion exchanges with the academia side is causing an extremely dire situation, considering there is no noteworthy cases where the scientist or academia side approaches Diet members (if any, that is for a budgetary request).
- Knowing that science and technology require medium- to long-term strategies and the Diet needs to have discussions from a broad perspective, some Diet members expressed their wishes to have casual discussions to prepare for that.
- The awareness of asymmetry being present in getting information compared with administrative bodies is shared among ruling and opposing parties.
- To break through such a situation, advanced countries have adopted an epoch-making initiative to develop human resources that understand both science and legislature, such as the Science & Technology Policy Fellowships in the US and the pairing schemes in the UK and European Parliament, and academies are playing an extremely important role in operating such programs. However, such initiatives are not made known to the members of the National Diet of Japan.

8. Measures the Engineering Academy of Japan shall take, and conclusion

(1) Measures calling for immediate attention

① Information sharing with research-related departments of legislative bodies

In order to communicate objective scientific information to the overall legislation, the first realistic measure is to enable the Academy to systematically provide investigation departments of both houses and the National Diet Library with comprehensive information related to themes desired by individual Representatives. This should make it easier for individual Representatives to acquire comprehensive information relevant to topics they are interested in.

To make this possible, we hope that the Academy and investigation departments of both houses, and the relevant departments at the National Diet Library will be able to regularly exchange opinions and interact with each other on themes of interest. If possible, it is preferable to have all parties meet at the same time to interact.

- Regular information provision between the National Diet Library, research office of the Houses, and EAJ, etc. will be systematically promoted.
- Advice about credible sources of information and advice about selection of persons such as expert witnesses will be provided upon request.
- Cooperation toward research business of research departments will be provided in various scenes, upon request.
- Data about matters mentioned in explanatory documents prepared by the National Diet Library will be provided at the time of submission of any legislative bill.

② Sharing information with Diet members

- Instead of creating a general large-scaled system of cooperation toward the House of Representatives and the House of Councillors, we aim to steadily increase contact points with individual Diet members.
- We want to establish a place where conversations can take place freely on a daily basis, in order to break down the walls between Diet members and scientists. Cooperation with younger Diet members, who have more interest in scientific information, will be the first step in making this possible.
- The issues Diet members usually face are not simply science and technological issues, they need to explore ways to resolve social issues by applying science and technology. This means that there will not only be one answer provided by scientists, as there will naturally be alternative ways to resolve a problem. An immediate issue for EAJ is to incorporate the broad interest of legislators in advance in selection of themes by policy advocacy for close examination from larger perspectives, and catering towards the diverse interests of Diet members as much as possible.
- Sharing opinions and understanding through daily interaction between legislators and scientists is expected to give birth to optimal measures at sudden occurrences of events with risks exceeding governmental predictions, such as large-scaled natural disasters, nuclear accidents and new infectious diseases.

③ Cooperation for the House of Representatives Special Committee on Promotion of Science and Technology, and Innovation

- We provide cooperation in proposal of topics, referring to experts for reference, etc.

④ Improving policy literacy and science literary

- Early establishment of Science & Technology Policy Fellowships such as those in the American Association for the Advancement of Science (AAAS), or pairing schemes such as those seen in England or the European Parliament. For the time being, incorporating an interview system like the one conducted by the EAJ Gender Committee[29] is an option. That is, the idea is to publicly advertise for graduate students or young researchers who want to meet particular Diet members, for EAJ to arrange a Diet member interview session, and to publish records of the visit on the EAJ newsletter after the interview session.

[29] Good Practice on Diversity: https://www.eaj.or.jp/?name=gender

Once the measures above become available and the relationship of cooperation with the legislation progresses, we can set our sights on the following activities as the next step

(2) The next issues to be addressed

The policy literacy of scientists and the science literacy of Diet members will both be boosted by creating opportunities for direct contact with academia and Diet members. So,

① Academy and relevant departments in the legislation should co-host a meeting for Diet members and scientists, to discuss issues and exchange opinions on themes which many Diet members are interested in. It is preferable to hold these meetings in the Diet Member's Office Building.

② Literacy should be boosted on both sides in the long run by having the Academy plan and host programs that offer opportunities for Diet members to directly interact with young researchers/graduate students on-site at universities and laboratories, and provide these programs to the legislation.

Specifically, as part of a follow-up of this trial, EAJ and the Research Center for Advanced Science and Technology (RCAST), The University of Tokyo will jointly conduct matching of laboratories at RCAST and National Diet members. Since RCAST engages in a wide range of research across the boundary of humanities and sciences, different from visiting one laboratory, visiting RCAST enables discussions from various viewpoints, learning that young researchers are actively engaged in research. In addition, RCAST is located close to the Diet Building. For these reasons, RCAST is suitable as a place of on-site interaction with problem awareness presented in this report. We hope to find other research sites that have similar potential as RCAST and vitalize interaction with Diet members.

③ Diet members in the House of Representatives are always aware of dissolution after being elected, This results in many Diet members not being able to afford to do anything else. To resolve this, EAJ should provide a curriculum to boost scientific literacy for budding politicians, such as at schools of political parties.

④ EAJ should gather participants, especially young researchers and engineers, from the industry, academia and government to hold policy advocacy exercise lectures at which policy creation is simulated. This will also work to enhance political literacy.

⑤ The probability of establishing a Science Media Center like one in Europe within Japan in the near future is extremely slim. We believe that boosting the Academy's fundamental ability to communicate is vital as the first step. Furthermore, interaction and cooperation with existing scientific departments in Japan's media is the first priority of the Academy.

(3) Conclusion

Interaction between legislators and scientists should be enhanced naturally by a steady build-up of activities like those described in this report. It will allow scientists' perspectives to open society up and catch the interest of legislators for science. We can expect both parties to communicate opinions in their own special field (legislation and science) for mutual advice if this can be achieved. This should not be described as giving science advice, but should instead be called co-creation of policies by legislators and scientists. That is why the sub-title for this report is **"Proposal toward achieving co-creation of policies between Diet members and scientists"**, and we look forward to achieving this as soon as possible.

Note that the EAJ cannot provide answers for all of the various issues that emerge in society. Acquiring the interest of the media while disseminating the purpose of this report widely to academia such as study societies and the media, and deepening cross-sectoral collaboration between diverse academic organizations are necessary to realize goals.

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