Section 2   Trend of Japan's Science, Technology and Innovation Policy

As the fourth Science and Technology Basic Plan has been started, the government is now implementing science, technology and innovation policies, integrating S&T policies and a wide range of related innovation policies into them.

After the change of government, innovation was positioned as a driving force for economic recovery. Under the leadership of Prime Minister Abe, who stated that his government would create "a nation that is the most suitable nation in the world for innovation," the Headquarters for Japan's Economic Revitalization has begun developing a growth strategy. While developing the growth strategy, innovation and regulatory reform are regarded as the most important issues, and collaboration is under way among the Council for Science and Technology Policy, the Headquarters for Japan's Economic Revitalization, the Industrial Competitiveness Council, and the Council for Regulatory Reform.

In this section, new trends of science, technology and innovation policies are described.

1   Discussion at the Council for Science and Technology Policy (CSTP)

The 107th meeting of the Council for Science and Technology Policy was held on March 1, 2013. At the plenary session, members discussed issues to be addressed in science, technology and innovation policies. Based on this discussion, Prime Minister Abe directed the council to intensively discuss the following three points and to summarize the results by the middle of 2013.

○ Comments from Prime Minister Abe at the 107th meeting of the Council for Science and Technology Policy held on March 1, 2013 (excerpts)

"Please hold an intensive discussion at the plenary session on the following three points that were suggested by knowledgeable members of the Diet, and summarize the results by the middle of this year. First, please formulate a "Comprehensive Strategy on Science, Technology and Innovation" that includes a long-term vision showing an overall perspective of the science, technology and innovation policies and short-term action programs.

Second, please discuss what policies should be included in the growth strategy, in terms of science, technology and innovation, in cooperation with the Headquarters for Japan's Economic Revitalization.

Third, please discuss and work out a drastic buildup policy for the headquarters' function in the Council for Science and Technology so that the council can exert an unprecedented, strong driving force in terms of both authority and budget."

Based on those directions, the Council for Science and Technology held discussions and its Comprehensive Strategy on Science, Technology and Innovation was approved by the Cabinet on June 7, 2013.

In order to tackle economic recovery—the biggest and most urgent issue of the moment—from the viewpoint of science, technology and innovation, the Comprehensive Strategy on Science, Technology and Innovation was formulated as based on the directions of Prime Minister Abe. The strategy includes

the following basic concepts:

· A long-term vision, including the entire spectrum of science, technology and innovation policies, as well as immediate action programs

· A comprehensive package of science, technology and innovation policies that are designed to solve problems

· Clarified roles for the ministries responsible for industry-academia-government cooperation, including a combination of various policies such as budgeting, taxing and regulatory reforms

Specifically, in order to shape the nation's economy by 2030, the Strategy has set three visions: an "Economy that maintains world-class economic strength and develops sustainably," a "Society where the people can enjoy wellness, security and safety," and an "Economic society that harmonizes with the world and contributes to the progress of humankind." The strategy also included five challenges to be immediately addressed by science, technology and innovation policies and other related important issues and measures.

<Challenges to Be Addressed by Science, Technology and Innovation>

(1) Realization of a Clean and Economic Energy System

(2) Realization of Healthy and Active Aging Society as a Top-runner in the World

(3) Development of Next Generation Infrastructures as a Top-runner in the World

(4) Regional Revitalization Taking Advantage of Regional Resources

(5) Early Recovery and Revitalization from the Great East Japan Earthquake

In addition, in order to enhance the effectiveness of issue-resolving activities for the economy, as well as to establish a basis for swift innovative creations, the strategy also establishes priority issues (Nurturing the sprouts of innovation; Activating the innovation system; and Fructifying innovations) and their measures.

Moreover, in order to fully implement these policies, the Strategy shows the measures needed to reinforce the headquarters' function of CSTP: Establishing the Strategy Meeting for the Science and Technology Budget［tentative name］, Establishing office-ministry-crossing programs such as the Strategic Innovation Creation Program［tentative name］, Establishing new developments for a succeeding policy of the Funding Program for World-Leading Innovative R&D on Science and Technology［FIRST］, Establishing the Innovative R&D Support Program［tentative name］—etc. (Figure 1-2-45).

The Comprehensive Strategy is, so to speak, a set of "muscular measures" for the new science, technology and innovation policies and it will be reflected (in terms of science, technology and innovation) in the growth strategy formulated by the Headquarters for Japan's Economic Revitalization.

Figure 1-2-45 / Summary of Comprehensive Strategy on Science, Technology and Innovation
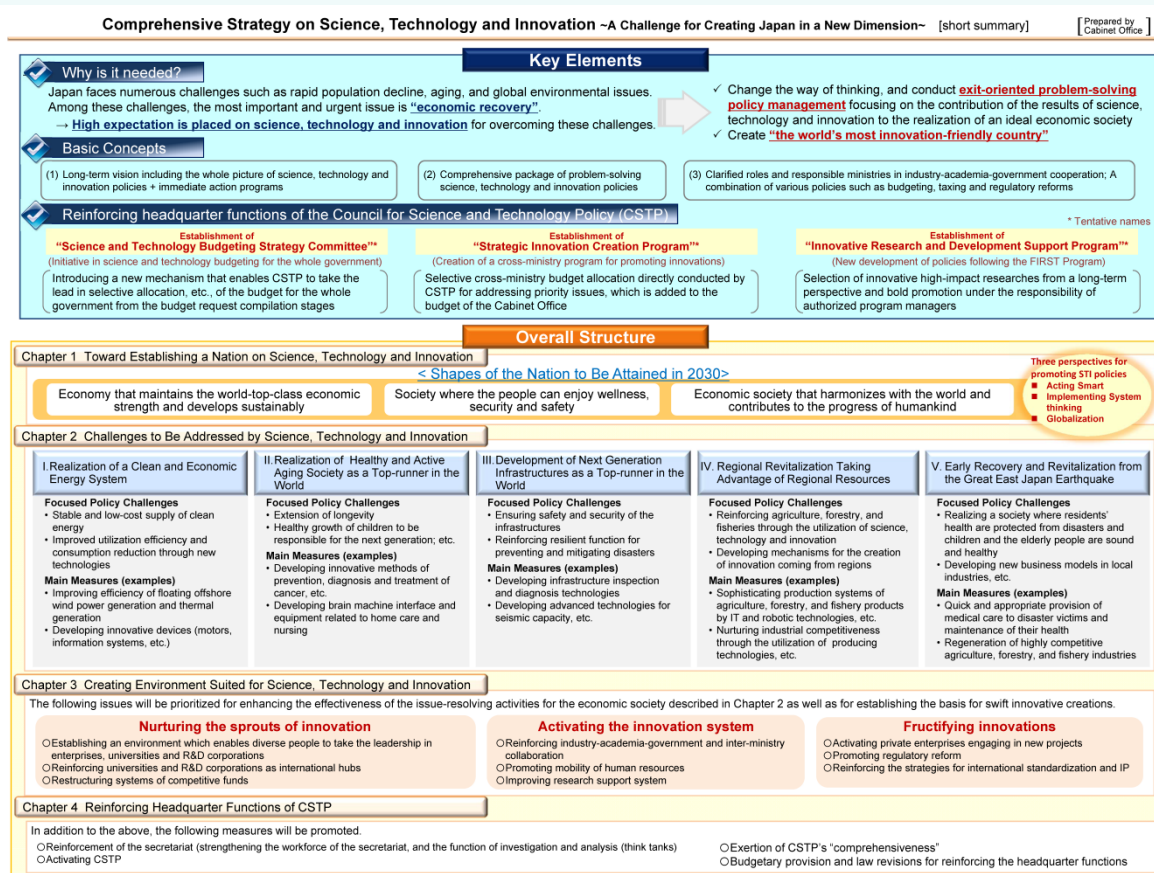
Source: Document for the 112th Council for Science and Technology Policy (June 6, 2013)

2   Basic Policy to Drastically Strengthen R&D Capacity in Japan

The Great East Japan Earthquake has revealed various internal problems within Japan. Those engaged in science and technology failed to meet the expectations of the Japanese people. They should honestly examine themselves. As a result of this understanding, gained in the aftermath of the earthquake, the Council for Science and Technology of MEXT seriously reviewed the issues facing science and technology and discussed how to reform R&D systems in order to solve these problems. The council proposed a report entitled "State of S&T Policy Based on the Great East Japan Earthquake (proposal)" at a meeting held on January 17, 2013, and Chairperson Noyori delivered the report to Mr. Shimomura, the Minister of Education, Culture, Sports, Science and Technology.

This proposal consists of five chapters: I. A review of the Great East Japan Earthquake in light of Science and Technology (General Description), II. A review of the Earthquake and Disaster Prevention; Contributions to Reconstruction, Revitalization and Security, III. Collaboration and Integration among Disciplines and Interdisciplinary Research for Solving Problems, IV. Proper and Effective Use of R&D Results, and V. Communication and Dialog with Society (Figure 1-2-46).

Figure 1-2-46 / What the Science and Technology Policies Should be in the Future in View of the Great East Japan Earthquake (summary of the suggestion)

State of S&T Policy Based on the Great East Japan Earthquake (summary of the suggestion)

Introduction

○ Those engaged in science and technology could not necessarily meet the expectations of the Japanese people and they should honestly examine themselves. Reconstruction of a relationship of trust with the Japanese people is needed.

○ STIR*1 should be the keynote of future policies. In view of the problems revealed by the earthquake, reforming R&D systems to solve the problems and advancing S&T innovation*2 policies are important. Emphasize the viewpoint of "science and technology for the society and in the society."

　*1 S: Science, T: Technology, I: Innovation, R: Redesign, Reconstruction, and Reform

　*2 S&T innovation is the "creation of intellectual and cultural values based on new knowledge brought by scientific discoveries and inventions," and the "renovation that develops the knowledge and connects it to the creation of economic, social and public values."

I Review of the Great East Japan Earthquake in light of Science and Technology (General Description)

○ Research is divided into the three steps of basic research, applied research and developmental research. In any given step, research is carried out in one of three ways: academic research based on the researchers' motivation, strategic research based on targets set by the government, or research based on requests by the government. When pushing policies forward , it is necessary to consider each of the characteristics.

○ A full understanding of the requirements of society is necessary.

　• Developing policies based on a mutual understanding is necessary to recover the public trust and meet its expectations. Researchers should improve their "social literacy" and understand the requirements of society.

　• Researchers who receive public funds for their research should understand the meaning of their research. They have accountability for the meaning of their research and results of their research.

　• It is necessary to develop diverse human resources who will support Japan's future in accordance with the requirements of society.

○ R&D in Japan tends to give too much weight to obtaining new knowledge and to developing the underlying technology. Systemization that takes actual operation into account is necessary in the future. In addition, it is necessary to establish systems designed to solve problems by gathering a wide range of professional knowledge.

○ Misconduct in research activities must be disciplined more severely as they damage the public trust.

II Review of the Earthquake and Disaster Prevention; Contribution to Reconstruction, Revitalization and Security

○ It is necessary to promote earthquake research through a comprehensive and interdisciplinary approach, such as by establishing a research system that includes humane studies and social sciences. In addition, the fundamental reevaluation of research methods is necessary in order to correctly assess low-frequent, large-scale natural phenomena and to fully contribute to disaster prevention and mitigation.

○ Researchers must free themselves from a village mentality in order to construct infrastructure that is resistant to environmental changes. As for issues that go beyond their abilities and roles, close cooperation with concerned organizations is necessary.

○ Necessary measures should be taken to control the risks of matters that randomly occur less frequently yet are expected to cause serious damage. Forming a national consensus on how to control risks is also necessary.

III Collaboration and Integration among Disciplines and Interdisciplinary Research for Solving Problems

○ Policy guiding is necessary to solve problems.

　• In order to urge thinking reform in researcher communities that give too much weight to these, a new evaluation system must be established to encourage research that contributes to S&T innovation policies.

　• It is necessary to encourage the establishment of a research system and the development of a research environment where researchers can use their abilities to the fullest.

　• A research-guiding system is necessary to advance collaboration and integration among disciplines and interdisciplinary research even at the stage of basic research.

　• Measures to promote collaboration among natural sciences, social sciences and humanities are necessary.

○ Human resource development to support collaboration and integration among disciplines and interdisciplinary research is necessary.

　• Fostering S&T innovation talents who will try frontier research is important. The key is to ensure the independence of students and young researchers.

　• Universities should cooperate with industry and should develop human resources who will contribute to solving social challenges. Post doctors sometimes are not evaluated properly, so this issue should also be addressed. The promotion of education and the promotion of S&T should be organically linked.

　• Measures to foster and secure research supporters and engineers are necessary.

　• Measures to support the middle- and long-term overseas dispatching of young researchers are necessary.

IV Proper and Effective Use of R&D Results

○ Measures to properly reflect social needs on issues are necessary; for example, establishing a collaboration system stretching across organizations and disciplines at the stage when issues are determined.

○ In order to spark S&T innovation, it is necessary to establish novel issues and strategically control R&D at every step from basic research to practical application.

V Communication and Dialog with Society

○ Developing a system for the government to collect appropriate scientific advice is necessary.

○ It is necessary to continue a sincere dialogue and discussion with society in order to form a consensus about risks, including the occurrence of an unexpected event. At that time, it is also necessary to send information in a manner that considers those who will receive it, so as to avoid a misunderstanding that "zero risk" is possible.

○ In order to achieve a social consensus, it is necessary to improve both the S&T literacy and the risk literacy of the public, as well as the social literacy of researchers.

Sources: Created by MEXT based on "What the Science and Technology Policies Should be in the Future in View of the Great East Japan Earthquake" proposed by the Council for Science and Technology

The Council for Science and Technology shared their understandings that the issues pointed out in the suggestion were all fundamental ones; thus, planning more effective policies was determined as necessary. Furthermore, the number of these policies and their citation frequency (indicators showing Japan's R&D capacity) have been stagnant, which was a matter of concern. For this reason, the council formulated the "Basic Policy to Drastically Strengthen R&D Capacity in Japan."

The Basic Policy consists of three chapters: 1. the promotion of youth, women, foreigners, 2. The improvement of the quality and productivity of research, and the promotion of research with high novelty, and 3. Reformation aiming at a world -class research management and a human resource development system. Based on the Basic Policy, the Council for Science and Technology is going to discuss and develop concrete measures at its plenary sessions, its subcommittee meetings, its sectional meetings and its committee meetings. At that time, in order to drastically strengthen R&D capacity in Japan, the council will examine the state of graduate school education, in particular, in collaboration with the Central Council for Education (Table 1-2-47).

Table 1-2-47 / Basic Policy to Drastically Strengthen R&D Capacity in Japan (Determined at Council for Science and Technology)

Basic Policy to Drastically Strengthen R&D Capacity in Japan
(Determined at Council for Science and Technology on April 22, 2013)

The 6th Council for Science and Technology (CST) proposed "State of S&T Policy Based on the Great East Japan Earthquake." All matters pointed out in the report are fundamental; and practical measures need to be formulated in regard to these matters. Also, in recent years, stagnant indicators of Japan's R&D capacity, such as the number of scientific papers and scientific paper citations, are matters of concern. Thus, the 7th general meeting and its associated committee and subcommittee section meetings will develop concrete policies based on the following basic concepts considering the matters pointed out in the report in order to drastically strengthen Japan's R&D capacity.

1.   Promotion of youth, women and foreigners

(1) Creating and promoting opportunities for the independence of young researchers

1)   Ensuring thorough understanding of the amended School Education Act of 2005 (implemented in 2007)[*1] in order to promote "superior young researchers" as independent leaders who can serve as the driving force of research in universities and other research institutions as quickly as possible and in accordance with a "world-standard" model.

2)   Encouraging the transformation of academic research from a hierarchical classification management research system, which is currently the mainstream model, into an autonomous research system with an integrated network including various academic disciplines.[*2]

3)   Securing the appropriate support of the whole of the university or the research institution, including administrative sections, is essential when promoting parts 1 and 2 as mentioned above.

4)   Promoting funding to encourage a "Labor to Leader"

policy in which superior youth, women and foreigners play key roles in independently leading research by themselves instead of merely being involved as labor.

5)   Implementing measures for burden mitigation, including financial support for newly posted superior researchers in order to smoothly launch independent research, and including English-language support to assist with the research-funding application process.

6)   Encouraging young researchers from various fields to join together in order to voluntarily promote cooperative and interdisciplinary research.

7)   Promoting enhancements within the research environment, including the networking of overseas researchers, and better job opportunities for Japanese researchers when they return to Japan, so that young researchers are more willing and able to take on medium-to-long term research opportunities overseas.

[*1] From the standpoint of stimulating educational research and international acceptability, assistant professors and the assistant system was reviewed. Consequently, the position of "Assistant Professor" was terminated, and the position of "Associate Professor" was established in its place. Also, the position of "Research Associate" was established for those who mainly conduct educational research.

[*2] It is necessary to construct a framework of organization that promptly and effectively promotes achieving objectives that are based on strategic research and on research that creates innovation.

(2) Response to international brain circulation

1)   Securing and fostering superior researchers from Japan and abroad in response to globalization by promoting an annual salary system instead of the traditional seniority-based pay system

2)   Constructing a strategic international network among research institutions and universities for the purpose of "brain circulation" between Japan and both emerging and developed countries.

2.　Improvement of quality and productivity of research, and promotion of research with high novelty

(1) Promoting both "high novelty" and "high-risk" research

1) Promoting innovative research that creates great social and economic value even though it may be difficult to accomplish (high-risk research).

2) Constructing a flexible research-support system in which researchers can select their own research topics based on their strengths and interests, and which allows them to obtain competitive funds for their research. These funds include (1) "Funding for academic research that forms the foundation of various fields based on each individual researcher's inherent motives," (2) "Funding for strategic research conducted under management based on the goals and fields set by the government," and (3) "Development fund that directly aims at innovation creation and industrialization." In addition, careful explanations informing researchers about the positioning and purpose of relevant funds should be thoroughly implemented in all invitations for funding applications.

3) Enhancing support for exploring new fields and promoting cooperative and interdisciplinary research across various fields. Also, it is important to operate this support system with a distributed system instead of a centralized system in order to raise the research potential of the country as a whole.

4) Thoroughly implementing the strict assessment of research funding in order to avoid excessive investments in large-scale, competitive research funds from the perspective of using public financial resources as efficiently as possible.

5) Promoting flexible and strategic R&D under the innovative project settings by adopting an open-innovation model instead of adhering to a linear model.

6) While maintaining the utmost respect for individual academic research based on inherent motives, it is also necessary to establish a policy-induced mechanism that promotes cooperative and multidisciplinary research that can create a wide range of ripple effects. To this end, it is necessary to prioritize issues through cooperation with the S&T community, considering a variety of social requests from both domestic and overseas sources, to establish a research framework that combines expertise, and to create special programs with the proper management system necessary to achieve the goals.

(2) Establishment of a new evaluation system

1) Carrying out appropriate research evaluations that are combined with the evaluation axis, which is common among basic research and development research, and the evaluation axis, which is based on characteristics such as phase, method, purpose and potentially-prosperous development, in addition to the evaluation of the capabilities and achievements of individual researchers according to their science merit.

2) Establishing a new evaluation system that encourages and actively supports research from a new non-conventional standpoint, research that would contribute to unexploited science and technology innovation drawn by research collaboration and multidisciplinary research, and high-risk research.

3) Introducing a new system where the promotion of researchers—and funds distributions to researchers—

are determined by properly considering the evaluation results based on the new evaluation concept; for example, rather than using a negative evaluation system that deducts points from a full score, points could be added for meeting a variety of benchmarks so that the evaluative system is more positive.

4) Establishing an evaluation method other than indexes for research papers in which social needs, intellectual property and social implementations are considered in regard to research activities, especially those in the development phase.

5) Evaluators welcome proactive assertions regarding the significance of the research from the researchers, and respect the opinions of non-specialists and/or outsiders according to circumstances.

6) Establishing a method that positively evaluates human-resource development.

7) Establishing an evaluation method for research institutions positively evaluating efforts for maximizing outcomes and ensuring a diversity of perspectives by promoting superior youth, women and foreigners as a leader.

8) Developing specialists who have advanced expertise about research evaluation.

(3) Understanding social needs

1) Constantly cooperating with organizations in various fields, understanding the real situation of the world from various viewpoints, and establishing a system that unearths social needs to appropriately determine research subjects.

(4) Enhancement of an environment that allows researchers to dedicate themselves to research

1) It is essential to improve a research environment that reaches international standards, so that researchers can concentrate on their primary activity, make excellent achievements and maximize outcomes. It is especially essential to have research administrators who have advanced expertise, and who work together with researchers and play an indispensable role in research . In order to improve and strengthen a research promotion system through revitalizing research activities and strengthening R&D management (planning, networking among researchers and across fields), developing and securing highly professional personnel as research administrators and promoting the establishment of associated jobs as secured ones are necessary.

2) Promoting the development, recruitment and securement of human resources who can support research infrastructure, and establishing career paths for personnel, including cooperation with other parties, in order to improve the environment and to maintain research equipment that is essential for researchers to perform advanced research.

3) Enhancing "opportunities" that would allow researchers to focus on their jobs, and find new targets and partners to collaborate with; for example by promoting a sabbatical system.

4) Studying the establishment and improvement of the S&T and academic information network from the standpoint of promoting open-access and networking between researchers and across fields.

(5) Further development, appropriate procurement and shared use of R&D equipment

1) From the viewpoint of securing the S&T competitiveness of Japan while effectively utilizing public resources, further promotion of strategic development and the installation of domestically-produced, cutting-edge research equipment based on the investigation and analysis of deployment situations concerning cutting-edge research equipment in actual research sites.

2) Promoting a rational procurement policy; for example, the effective management of research expenses which are flexible for purchasing expensive equipment.

3) Improving the research environment by promoting the shared use of R&D equipment, and promoting efficiency in spending.

(6) Policy making based on public trust and mutual understanding

1) Improving both the S&T literacy and the risk literacy of the public, and the social literacy*3 of researchers.

2) Reviewing the ways of effective S&T communications in order to inform the public of potential risks.

3) Reviewing science literacy and science education with an emphasis on understanding the essence and limitations of S&T; that is, S&T does not necessarily provide a single answer and may possibly be associated with risk because of potential uncertainty.

4) Eliminating misconduct and the unauthorized use of research expenses and securing research integrity to gain the public trust by improving ethics education in order for researchers to always make ethical judgments and to behave accordingly, based on the thorough recognition of "S&T in society, for society."

*3: The "Social literacy of researchers" is described as the "capability to appropriately assume and understand what the general public expects of S&T and academia and how the general public receives information about S&T and academia taking the values and diversified knowledge of the general public into consideration, and the capability to appropriately send messages about S&T and academia while keeping diversity in mind."

3. Reformation aiming at a world-class research management and human resource development system

(1) Creation of a new R&D agency system

1) Creating a new R&D agency system that can achieve maximum results within a given budget in order to win fierce international competitions over S&T innovation.

(2) Reformation of research personnel development system

1) Development of superior research personnel is essential to establish a social structure that adds tremendous value and allows Japan to succeed in fierce international competition. Establishing a more attractive environment for personnel development, where superior personnel can pursue doctoral courses and create increased value, by improving the number and quality of doctorate holders, as well as by raising their social value, and promoting organic collaboration between science education and S&T promotion at each educational stage: the elementary level, the undergraduate level and the graduate level.

2) Improving financial aid for graduate students to make the above mentioned matters possible (For example, the United States recruits superior graduate students, and living expenses are paid to them as "quasi-professionals." Also in Europe and Asian countries, there are environments where, thanks to public support, such students can be dedicated to their research without spending their own money).

3) Reviewing a practical program of industry-academia collaboration that develops personnel who would resolve social problems and promote innovation (consideration is based upon investigation and analysis to find out what is needed by the various sectors of society, including industry). Utilizing personnel flexibly, including establishing a rotation between academia and industry so that industry is considered as a career path.

4) Considering mechanisms (for example, the securing of educational expenses to provide for a certain level of experimentation).in order for all students to receive the high-quality education demanded by society that includes experiments and practical training

5) Thoroughly disseminating the objectives of the amended School Education Act of 2005 (implemented in 2007) in order to promote "superior young researchers" who can fundamentally drive research in universities and other research institutions, so they can become independent leaders as quickly as possible in accordance with a world standard model (re-posted).

6) Promoting support to encourage the transformation of academic research from the classification management system (a hierarchy), which is currently the mainstream, into the autonomous research system with integrated various academic disciplines network (re-posted).

7) It is essential to appropriately secure the support of all universities and research institutions including the administrative sections, in promoting the above mentioned 5) and 6) (re-posted).

8) Improving fellowship to support young researcher's independence and to open their career paths, as well as establishing a tenure track system to promote smooth brain circulation and generational change.

9) Promoting the exploration and development of a variety of career paths for graduate students and young researchers, focusing on developing the capability to select activities over a wide range of society, including industry. For this purpose, close interaction between academia and industry should be promoted.

10) Conducting investigations and reviews from the view point of a post-doctoral career path expansion based on situations that arise in each research area.

11) Improving interest in, and understanding of S&T and how it relates to society in elementary and secondary education in order to expand the number of personnel who will be responsible for the next generation of S&T.

12) Studying in collaboration with the Central Council for Education/ECTP about the direction of elementary and secondary education, undergraduate education and graduate school education; and measures to create smooth connections between each educational phase and to strengthen collaboration.

Sources: "Basic Policy to Drastically Strengthen R&D Capacity in Japan" Determined at Council for Science and Technology on April 22, 2013