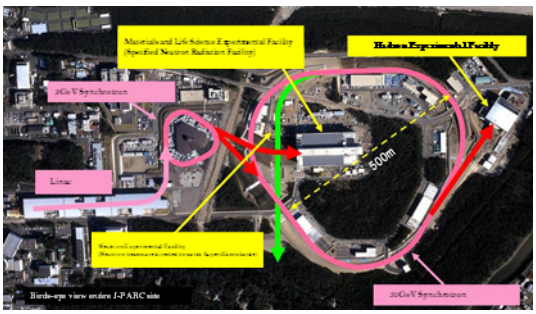
○ Japan Proton Accelerator Research Complex (J-PARC)

The Japan Proton Accelerator Research Complex (J-PARC) contributes to a wide range of R&D, including basic research and industrial applications in using secondary particles such as neurons and neutrinos[1] that are generated by a proton accelerator having world-class beam intensity. At the neutron facility that is specified in the Sharing Act, many outcomes have been derived from the researches, such as structural analysis leading to the development of innovative materials and new drugs.



Japan Proton Accelerator Research Complex (J-PARC)
Courtesy of J-PARC Center

In addition, there are facilities that are not specified in the Sharing Act, but which conduct research on atomic nuclei and particle physics. For example, at the Hudron experimental facility, a radioactive substance leaked out in May 2013. This event the revealed diminished consciousness of those who work as safety management in a facility that deals with radioactive substances and the overall failure of the safety management system. Currently, the High Energy Accelerator Research Organization and the Japan Atomic Energy Agency, which were established by MEXT, have been asked to rapidly investigate the cause, to reconfirm the safety management system, and to report their findings.

Figure 2-3-9/ Major measures to enhance and strengthen the common platform for science (FY 2012)

Ministry/Agency	Conducting organization	Measures
MIC	National Institute of Information and Communications Technology (NICT)	R&D of future ICT platform technology
MEXT	MEXT	Nanotechnology Platform
		Development of platform technology to form a light/quantum science research center (Competitive funds)
		R&D for the establishment of a next-generation IT platform
		The Program for the Strategic Use of Advanced, Large-scale Research Facilities
	MEXT RIKEN Japan Synchrotron Radiation Research Institute (JASRI)	Enhancement and Sharing of Super Photon ring-8 GeV (SPring-8)
	MEXT Japan Atomic Energy Agency (JAEA) High Energy Accelerator Research Organization	Enhancement and Sharing of a Japan Proton Accelerator Research Complex (J-PARC)
	Japan Science and Technology Agency	Industry-Academia Collaborative R&D Programs (Advanced measurement and analysis technology and equipment-development program)
METI	MEXT	The program for promoting information security measures

1 This is one of the smallest elementary particles that compose a substance. A neutrino is difficult to detect because it is electrically neutral and can penetrate substances. Therefore, many properties, including its mass, are unknown.

Section 2 System Reform to Overcome Critical Problems

1 System Reform to Promote Problem-solving Based R&D

In order to effectively and efficiently promote problem-solving based R&D, it is necessary to comprehensively and systematically promote efforts such as R&D by coordinating and cooperating with each other and by soliciting broad participation from industry, academia and government. Thus, the government aggressively promotes the efforts stated in Part 2, Chapter 2, Section 4.

2 Establishment of a System to Promote R&D Led by the Government

In Japan, regarding the promotion of 1) the R&D of platform facilities and equipment that are shared by multiple organizations and in multiple areas, and 2) the critical technology related to national security, a system to conduct R&D shall be established by combining all resources from related research institutions in industry, academia and government, and the government shall take the lead because these activities should be continuously taken over the long-term. Thus, a new project shall be created in order to promote the effective and efficient implementation of such R&D.

METI has established "Research on Exploring the Future," a new R&D system. The research on exploring the future sets a "Governing Board" for each theme and operates projects in collaboration with the government, academia and industry based on coordination with each of the ministries and agencies concerned. It also conducts and follows all parts of R&D projects from basic to practical uses and, as a nation leads long-term, high-risk R&D that will take more than 10 years until it reaches commercialization, In addition, it invests exclusively in the areas that require fundamental measures, such as energy and environmental restrictions. Furthermore, METI formed an industry-academia-government dream team that can compete in the world market of technology and business in order to deal with the management and standardization of intellectual property that is appropriate for promoting commercialization.

Both ministries of METI and MEXT work together to set the R&D theme for research on exploring the future in a joint-review session, and they make efforts to create innovation that can lead the world by supporting government-academia-industry type activities.

Section 3 Strategic Development of International Activities

In order for Japan to further develop S&T while playing a vital role in the international community, it is important to strategically develop its integrated international activities and to promote "S&T Diplomacy."

For this reason, in accordance with the 4th Basic Plan, the government is making efforts to contribute to the solution of global-scale issues, to promote strategic international cooperation in advanced S&T fields, to enhance international networks of human resources and research, and to promote the improvement of the environment in order to support these efforts, all of which strengthen international activities.

1 Promotion of R&D Aimed at Solving Common Issues across Asia

In order for Japan to play a leading role in solving global-scale issues and to maintain a strong position in the world, it is necessary to strategically promote science, technology and innovation (STI) policies through international cooperation. Particularly in Asian countries, there are many issues that Japan can tackle by using its S&T capabilities, such as issues regarding the environment, energy, food, water, disasters and infectious diseases. Japan is required to play a vital role in solving these problems, which are common to Asian countries, and Japan aims to establish relationships of mutual trust and mutual benefit within this region.

In June 2012, in cooperation with the Japan Science and Technology Agency (JST), MEXT started the "e-ASIA Joint Research Program," which intends to strengthen research and development capabilities by accelerating research interaction in the S&T field throughout Asia and to solve problems that Asian countries have in common by practicing multilateral joint research. In October of that year, the program adopted three joint research projects among Japan, Thailand and Vietnam, and started supporting them.

The Ministry of the Environment has been supporting efforts to create low carbon societies and to adapt to climate change in the Asia-Pacific region since FY 2012 through the "Asia-Pacific Network for Global Change Research (APN)," which is intended to improve researchers' capabilities and to solve common problems in this region. In April 2012, the ministry also started supporting the "Low Carbon Asia Research Network (LoCARNet)" to help create low carbon societies in a rapidly growing Asia.

2 New Developments of S&T Diplomacy

(1) Development of international activities capitalizing on Japan's strengths

Japan is promoting activities on various issues, including the environment and energy, more quickly than other nations, and its S&T maintains a high standard throughout the world. In order to achieve sustainable growth in the future, Japan should promote the "export of task-achieving type prescriptions" (system export), based on its high-level S&T, and should create new demands with a focus on a rapidly growing Asia. Hence, the government is promoting the development of systems that lead to social reforms in emerging countries, located mainly in Asia, by taking advantage of Japan's strengths.

1) Active Efforts toward International Standardization

Based on the "Intellectual Property Promotion Plan of 2012" (Intellectual Property Strategy Headquarters on May 2012), the government promoted a strategy to comply with international standards in order to strengthen Japan's leading technology in specific strategic fields, and with cooperation between the government and its people.

MIC is strategically promoting international standardizations especially regarding the four major areas, which were designated by the "Report on Standardization Policy regarding the Information and Communications Field (Inquiry No.18 of February 10, 2011)" (July 25, 2012). Furthermore, in order to provide many convenient ICT means to various users and strengthen international competitiveness of Japanese ICT industry, MIC is promoting ICT related standardizations, which contributes to reduce impacts on the environment, in cooperation with *de jure* standardization institutions, including the International Telecommunication Union (ITU), and *de facto* standardization entities in the private sector.

In order to secure the market in the green-innovation field, an area in which Japan is more advanced than other rapidly growing Asian countries, Japan's technology in such field needs to be evaluated properly. Through the "Asia Standards Conformance Promotion Project," the Ministry of Economy, Trade and Industry (METI) is working with Asian countries to develop performance assessment methods, to promote international standardization of assessment methods and to help examination bodies in Asian countries improve their certification abilities.

(2) Promotion of international activities for advanced S&T

In order to ensure further development of Japan's S&T and to enhance the synergetic effect of S&T and diplomacy, Japan needs to promote its R&D activities concerning advanced S&T in cooperation with other developed countries and international organizations, and to utilize such activities for diplomatic activities. For this reason, Japan must aggressively promote international activities for advanced S&T and advance activities for improving international research networks while preventing the leakage of technology.

1) Improvement of international research networks

Japan needs to improve international research networks in various areas with countries that have the world's highest levels of S&T and while also promoting international cooperation concerning advanced S&T that utilizes quality research resources from overseas.

Various exchanges of researchers are being conducted among universities and research institutions at both the individual and organizational level. In order to develop S&T and academic studies, Japan needs to attract many leading researchers from both home and abroad, so that Japanese researchers interact with top researchers from around the world and improve their skills.

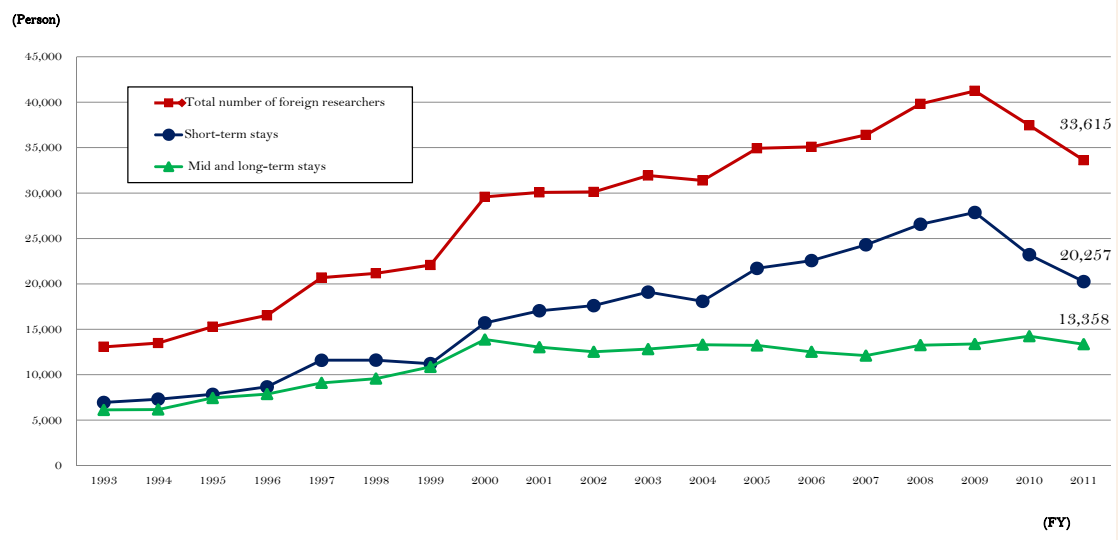
(i) The current international mobility of Japanese researchers

Looking at the number of foreign researchers accepted in universities and incorporated administrative agencies throughout Japan (FY 2011), the number of those accepted for short-term stays has decreased since FY 2009. On the other hand, the number of those accepted for mid and long-term stays of more than 30 days has been between 12,000 and 14,000 since FY 2000, with little change in the trend (Figure 2-3-10). The proportion of mid and long-term foreign researchers among the total number of researchers in Japan's universities and incorporated administrative agencies was approximately 5.7%[1].

In terms of the number of Japanese researchers sent abroad (FY 2011), the number of those sent abroad for short-term stays and the number of those sent for mid and long-term stays of over 30 days have both increased (Figure 2-3-11).

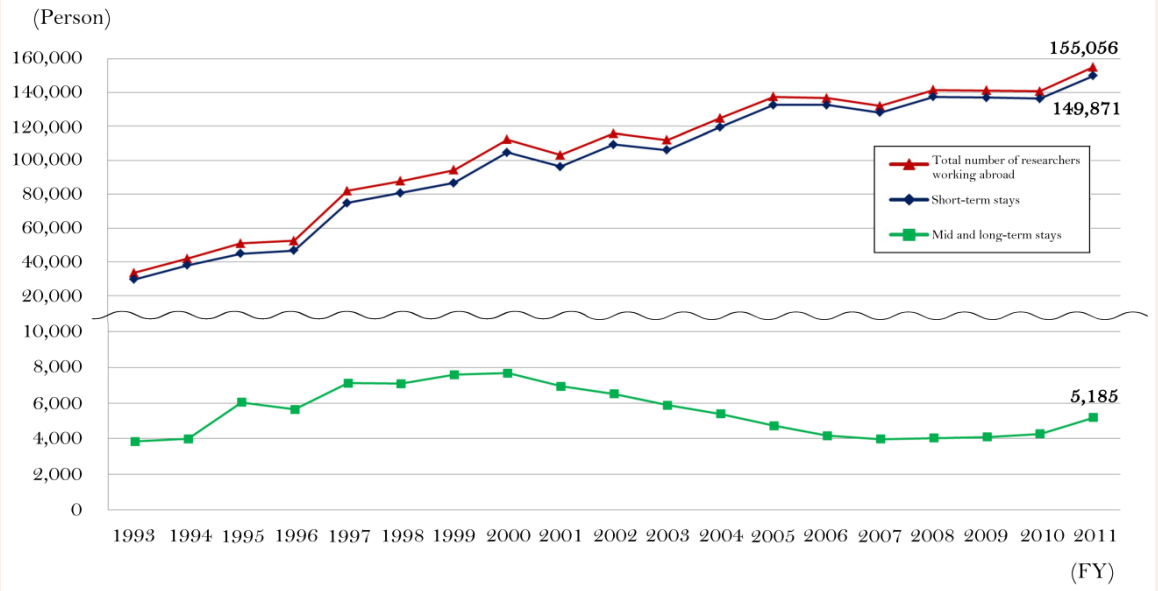
1 Source: MEXT, "Survey on International Research Exchanges in FY 2011"

Figure 2-3-10/ Transition of Number of Foreign Researchers by Duration of Stay (Short-term, Mid and Long-term)



Note 1: "Mid and long-term" refers to a period of more than 30 days and "short-term" refers to a period of 30 days or less in this survey.
2: The numbers since FY2008 include post-doctorates, etc.
Source: MEXT, "Survey on International Research Exchanges" (June 2013)

Figure 2-3-11/ Transition of Number of Researchers Working Abroad by Duration of Stay (Short-term, Mid and Long-term)



Note 1: "Mid and long-term" refers to a period of more than 30 days and "short-term" refers to a period of 30 days or less in this survey.
2: The numbers since FY2008 include post-doctorates, etc.
Source: MEXT, "Survey on International Research Exchanges" (June 2013)

(ii) Activities for promoting the international exchange of researchers

The government is making two-way exchanges by combining two policies—dispatching young researchers abroad and inviting leading researchers from other countries—as an effort to foster and secure world-class researchers.

To foster young Japanese researchers and enable them to work actively within the international arena, the Japan Society for the Promotion of Science (JSPS) carries out various programs to send them abroad. Other programs are provided to invite excellent researchers from other countries to Japan.

For example, JSPS's "Postdoctoral Fellowships for Research Abroad" provides individual Japanese researchers with an opportunity to work at overseas universities or research institutions and to interact with colleagues from other countries. Another program called the "Strategic Young Researcher Overseas Visits Program for Accelerating Brain Circulation" supports Japanese universities and research institutions that dispatch their students and young researchers abroad to participate in joint research.

To provide excellent overseas researchers with opportunities to work with colleagues in Japanese universities and research institutions, JSPS provides "Postdoctoral Fellowship for Foreign Researchers" and other invitational programs that support overseas researchers at different stages of their careers and purposes for their visits.

To foster young scientists and build networks among them in the Asia-Pacific and Africa regions, JSPS holds the HOPE Meetings. They provide graduate students and young researchers from the region opportunities to interact with Nobel laureates and other distinguished researchers.

2) Large-scale international projects

The government needs to promote cooperation with research communities and take their opinions into account when carrying out large-scale international projects and R&D that requires comprehensive database preparation. At that time, considering Japan's international position in each research area, the government provides support so that Japan can demonstrate leadership in the areas where it has strengths or strong interest.

(i) International Thermonuclear Experiment Reactor (ITER)

The International Thermonuclear Experiment Reactor (ITER) project is an international cooperation project intended to demonstrate the scientific and technological feasibility of fusion energy, which is expected to completely solve problems related to energy resources, through the construction and operation of a fusion experimental reactor. Currently, seven parties are participating: Japan, the EU, the U.S., Russia, China, South Korea, and India (refer to Part 2, Chapter 2, Section 2, 1 (1)).

(ii) International Space Station (ISS)

The International Space Station (ISS) project is an international cooperation project intended to construct manned space facilities in orbit around the Earth; it involves the cooperation of five parties (Japan, the U.S., Europe, Canada and Russia). As part of this project, Japan is operating the Japanese Experiment Module (JEM), also known as "KIBO," and an unmanned cargo transporter H-II Transfer Vehicle (HTV), also known as "KOUNOTORI" (refer to Part 2, Chapter 3, Section 1, 4 (2)).

(iii) Integrated Ocean Drilling Program (IODP)

The Integrated Ocean Drilling Program (IODP), launched in 2003, is an international research program led by Japan and the U.S., and includes a total of 26 participating nations. The program is intended to help researchers better understand global environmental changes, Earth's internal structure, and the deep biosphere of the crust, which is achieved by drilling through the bottom of the deep seafloor. The seafloor is drilled using multiple drilling vessels. The main three drilling vessels include Japan's deep-sea drilling vessel "CHIKYU," capable of drilling 7000m below the seafloor, and other mission-specific drilling ships supplied by the U.S. &Europe, which are also used to drill various areas of the seafloor across the world (refer to Part 2, Chapter 3, Section 1, 4 (2)).

(iv) Large Hadron Collider (LHC)

The Large Hadron Collider (LHC) project uses an enormous circular accelerator, located at the European Organization for Nuclear Research (CERN), in order to reproduce the state that existed at the creation of the universe (immediately after the Big Bang). The project plans to conduct experiments to search for unknown particles and to explore the internal structure of substances. The construction of the accelerator was completed in 2008 through international cooperation, including the CERN member countries, Japan and the U.S. At present, experimental research within the world's highest-energy fields are being conducted.

About 200 Japanese researchers are participating in the project, mainly in the A Toroidal LHC ApparatuS (ATLAS) experiment searching for the "Higgs boson," which is considered to be an origin of mass. In July 2012, CERN announced that they discovered a new particle that seemed to be the Higgs boson.

(v) International Linear Collider (ILC)

Aiming to determine the properties of the "Higgs boson" in more detail, an international group of international researchers has developed a plan for the International Linear Collider in which a linear particle accelerator will be constructed through international cooperation and will be used to carry out collision experiments using electrons and positrons. In December 2012, the group drafted a report on the facility design. The international group of researchers is working on the report to complete it by June 2013.

Column 2-7

Discovery of the "Higgs Boson"?—new development of particle physics

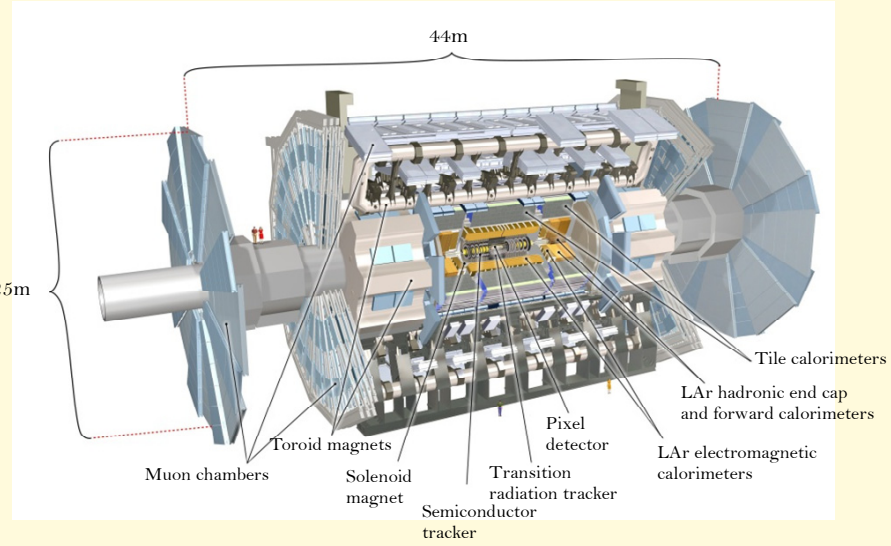
In July 2012, two international joint experiment groups, ATLAS and CMS, which were conducting experiments at the Large Hadron Collider (LHC) particle accelerator of the European Organization for Nuclear Research (CERN) in the suburbs of Geneva, Switzerland, announced that they detected a new particle with a mass of 126 GeV (giga-electron-volt[1]), approximately 130 times heavier than the proton. This new particle is considered most likely to be the "Higgs boson," the previously unknown particle that gives substances mass. The particle had been searched for for nearly 50 years since British physicist Dr. Higgs and other researchers predicted its existence.

LHC is a huge circular accelerator with a circumference of 26.7 km, almost as long as the Yamanote line. Researchers have conducted experiments there by accelerating protons up to 99.999997% of light speed and having them collide head-on with each other, creating a center-of-mass energy of 8 TeV (tera-electron-volts[2]), the largest one humankind has ever achieved. Although CERN is a European international research organization, many countries in the world, including Japan and the U.S., participated in constructing the LHC, which took about 14 years. The gigantic measuring instruments used by the two experiment groups mentioned above were each constructed with the cooperation of about 3,000 researchers from around the world. More than 100 researchers at universities and research institutions throughout Japan, such as the High Energy Accelerator Research Organization or University of Tokyo, constructed a gigantic measuring instrument, as large as a six-story building over 25 meters in diameter and 44 meters in length, and they have conducted full-scale experiments since November 2008. Constructing the accelerator and measuring instruments required new technical development, to which many Japanese companies contributed in cooperation with the researchers.

Particle physics explains the origins of substances that constitute the universe and the forces among them using a theory called the Standard Model. In this theory, all elementary particles must be essentially massless. Dr. Higgs and other researchers proposed an idea that the Higgs field, with which the whole universe is filled, gives particles mass. This time, of about 1,000 trillion events produced by the collisions at LHC, several hundred events indicating the existence of the new particle were observed. ATLAS and CMS captured events in which this new particle decayed into two photons and also observed events in which the new particle decayed into four electrons. The decaying pattern was in accordance with the behavior of the Higgs boson. These findings were the results of careful data analysis using delicate measuring instruments. The total power of thousands of researchers from around the world made this possible; especially the young researchers, including postgraduate students, all of whom made major contributions.

LHC has ceased its operation since February 2013 and is being modified in order to double the amount of collision energy it creates; it is estimated that this will take approximately two years. Then, researchers will examine the properties of the new particle more closely in order to better understand the Higgs field and how it gives substances mass. It is certain that there are still unknown particles such as dark matter in the universe that cannot be explained by the Standard Model; thus, they will continue searching for other new particles by making high-energy protons collide with each other.

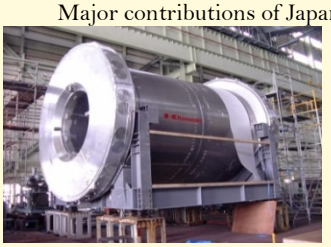
1 A unit for expressing particle energy. One GeV is one billion electron volts.
2 One TeV is trillion electron-volts.



ATLAS detector
Source: ATLAS/CERN

Major contributions of Japanese companies

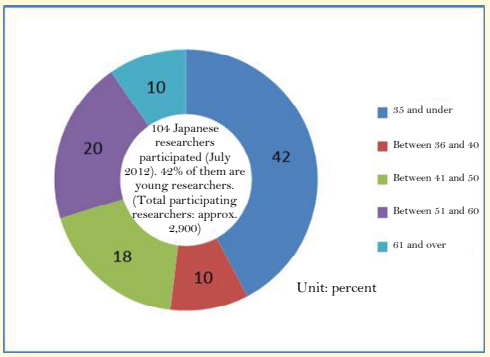
Beam-converging superconductive quadruple magnet
Source: Toshiba Power Systems Company



Liquid argon vacuum chamber
Kawasaki Heavy Industries, Ltd.

Silicon detector
Hamamatsu Photonics K.K.

Superconductive cable
Furukawa Electric Co., Ltd.



Major contributions of Japanese companies
Source: Created by MEXT

Name of equipment	Name of company
1.8K helium freezing system	IHI Corporation
Ultralow-temperature completely-nonmagnetic stainless	Nippon Steel & Sumikin Stainless Steel Corporation
Optical fiber	Fujikura Ltd.
Steel materials for superconductive magnets	JFE Steel Corporation
Superconductive solenoid magnet, etc.	TOSHIBA Corporation
Insulation sheet and tape	Kaneka Corporation
Plastic scintillation fiber	KURARAY Co. Ltd.
polyimide film copper-clad plate	Arisawa Manufacturing LTD.
Wire chamber	REPIC Corporation

Other major contributions of Japanese companies

3) Collection and analysis of overseas S&T information and the practical use of overseas research centers

In order to use overseas information for policy decisions on S&T, it is necessary to set up a system to collect, accumulate and analyze overseas information continuously and systematically, and to use it in a cross-sectional manner. For this reason, MEXT and all organizations concerned are working on such activities.

As one of Japan's concrete efforts, the National Institute of Science and Technology Policy (NISTEP) collects information and data on overseas S&T trends, compares them with Japan's conditions and analyzes them. Based on such objective and quantitative data, NISTEP conducts research studies useful for the promotion of S&T policies.

In addition, the JST Center for Research & Development Strategy (CRDS) carries out the investigation and analysis of overseas trends that are useful to formulate STI policies.

Furthermore, JSPS's overseas offices gather information on scientific trends in other countries, supports the internationalization initiatives of Japanese universities, holds symposiums and conducts collaborative activities with counterpart science-promotion agencies.

4) Systematic Efforts for S&T International Activities

(i) Practical use of international frameworks

a) G8 Summit

The G8 Camp David Summit was held in May 2012 in the U.S. and then Prime Minister Noda represented Japan. The G8 Leaders adopted the "Camp David Declaration," which included reference to science and technology, including energy and climate change issues.

As for the International Research Network for Low Carbon Societies (LCS-RNet), which consists of various research organizations who are working on the creation of a low-carbon society in each country, the fourth annual meeting was held in the U.K., in September 2012. As of 2012, sixteen research organizations from seven countries, including Japan, were participating.

b) Asia-Pacific Economic Cooperation (APEC)

The APEC Industrial Science and Technology Working Group (ISTWG) has conducted surveys on the subjects in which each economy was interested regarding the industries and S&T fields. It also held workshops and training courses, carried out various projects, and exchanged information about industrial and S&T policies among the economies. The Japanese government is leading the "Innovation Policy Dialogue," as an activity in ISTWG, where people involved in the innovation policies of the economies learn about each other's knowledge and experiences in order to improve both the drafting and implementation abilities of innovation policies throughout the APEC region.

In 2012, Russia, the host economy of APEC, proposed the establishment of the Policy Partnership on Science, Technology and Innovation (PPSTI) as a framework that would be a reorganized and strengthened version of the ISTWG and would deal with a wider range of innovations in areas such as industry, government and university-level research and development. The proposal was approved at the 20th APEC Economic Leaders' Meeting, held in September 2012.

c) Association of South-East Asian Nations (ASEAN)

As an activity of the ASEAN Committee on Science and Technology (COST), collaboration of Japan, China, the Republic of Korea and ASEAN countries, called ASEAN COST+3, are carried out. MEXT is taking leadership of ASEAN COST+3 on the Japanese side. The Sixth Meeting of ASEAN COST+3 was held in Jeju, the Republic of Korea in December, 2011, and opinions were exchanged regarding the joint projects of the ASEAN+3 countries. In addition, as a framework of cooperation between Japan and ASEAN COST, the ASEAN-Japan Cooperation Committee on Science and Technology (AJCCST) was started in 2009, and the Third Meeting of the ASEAN-Japan Cooperation Committee on Science and Technology was held in Naypyidaw, Myanmar in May 2012.

d) Other

(Asia-Pacific Regional Space Agency Forum (APRSAF))

Japan has hosted the Asia-Pacific Regional Space Agency Forum (APRSAF) since 1993. The APRSAF is the largest framework of space cooperation in this region, and it serves as an opportunity to exchange information and promote multilateral cooperation in the Asia-Pacific region regarding activities in space and the use of space. The number of participants has grown steadily from 15 countries and 1 international organization at the time of foundation to 33 countries and 14 international organizations at present. Initiatives conducted by APRSAF have achieved many results and one of them is the "Sentinel Asia" project, which shares disaster-related information, such as earth-observation satellite data, on the Internet in order to reduce the damages caused by natural disasters. The project was promoted with the cooperation of 25 countries or regions, 73 institutions and 13 international organizations (as of February 2013), and Japan received earth-observation satellite data from participating nations when the GEJE hit the country. The 19th Meeting of APRSAF, held in Malaysia in December 2012, had about 380 participants from 33 countries and 14 international organizations.

(Global Biodiversity Information Facility (GBIF))

GBIF is intended to collect data on biodiversity and use it globally.

(The Global Earth Observation System of Systems (GEOSS))

GEOSS is a comprehensive framework that coordinates various observation systems, such as satellites and ground observation that contribute to nine social benefit areas, including disaster and climate (refer to Part 2, Chapter 3, Section 1, 3 (1)).

(ARGO Project)

ARGO is an international project that monitors global ocean temperature and salinity in real time by deploying more than 3,000 floats, called Argo floats. The World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC) and other international institutions, as well as over 30 nations, including the U.S., Australia and Japan, are participating in the project. This project is expected to help researchers to comprehend changes in thermal and salinity structure inside the oceans and to predict climate changes more precisely. In Japan, ARGO project is implemented under the cooperation between MEXT, the Japan Meteorological Agency (JMA) and relevant governmental

agencies, and approximately 300 Argo floats were in operation mainly in the Pacific as of 2012.

(ii) Practical use of international organizations

a) The United Nations System (UN System)

Japan participates and cooperates to a great extent in a variety of science projects and activities conducted by the United Nations Educational, Scientific and Cultural Organization (UNESCO), a specialized agency of the UN.

UNESCO is conducting programs to resolve global issues and to establish international rules through such organizations as the Intergovernmental Oceanographic Commission (IOC), the International Hydrological Programme (IHP), the Man and the Biosphere Programme (MAB) and the International Bioethics Committee (IBC). Japan is promoting UNESCO activities by implementing human resource development projects in the S&T fields in the Asia-Pacific region through its contribution to the Japanese Funds-in-Trust and by dispatching experts to the commissions. Furthermore, Japan has been promoting the implementation of Education for Sustainable Development (ESD). In addition to ESD, "Sustainability Science" has been discussed with the Japanese National Commission for UNESCO and the UNESCO Secretariat as well as other Member States. Sustainability Science is an integrated approach to resolve global issues through collaboration between natural sciences and social and human sciences. As a result, experts meeting on Sustainability Science was held in collaboration with UNESCO Jakarta office, and the Working Group on Sustainability Science was established in the Japanese National Commission for UNESCO.

b) Organization for Economic Co-operation and Development (OECD)

OECD is engaged in S&T activities, including the exchange of opinions, experiences, information and personnel among participating countries and the preparation of statistical information through its many committees and agencies. These include the Council of the Ministerial Level; the Committee for Scientific and Technological Policy (CSTP); the Committee for Information, Computer and Communications Policy (ICCP); the Committee on Industry, Innovation and Entrepreneurship (CIIE); the Committee for Agriculture (AGR); the Environmental Policy Committee (EPOC); the Nuclear Energy Agency (NEA); and the International Energy Agency (IEA).

At the CSTP of OECD, members exchange information and opinions on S&T policies and study the role that science, technology and innovation play in economic growth, the improvement and enhancement of research systems, the roles of the government and the private sector in R&D, and methods of international R&D cooperation.

There are six subgroups under the CSTP: the Global Science Forum (GSF), Research Institutions and Human Resources (RIHR), the Working Party on Innovation and Technology Policy (TIP), the Working Party on Biotechnology (WPB), the Working Party on Nanotechnology (WPN), and the Working Party of National Experts on Science and Technology Indicators (NESTI). The main activities where Japan takes leadership by dispatching a chairperson or vice-chairperson are as follows:

(Global Science Forum (GSF))

The GSF is held to exchange information about each member country's studies, particularly on mega

science[1] and global challenges, and to present suggestions for the future in order to promote S&T cooperation between member countries. GSF offers opportunities to exchange opinions, to look for new international cooperation in specific S&T domains, to establish international frameworks helpful for important decisions on science policies and to reflect scientific findings about global challenges.

(Working Party on Innovation and Technology Policy (TIP))

TIP discusses policies related to innovation and technology, in order to enhance productivity, promote the creation and utilization of knowledge, encourage sustainable growth, and promote the creation of employment for highly skilled technicians.

In 2012, as in the previous year, TIP conducted a case study on open innovation as part of the "Financing, transferring and commercializing knowledge" project and also held a discussion about each project.

(Working Party of National Experts on Science and Technology Indicators (NESTI))

NESTI provides supervision, advice and adjustments concerning statistical work, and also contributes to the development of indicators and quantitative analysis helpful for the promotion of STI policies. Specifically, NESTI sponsors discussions and examinations regarding frameworks for international comparison, investigation methods, and the development of S&T indicators, such as those concerning research expenses and human resources. Japan delegates experts to the OECD office, and they are working on development of new indicators. At the meeting in FY 2012, NESTI decided to start revising the Frascati Manual, a manual for measurement of R&D, and it discussed how to proceed with the revision work.

c) International Science and Technology Center (ISTC)

ISTC is an international organization that was established by four parties—Japan, the U.S., the EU and Russia—in March, 1994, in order to support R&D projects for peaceful purposes in which researchers who had been engaged in the development of weapons of mass destruction in the former Soviet Union (FSU) are involved. As of January 2013, the amount of the funds earmarked for approved projects totaled about 868 million U.S. dollars, and the total number of participating researchers from Russia and CIS countries stood at more than 75,000.

(iii) Practical use of research institutions

(Economic Research Institute for ASEAN and East Asia (ERIA))

ERIA is an institution intended to conduct policy research and to provide policy recommendations for the promotion of East Asian economic integration. With "Deepening Economic Integration," "Narrowing Development Gaps" and "Sustainable Development" as the main three objectives, the focus is on working on research and conducting symposiums and human resource development in a wide range of areas, including innovation policies. In FY 2012, ERIA conducted research and held seminars on the production and use of biomass, one of the issues related to dissemination and promotion of S&T.

1 Large-scale projects for scientific R&D

(iv) International research grant program
(Human Frontier Science Program (HFSP))

The HFSP is an international research grant program aimed at supporting basic, international, joint research to resolve the complex mechanisms of living organisms, and was advocated by Japan at the Venice Summit in June 1987. The HFSP is now operated by 14 parties—Japan, the U.S., France, Germany, the EU, the UK, Switzerland, Canada, Italy, Australia, South Korea, New Zealand, India and Norway. Japan has been an active supporter of the program since its establishment. The Program offers grants for research expenses to international joint-research teams and fellowships to travel, living and other expenses for young researchers conducting research abroad. The program also organizes the HFSP awardees' meetings. With 18 HFSP research grant awardees having received the Nobel Prize up through FY 2012, the program has been highly acclaimed worldwide.

(v) Actions by Japan's academic institutions
(International activities conducted by the Science Council of Japan (SCJ))

On behalf of Japanese scientists and scientific communities, The SCJ has been striving for cooperation with many countries and has held together the memberships of the 45 international scientific organizations, including the International Council for Science (ICSU[1]) and the global network of science academies (IAP[2]).

Academies of the G8 and other nations have been involved in the Joint Statements based on scientifically informed opinions relevant to the annual G8 Summit's agenda. In May, 2012, the SCJ issued Joint Statements concerning "Building Resilience to Disasters of Natural and Technological Origin" "Energy and Water Linkage: Challenge to a Sustainable Future" and "Improving Knowledge of Emissions and Sinks of Greenhouse Gases," in cooperation with the science academies of the G8 and other nations, prior to the G8 Summit at Camp David in the U.S.. In Japan, the President of SCJ delivered the statements to the Prime Minister in person. The meeting of the science academies (G-Science Meeting) was held in India, from March 7 to 9, 2013, and focused on the themes of "Driving Sustainable Development: the Role of Science, Technology and Innovation" and "Drug Resistance in Infectious Agents - A Global Threat to Humanity." This occurred prior to the G8 Summit and other meetings which was held in the U.K. later in the same year.

In addition, in order to promote partnerships and collaboration among Asian countries in the field of academic research, the Science Council of Asia (SCA[3]), which has increased its number of member nations by adding four new nations, held the General Assembly meeting in Indonesia in July, 2012, with the main theme of "Mobilizing Science toward a Green Economy."

(vi) Actions for peaceful use of nuclear energy

Japan is leading international cooperation for the development of technical and human resources as related to nuclear non-proliferation and nuclear security while also gaining the trust of other nations in regard to Japan's peaceful use of nuclear energy.

1 International Council for Science: It was founded in 1931 as a nongovernmental, nonprofit, international scientific organization intended to promote international activities in the science and applied science fields for the benefit of humanity.
2 IAP - the global network of science academies: It was founded in 1995 as a forum of the world science academies. Science Council of Japan had been a member of its executive committee from 2004 to 2006, and 2007 to 2009.
3 Science Council of Asia: It consists of 27 academic institutions of 16 countries.

Japan concluded the safeguards agreement between Japan and the International Atomic Energy Agency (IAEA) in December 1977, and accepted the "safeguards," under which the IAEA confirmed that the contracting states would only use nuclear materials for peaceful purposes and never misuse them to create nuclear weapons. In response to this, the government has ensured that state system of accounting for and control of nuclear material within Japan under the "Nuclear Reactor Regulation Act." As a result of the inspection and the information submitted to the IAEA by Japan in regard to its nuclear materials, the IAEA has confirmed that all of Japan's nuclear materials were used for peaceful purposes.

At the Nuclear Security Summit held in the U.S. in 2010, Japan announced that it would promote the establishment of an integrated support center for strengthening nuclear security mainly for Asian countries and for the development of technology related to measurement and detection of nuclear material and nuclear forensics. Later, the "Integrated Support Center for Nuclear Non-proliferation and Nuclear Security" was built under the Japan Atomic Energy Agency (JAEA) and provided training in nuclear nonproliferation and nuclear security capacity to over 1,000 people from more than thirty countries, including Japan. In addition, starting in 2011, at JAEA, Japan and the U.S. have jointly conducted the demonstration of non-destructive assay technology that measures the amount of plutonium in spent fuel, the development of non-destructive assay technology utilizing nuclear resonance fluorescence, and the development of nuclear forensics technology that identify the source of nuclear materials illicitly trafficked. Through these efforts, the Japanese government promotes international cooperation for research and development and human resources development related to the nuclear non-proliferation and nuclear security while also fostering the international confidence in regard to peaceful use of nuclear energy in Japan.

(vii) Other international efforts

In October 2012, with the Science and Technology Ministers and other representatives from twenty countries attending, the Cabinet Office held the Science and Technology Ministers' Roundtable Meeting to discuss "Green Growth and Inclusiveness -The Role of International Collaboration in Science, Technology and Innovation."

(3) Promotion of cooperation with developing countries on global-scale issues

In order to promote international joint research with the objectives of solving global issues and practical application of research outcome, MEXT and JST, MOFA and JICA, which have expertise in Japan's leading-edge S&T and ODA, respectively, implement the "Science and Technology Research Partnership for Sustainable Development (SATREPS)" program, based on the needs of the developing countries in Asia, Africa and Latin America. Between FY 2008 and 2012, a total of 68 projects (34 in Asia and 19 in Africa) in 35 countries were adopted as SATREPS projects in the fields of environment and energy, bio-resources, natural disaster prevention, and infectious diseases control.

MEXT combines international joint research with the Japanese Government Scholarship Program by accepting those who desire to study at participating universities of SATREPS in Japan as government-sponsored exchange students. As a result, young researchers from partner countries who participate in the international joint research program will be able to obtain academic degrees in Japan. MEXT is thus promoting diversified cooperation on human resource development.

Moreover, in cooperation between MEXT, the Japan Society for the Promotion of Science (JSPS)) and between, the Ministry of Foreign Affairs and JICA the "Dispatch of Science and Technology Researchers" program has been implemented in order to establish research fundamentals in partner countries and develops human resources through international joint research by dispatching Japanese researchers to developing countries. The program has thus helped capacity building in order to let researchers of partner countries tackle global issues.

Furthermore, in order to tackle global-scale issues, such as poverty reduction and climate change through support of agriculture, forestry and fishing industries, the Ministry of Agriculture, Forestry and Fisheries (MAFF) is supporting the development of abiotic stress tolerant crops (e.g. against dryness) through international collaborative research projects; it is also supporting research and capacity-building strategies in order to increase the productivity of rice, tubers, legumes and other crops in developing countries through the use of international agricultural research institutions.

(4) Reinforcement of foundations for developing international S&T activities

In order to strategically advance bilateral and multilateral international cooperation regarding S&T, Japan needs to further promote government-to-government dialogues with other countries and to continuously collect and use information on overseas S&T trends. For this reason, the government is making efforts to enhance its infrastructure to better develop international S&T activities.

1) International Cooperation Efforts

(i) Cooperation with China, South Korea and other Asian countries

Within the framework of the Japan-China-Korea trilateral cooperation, the Minister of Education, Culture, Sports, Science and Technology attends the Japan-China-Korea Ministerial Meeting on Science and Technology Cooperation.

The third Japan-China-Korea Ministerial Meeting on Science and Technology Cooperation was held in Shanghai, China in April 2012. At the meeting, the current situation of S&T policies in Japan, China and

Science and Technology Research Partnership for Sustainable Development (SATREPS)
"Improvement of Food Security in Semi-arid Regions of Sudan through Management of Root Parasitic Weeds"
Source: JST

South Korea were reported, and the future direction of their cooperation was discussed.

As a result of the Japan-China-Korea Ministerial Meeting on Science and Technology and the Director-Generals Meeting, which is held alternately with the Ministerial Meeting, the Japanese-Chinese-Korean Cooperative Joint Research Collaboration Program (JRCP) and the Young Researchers' Workshop were conducted.

In March 2012, the "Japan-China-Korea Green Technology Forum" was held in Tokyo, in order to share research results and build a network regarding the green-technology field in all three nations.

In addition to Japan-China-Korea Trilateral cooperation, the three countries also hold the Science and Technology Cooperation Committee, exchange information and researchers, and carry out joint research to enhance the S&T capabilities of all three nations.

The 14th Meeting of the Japan-China Science and Technology Cooperation Committee took place in Tokyo in August 2012, and the two countries discussed their policies and the future direction of their cooperative efforts; they also approved a new Japan-China S&T cooperation project. In addition, MEXT and the Chinese Academy of Sciences hold the Japan-China Science and Technology Policy Seminar every year, in order to exchange opinions on S&T policies. In November 2011, the eighth seminar was held in Obihiro, Hokkaido.

Between Japan and South Korea, the two countries had a talk in March 2009, and agreed to continue to have policy dialogues between the Council for Science and Technology Policy of Japan and the National Science and Technology Council of Korea. In November 2011, the fourth policy dialogue was held in South Korea.

In addition, JSPS carries out the "A3 Foresight Program" in cooperation with National Natural Science Foundation of China and National Research Foundation of Korea to support interaction among research centers in the three countries aimed at developing scientific research networks and fostering young researchers.

(ii) Cooperation with European countries and North America

The government is actively promoting cooperative activities in advanced S&T fields, such as the life sciences, nanotechnology including associated materials, the environmental sciences, nuclear technology and space development. These cooperative activities include holding joint committee meetings based on bilateral agreements on S&T cooperation, information exchange, researchers exchange, and joint research.

Between Japan and the U.S., the 13th meeting of the Japan-U.S. Joint Working Level Committee on Cooperation in Science and Technology was held in Washington D.C., (U.S.A.) in July 2012. During the meeting, the current status of each cooperation field and the future direction of their cooperation efforts were discussed. In addition, the two countries had a policy discussion prior to the Japan-U.S. Joint High-Level Committee Meeting on Science and Technology Cooperation at Ministerial level, scheduled to be held in 2013, and they approved policy recommendations after the meeting.

Between Japan and the EU in accordance with the agreement on S&T cooperation signed in November 2009, which became effective in March 2011, the first Japan-EU Joint Committee on Science and Technology Cooperation was held in June 2011and the committee decided to support joint research in the "development of new materials for the substitution of critical metals." The two parties launched a

coordinated call on international joint research projects in the ICT field in October and November 2012 after discussions with the European Commission. Since January 2011, Japan has also participated in "Connecting and Coordinating European Research and Technology Development with Japan (CONCERT-Japan)," an ERA-NET initiative under FP7. In this project, each government agency and a funding agency form a consortium, and the consortium holds a variety of symposiums and meetings to exchange information regarding the specific S&T policies of both Japan and the EU and to build networks among participating countries.

In addition, in 2012, Japan held meetings of the Joint Committee on Science and Technology Cooperation with Hungary and Slovakia in February, with Sweden and Finland in May, with Norway in June, with Spain in July and with Switzerland in November.

The Second Trilateral Workshop on Rare Earths was held in Tokyo in March 2012, with experts in material technology and the policy makers of Japan, the U.S. and the EU attending. High-level government officials of the three economies participated in the workshop in order to deepen common understanding on how global issues are related to the rare earth supply and to discuss strategic efforts to secure a stable supply of rare earth in the future.

(iii) Cooperation with other countries

Japan is also promoting cooperation with Australia, Russia, South Africa, Brazil and other countries based on the Science and Technology Cooperation Agreements through the exchange of information, the exchange of researchers and joint research. The government held "Joint Committee on Science and Technology Cooperation" meetings with Australia in August 2012 and with South Africa in October of the same year.

The government is also exchanging opinions about the possibility of future cooperative activities with other countries that have yet to conclude a Science and Technology Cooperation Agreement with Japan.

2) Policy dialogues regarding S&T by the private sector

In order to broaden the range of international activities for S&T diplomacy, and in an effort to promote the establishment of international communication, the Japanese government is supports holding international meetings with a wide range of stakeholders attending, so that the international S&T leaders in industry, government and academia can discuss the future of S&T research. In FY 2012, the government carried out the "Program for the Promotion of International Policy Dialogues Contributing to the Development of Science and Technology Diplomacy." This is one of the Programs for the Promotion of International Strategy for Science and Technology and is supported by Strategic Funds for the Promotion of Science and Technology.