Chapter 3 Science and Technology System Reform

Section 1 Fostering, Securing, and Activating Competent Person

1 Establishing an Environment that Enables Individuals to Play Active Roles

The future of S&T in Japan and the maintenance and enhancement of the country's international competitiveness depend on the capabilities of people fostered in Japan, and it is important to cultivate an environment that enables a diverse pool of individuals, including young researchers, female researchers and foreign researchers, to become highly motivated and exercise their capabilities. Described below are the outlines of major policies adopted by ministries and agencies as categorized by purposes.

(1) Supporting the independence of young researchers

If Japan is to aim towards becoming an advanced science- and technology-oriented nation, it is critical to foster and secure distinguished young researchers with abundant creativity capable of leading future research activities. To this end, research institutes are expected to provide opportunities for research activities and promote researcher independence, and universities are expected to attract and provide opportunities for assistant professors to assume active roles, in an environment of competition based on fair and transparent personnel evaluations.

In order to foster next-generation researchers in the field of information and communications technologies (ICT), MIC implements R&D through the Fostering Young ICT Researchers [literal translation] as part of the Strategic Information and Communications R&D Promotion Programme (SCOPE), providing research funds for R&D projects proposed by young researchers.

MEXT implemented the program “Promotion of Environmental Improvement to Enhance Young Researchers' Independence” under the Special Coordination Funds for Promoting Science and Technology for young researchers to play an active role. Under this program, MEXT provides support for 34 organizations as of FY 2009, promoting introduction of the tenure track system and supporting efforts to improve the research environment by providing start-up funds.

In relation to the Grants-in-Aid for Scientific Research, MEXT appropriate approximately 33.1 billion yen in 2009, in an attempt to enhance “Grant-in-Aid for Young Scientists,” which is to provide research items aimed at young researchers, to support young researchers with little experience to acquire research funds and to make a good start.

In addition, the ministry provides through JSPS excellent young researchers with opportunities to devote themselves to their research activities and independently choose topics without restriction by making the Research Fellowships for Young Scientists available and by providing opportunities to gain research experience abroad in order that they may improve themselves by competing with foreign researchers through the Postdoctoral Fellowship for Research Abroad to foster and secure researchers capable of playing an active role across national borders.

MHLW invites applications for funding to foster young researchers who will conduct the ministry-related research activities in future under projects funded by the Health and Labour Sciences Research Grants.

MAFF establishes an award as part of its Human Resources Development Program in Agriculture, Forestry and Fisheries Research [literal translation] to recognize researchers under 40 years of age who have achieved excellent results as a means of motivating young researchers.

Meanwhile, the National Agriculture and Food Research Organization provides a special category in competitive funding to support young researchers in research to develop technical seeds. The National Institute of Agrobiological Sciences promotes the independence and enhancement of young researchers' motivation through a junior researcher system, which is intended to allow graduate school students enrolled in doctoral programs to advance their education while working for research institutions.

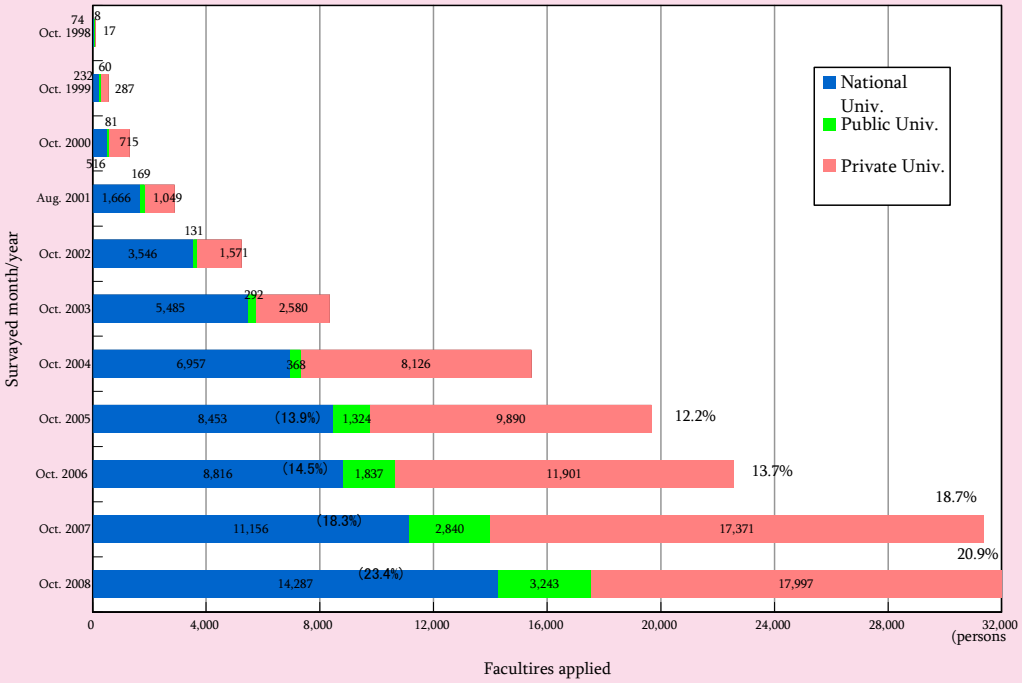
METI provides through NEDO subsidies for young researchers' R&D activities aiming at industrial applications.

MOE supports the improvement of work carried out by young researchers by setting up a special reserve for the ministry's competitive funds.

(2) Improving the mobility of competent persons and limiting the proportion of alumni

In order to develop researchers with broad creative perspectives and to achieve competitive and dynamic R&D environments, it is important to improve the mobility of researchers, to form a creative research environment, and to provide opportunities that allow researchers in versatile sectors to gain experience at various research sites. The Basic Plan calls for universities and public research organizations to make continued efforts to ensure widespread adoption of a fixed-term system and the system is being introduced by them. (Figure2-3-1) Furthermore, universities are encouraged to pay sufficient attention to the proportion of alumni on their faculties, and it is expected that universities with an excessively high proportion of alumni on staff will endeavor to lower the proportion.

Figure 2 3 1 Status of the Introduction of Fixed-term Faculty Members at Universities



Note: The numbers at the right end of the bar chart are the percentages of the faculties with fixed term among all full-time faculties; the numbers in the parentheses are the percentages of the faculties with fixed term among all full-time faculties in national universities.
Note: The numbers include those who were employed with labor contracts with fixed term, regardless of the "Act on Term of Office of University Teachers, etc." since October 2004, when national universities became juridical persons.
Source: Prepared by MEXT

(3) Promotion of the activities by female researchers

The ratio of female researchers in Japan is lower than in European countries and the US. It is important to promote activities by female researchers not only in order to promote gender equality but to broaden the base of S&T-related competent persons.

The Basic Plan calls for a variety of initiatives to promote activities by female researchers. In response to this, since 2006, MEXT supports the establishment of an environment which allows excellent female researchers who have taken a parental leave to return to research through the JSPS's Research Fellowships for Young Scientists.

Moreover, MEXT implemented a "model project to enable female researchers to simultaneously perform the duties of researchers and mothers" funded by the Special Coordination Funds for Promoting Science and Technology to encourag the female researchers to pursue their careers while raising children in 35 organizations as of FY 2009. In addition, since FY 2009 five new organizations implemeted the "Program to accelerate female researcher training system reform [literal translation]" to accelerate the training of female researchers especially in the areas of siences, agricultural sciences, and engineering where the percentage of female employees is particularly low.

JST Basic Research Programs establish and support a system that enables researchers to postpone their research activities for parental leave or to return from their leaves.

The ministry implements a project to encourage female students of lower and upper secondary

schools to follow science career paths by creating opportunities for them to mingle with female researchers and by providing courses as a way to foster their interest in S&T.

Under the slogan "Challenge Champaign: Choice of S&E Courses for Female Students [literal translation]," the Cabinet Office provides them with information related to S&E to raise their awareness about this area.

AIST examined measures for the support of the simultaneous pursuit of nursing and business, including the holding of gender-equal symposia, and recruitment seminars targeting female students, and it also executed surveys and organized study meetings concerning nursing care as a means of improving the work environment. Moreover, AIST organized a consortium consisting of universities and research institutions collaborating together to expand and disseminate the measures to improve the work environment, career building and motivation of female researchers. (12 organizations including AIST are in this consortium as of January 2010.)

(4) Promotion of the activities by foreign researchers

Along with the promotion of active participation by a diverse range of individuals, it is important, not only from the perspective of attracting competent persons, but from the perspective of improving the level and international nature of research activity in Japan, to prepare an environment that allows talented researchers from other countries to live and work.

However, the percentage of foreign nationals in general among highly skilled workers is extremely low in Japan relative to international levels. Japan hosts only about 11,000 foreign researchers[1], accounting for only 1.34% of the total number of researchers in the country.

The acquisition of talented researchers is currently the focus of fierce international competition among the US, European countries, and China. In order to attract excellent foreign researchers, the Japanese government has reformed its immigration control system in 2006 as to expand the special measure allowing foreign researchers to stay in Japan the original three years to up to five, an extension that was previously applied only to designated structural reform districts where programs for the promotion of receiving foreign researchers were in place. MEXT implemented measures through JSPS such as the Strategic Fund for Establishing International Headquarters in Universities, to support the globalization of the research environment, the Postdoctoral Fellowship for Foreign Researchers, and the Invitation Fellowship Programs for Research in Japan, etc. to inviting approximately 6,100 excellent foreign researchers annually to Japan.

(5) Appointment of ability of elderly researchers

It is important for improvement of the level of S&T in Japan that researchers who are recognized as truly excellent across the world can continue to contribute at any age.

AIST established a reemployment system to secure employment of people up to 65 years of age in response to the Revised Act concerning Stabilization of Employment of Older Persons and is working proactively to appoint elderly researchers.

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1 Statistical figure for persons whose residence status falls under the category of "professor" or "research" in the Ministry of Justice Statistics on Foreign Residents Registered [literal translation].

2 Strengthening the Fostering of Competent Persons Function of Universities

(1) Fostering of competent persons at universities

Universities, essential institutions for the creation and utilization of knowledge, have a large role to play in fostering competent persons endowed with the creativity, broad perspective and flexible thinking necessary for exercising leadership across national borders. Universities are actively working to improve education for this purpose. For example, the number of universities introducing major-minor systems that enable students to systematically study in a broad range of fields has been increased over the past few years, with 167 universities (undergraduate level) and 100 universities (graduate level) adopted this system as of FY 2008. Furthermore, in order to improve and enhance the education environment, 727 universities executed organizational efforts to improve the educational strengths of faculties (faculty development) in FY 2008, and 341 universities (undergraduate level) and 250 universities (graduate level) executed performance evaluations for faculties in the same year.

MEXT provides support to excellent efforts by national, public and private universities to reform university education in order to promote the implementation of education and research that reflect their own characteristics.

(2) Drastic enhancement of graduate school education

In a modern society in which specialization and segmentation of knowledge is progressing and international competition is intensifying, there is a pressing need to foster competent persons equipped with both deep expertise and broad versatility that can adapt to new academic fields and rapid technological innovations. With regard to graduate schools, which should play a central role in the development of such persons, quantitative improvement has steadily progressed with the number of graduate school students rising by about 70,000 over the 10-year period between FYs 1999 and 2008. From now, it is necessary to further improve the quality of education at graduate schools.

In this context, it is important to have graduate schools clarify the objectives of their curriculums while taking into account social needs and, based on such definitions, enhancement and reinforcement of graduate school education (enhancement of systematic development) in such a direction that systematic education programs leading to degrees should be created and offered, and that management and transparency of the processes should be diligently pursued. MEXT has implemented the “Organizational Support Program for Improving Graduate School Education” that supports excellent organizational and systematic educational projects in graduate schools for developing high-level personnel who can take an active role in a variety of different fields of society including industry. As of FY 2009, MEXT had adopted 221 programs proposed by 91 universities.

(3) Drafting of initiatives related to the reform of graduate school education

MEXT formulated the Platform for the Promotion of Graduate School Education which features systematic and intensive efforts towards enhancing graduate schools over a five-year period in March 2006. This sets the direction of reform towards 1) realization of effective graduate school education, 2) assurance of conformity to international standards and credibility and 3) establishment of education and outstanding research centers that are competitive internationally. MEXT implements measures for making Japanese universities attractive across borders based on this platform.

In the Graduate School Section, Subdivision on Universities, Central Council for Education, progress and issues are under examination in relation to suggestions and policies mentioned in the "Graduate School Education in the New Age" and the "Platform for the Promotion of Graduate School Education," and in the future, through these works, new direction of graduate school education will be clarified.

(4) Expansion of financial support for doctoral students

In order to secure excellent researchers, it is necessary to enable talented students to proceed to doctoral courses without overly worrying about the financial burden involved. Therefore, the Basic Plan aims to enable about 20% of doctoral students to receive financial support equivalent in amount to their living expenses.

To this end, MEXT enhanced, as a priority, support for doctoral students that is provided through the JSPS Research Fellowship for Young Scientists and expanded the amount of competitive funds that can be used to appoint as teaching assistants (TA), which lets graduate students assist educational activities, and as research assistants (RA), which allows doctoral students to participate in research projects conducted by universities. The JST Basic Research Programs also has been supporting the employment of excellent doctoral students as RAs.

The Japan Student Services Organization implemented scholarship loan programs for those who have ability but are not possible to go to school due to their economic reason, and exemption of scholarship repayment for those who achieved especially outstanding results.

3 Fostering of Competent Persons that Meet Social Needs

(1) Fostering competent persons through industry-academia collaboration

For Japan to maintain its prowess in industrial technologies and achieve sustainable development, it is important to develop, by taking account of the needs of the society including the industrial sector, competent persons that meet such needs and that can adapt to change in the needs. To do so, it is essential that universities and companies form cooperative relations for fostering competent persons and coordinate their activities.

Therefore, MEXT and METI are promoting the "Industry-Academia Collaboration for Fostering Competent Persons [literal translation]" to provide opportunities to communicate and carry out the activities in relation to human resources between universities and industries, and implemented the "Career Development Program for Foreign Students from Asia" to attract excellent foreign students from Asian countries to Japan and promotes their activities within Japanese corporations.

MEXT promotes fostering of competent persons through industry-academia collaboration at universities, by the Support Program for Fostering Manufacturing Engineers [literal translation], which supports fostering of engineers involved in manufacturing through cooperation of regional communities and industries, and the Program for Practical Human Resource Development by Industry-Academia Cooperation – Service Innovation Human Resource Development –, which contributes to creation of innovations and cultivate competent persons.

MEXT implemented the Strategic Program for Fostering Environmental Leaders under the Special Coordination Funds for Promoting Science and Technology, in order to establish centers at which foreign students from Asian and other countries can study together with Japanese students and competent persons who have the leadership potential to solve environmental problems in developing countries (called environmental leaders) can be fostered. At present, 12 organizations are advancing in each project.

The MOE has been implementing the project to establish an industry-academia-government collaboration, "Environmental Consortium for Leadership Development (EcoLeaD)," based on the "Vision of University-led Environmental Leadership Initiatives for Asian Sustainability," which was set forth in March 2008, to train people (green human resource) to work on socio-economic green actively.

METI has provided support for the program for fostering competent persons through industry-academia collaboration based on the achievements of the above-mentioned Industry-Academia Partnership.

In Small and medium enterprises, passing down of techniques and skills, as well as training and acquisition of young technicians are becoming immediate problems. Thus, METI implemented measures to support fostering competent persons by enhancing practical training programs intended for specialized upper secondary school students through the collaboration of industries, technical upper secondary schools, and administration in the respective regions. In addition, METI has implemented a model program for the systematic fostering of basic skills in various areas at universities, which comprise of "capacity to step forward," "capacity to think out," and "capacity to work in team," so that university students can develop the abilities that are required by society through industry-academia collaboration.

(2) Promotion of the activities of doctorate holders

Amid the deepening and diversifying relationship between S&T and society, it is desirable that post-docs and other personnel with expertise in S&T play an active role not only at universities and research institutions but in various sectors of society such as the industrial sector and administrative agencies.

However, since such personnel have not been given sufficient opportunities to do so because the career paths after post-doctoral period are uncertain, MEXT has implemented the "Fostering Young Researchers for Innovation Creation [literal translation]" (Special Coordination Funds for Promoting Science and Technology), and so far 17 organizations are promoting the development of a system to foster research personnel by which young researchers can acquire not only specialized ability in specific disciplines but the ability to produce creative results in various fields both within

and outside Japan.

AIST is recruiting doctorate holders for joint research projects to train human resources capable of making contributions to the corporation immediately, based on coordination or collaboration agreement with corporations. In addition, to foster competent persons who can contribute to innovation in industries, or the personnel who have broader perspectives as well as better communication skills, AIST has established the AIST School of Innovation as the program to employ doctorate holders on temporarily bases and to provide practical high-level education through on-the-job training (OJT) utilizing the classroom lectures or the join research environment of AIST

METI is trying to promote and recruit for creating next-generation industries such as a low carbon society and medical technologies to reinvigorate the local economies. However, since it is difficult to secure high-level R&D human resources, in FY 2009, METI has implemented the "project to create centers for human resources and employment for next-generation industries [literal translation]" to support recruitment and training of people in the advanced technologies while collaborating with local universities, public research institutions, private sector, self governing bodies etc. (11 centers were selected)

(3) Development of diverse human resources responsible for utilizing and returning knowledge to society

Fostering of competent persons related to intellectual properties and management of technology

In order to promote the creation of innovation, it is necessary to foster competent persons capable of creating, protecting and utilizing intellectual properties and those capable of effectively leading the results of R&D to the creation of market value based on understanding of both technology and business management.

MEXT promotes voluntary efforts by universities in this regard by supporting educational projects related to intellectual properties. For the purpose of fostering advanced professionals in areas such as management of technology, professional graduate schools with a total of 182 majors were in place as of April 2009.

Fostering S&T communicators

To be supported by the citizens and to promote S&T with the citizens, it is necessary to foster and promote the activities of S&T communicators, personnel suited for promoting communications between scientists/engineers and ordinary people by explaining S&T in an easy-to-understand manner and by conveying the concerns of the society to scientists/engineers.

MEXT supports universities that will provide courses intended to train S&T communicators through the Fostering Talent in Emerging Research Fields [literal translation] program, which is funded by the Special Coordination Funds for Promoting Science and Technology. The National Science Museum and the National Museum of Emerging Science and Innovation make active efforts to foster S&T communicators and promote their activities, through training courses or programs.

Fostering engineers

To become an advanced science- and technology-oriented nation, it is necessary to create industrial frontiers and strengthen international competitiveness through technological innovation, as well as to strengthen the technological platform. For this purpose, efforts are being made to foster sufficient leading engineers through the following policies.

1) Professional engineer system

The professional engineer system was established with the enactment of the Professional Engineer Act in 1957 (revised in 1983). It aims to contribute to the improvement of S&T and the development of the national economy through sound engineering, by conferring the qualification of professional engineer on those who possess advanced and specialized abilities in applying S&T to planning and design work.

In order to become a professional engineer, requires passing of the national examination that judges whether the applicants possess highly specialized application abilities in individual 21 fields of specialization and registration. The examinations are held annually for both professional engineer and associate professional engineer. To be an associate engineer, requires specialized knowledge that is equivalent to engineering degree graduate, and to be a professional engineer, requires highly specialized application ability of the knowledge in there fields. In FY 2009, the test resulted in 9,998 individuals being certified as associate professional engineers, and 4,269 being certified as professional engineers. The breakdowns of the certified professional engineers are listed in the Table 2-3-2. As of the end of March 2010, there were a total of 68,546 individuals registered as professional and associate professional engineers.

Table 2 3 2 Certified people as professional engineers in selected categories (FY 2009)

Technical Discipline	Applicant (persons)	Certified (persons)	Rate of certified people (%)	Technical Category	Applicant (persons)	Certified (persons)	Rate of certified people (%)
Mechanical Engineering	922	234	25.4	Agriculture	828	189	22.8
Marine & Ocean	15	4	26.7	Forest	270	82	30.4
Aerospace	25	6	24	Fisheries	141	25	17.7
Electrical & Electronics Engineering	1397	209	15	Industrial Engineering	152	37	24.3
Chemistry	156	30	19.2	Information Engineering	543	66	12.2
Textiles	23	5	21.7	Applied Science	764	143	18.7
Metals	136	35	25.7	Biotechnology & Bioengineering	73	14	19.2
Mining	27	7	25.9	Environment	758	127	16.8
Civil Engineering	14819	1933	13	Nuclear & Radiation	144	34	23.6
Water Supply & sewage	1683	310	18.4	Comprehensive Technical Management	3264	697	21.4
Environmental Engineering	603	82	13.6				

Source: Prepared by MEXT

2) Supporting the continuous development of engineer abilities

JST supports engineers in acquiring extensive basic knowledge in S&T and knowledge of failure by providing internet educational tools for self-learning that covers the respective areas of S&T and across different areas at http://weblearningplaza.jst.go.jp/ (Web Learning Plaza website), as well as the Failure Knowledge Database at http://shippai.jst.go.jp/ (JST Failure Knowledge Database website) that includes failure cases in the S&T field together with lessons learned from failures.

3) Others

MEXT held the "Conference of collaborators in relation to how practical education should be for engineers in universities [literal translation]" for the purpose of further enhancing the training of engineers, and examining how to train necessary capacities and skills of engineers in the "program to foster expert engineers" and to maintaining the quality of education for engineers.

AIST continued the program to foster expert engineers, in order to train engineers to acquire advanced expertise useful for R&D by utilizing its versatile research activities and the cutting-edge research infrastructure.

4 Expanding the Range of Next-generation S&T-related Personnel

To foster next-generation S&T-related personnel, the government has systematically promoted the enhancement of math and science education. This creates an environment in which children at the level of elementary, lower secondary education can become friendly with and learn S&T and develops an effective environment that fosters the ability of children who are interested in math and science.

CSTP called for deliberations on and enhancement of measures concerning various strategic initiatives, including the fostering of top-level personnel, the use of outside experts to strengthen the teaching staff and improve school education, training of S&T communicators, and enhancement of outreach activities of research institutions. It was reflected in the FY 2010 budgets of multiple ministries.

(1) Fostering children brimming with intellectual curiosity

In order to enhance observation and experiment activities and the capabilities of teaching personnel in elementary school science classes, JST utilizes outside personnel including researchers, engineers, undergraduate (graduate) students, and retired teaching staffs as nature study support staff and special lecturers in the "Science education assistants allocation program." In FY 2009, the program was implemented in 65 prefectures and government-designated cities. Collaborating with the school boards, universities and graduate schools have started in 2009 a new support project to train teachers in elementary and junior high school to be the central personnel with excellent instructing capability in math and science education in their schools or in the community. It is also implementing "Science Partnership Project," as a collaboration project of schools and boards of education with universities and science museums, to support projects to experience and to answer questions of children while enhancing further their interest and intellectual curiosity regarding S&T, natural sciences, and mathematics. More specifically, these initiatives include educational

activities such as observations and experiments supervised by front-line researchers and engineers, and science camps (camp-type learning activities) for hands-on S&T lessons in the latest research environment, and other activities. In addition, JST is engaged in the development of digital materials for science education and provision of such materials to schools via the internet.

In MEXT, efforts are underway, based on the Act for Promotion of Science Education [literal translation], to systematically enhance the facilities and equipment used in science and mathematics education at elementary, lower secondary, and upper secondary schools, as they are insufficient in number and outdated in many cases.

In cooperation with MEXT, METI is implementing the "Education support project utilizing part-time outside lecturers [literal translation]" to create curriculums of elementary school sciences classes in connection with the technologies owned by local corporations, to discover part-time outside lecturers from industrial professionals, including corporate technicians, etc., and to construct local networks in the industry-academia and among educational institutions, among other projects.

METI supports career education to encourage children to understand work through the

first-hand experience of Manufacturing technology, etc. The ministry launched a coordinator fostering program for the further enhancement of career education in response to the increasing need for coordinators to combine the industry with local schools. In addition, to help lower and upper secondary school students flesh out their future career perspectives and improve the effectiveness of their classes by showing knowledge-society linkage and careers in engineering while utilizing local industrial engineers and facilities, METI not only executed development and verification tests of the programs designed to locate cooperative enterprises and link industrial technology with basic knowledge acquired through education, but developed networks between organizations of industry and academia in the "Project targeted at school students for fostering engineering-related personnel [literal translation]."

(2) Development of the individuality and capacity of talented children

MEXT promoted, with the support of JST, the development of S&T-related personnel capable of playing an active role internationally by designating upper secondary schools and other schools that focus on science and mathematics education as Super Science High Schools. Specifically, efforts are underway to develop and implement curriculums that do not follow the National Curriculum Standards and promoting research projects. In FY 2009, 106 upper secondary schools engaged in unique efforts in this regard.

In addition, it is implementing the "Project to support science and math students [literal translation]" to promote intensive projects to enhance further the motivation and capacity of the students who have already shown strong learning motivation in math and science fields in universities with the faculties of natural sciences, for the purpose of fostering significant S&T human resources.

JST supports domestic competitions of international science and technology contests in mathematics, physics, chemistry, biology, informatics, etc., the sending of Japanese teams to international competitions, and international contests within Japan. (In Japan, the International

Biology Olympiad was held in FY 2009, and the International Chemistry Olympiad is to be held in FY 2010.) (Figure 2-3-3) It also implements the program "Fostering Next-generation Scientist" to foster excellent, aspiring scientists by supporting projects carried out by universities in order to provide a continuous supply of high-level, evolutionary learning experiences outside the schools throughout the year to pupils who have excellent motivation and ability in science and mathematics.

The Japan Patent office creates textbooks and side readers to enhance IP literacy for students in elementary school, junior high school, high school, technical colleges, and universities through the National Center for Industrial Property Information and Training (INPIT) and offer these materials for free to institutions when requested. It also holds seminars for elementary to university students and teachers throughout the country using these textbooks and side readers.

In addition, it hosts patent contests and design patent contests for the purpose of enhancing the understanding towards the IP system through first-hand experience for high school and university students. Excellent inventions and designs contributed to the contests will be the actual candidate for patent protection while the students actually take the procedures of patent or design registration applications.

Furthermore, it is important to develop the individuality and capacity of talented pupils and students, and improvement in the interconnection between upper secondary schools and universities is essential for that. In this regard, in FY 2009, about 70% or more of universities adopted the admission office (AO) entrance examination, which comprehensively evaluates the applicants' capacity, aptitudes and motivation.

Figure 2 3 3 International Science Olympiads 2008 Japanese Medalists

International Mathematics Olympiad (IMO) in Germany

From the left;
Makoto Fukushima* 12th grade, Komaba Senior High School, Attached to University of Tsukuba (Gold)
Suguru Ishikawa 12th grade, Hokusetsu Sanda Senior High School (Bronze)
Shiro Imamura 12th grade, Nada High School (Gold)
Akio Kishikawa 11th grade, Kurume University Senior High School (Gold)
Motoki Takigiku* 12th grade, Komaba Senior High School, Attached to University of Tsukuba (Gold)
Kazuhiro Hosaka* 12th grade, Kaisei Senior High School (Gold)

International Physics Olympiad (IPhO) in Mexico

From the left;
Hiroyuki Namba 12th grade, Okayama Asahi Senior High School (Silver)
Sho Higashikawa 12th grade, Mito 1st Senior High School (Gold)
Yuto Ashida 12th grade, Keio Senior High School (Gold)
Takeru Yokota 12th grade, Nansei Gakuin Senior High School (Bronze)
Takashi Ando 12th grade, Asahigaoka Senior High School (Bronze)

International Biology Olympiad (IBO) in Japan

From the left;
Atsuhito Nakayama 11th grade, Nada Senior High School (Silver)
Ayako Yanaka 11th grade, Oin Senior High School (Silver)
Ryota Otsuki 12th grade, Chiba-pref. Funabashi Senior High School (Gold)
Mai Yamakawa 12th grade, Oin Senior High School (Silver)

International Chemistry Olympiad (IChO) in UK

From the left;
Atsuhiro Nakajo 12th grade, Todaiji Gakuen Senior High School (Silver)
Naoya Ozawa 12th grade, Komaba Toho Senior High School (Gold)
Kenichi Endo 11th grade, Eiko Gakuen Senior High School (Gold)
Aya Eizawa 12th grade, Hakuryo High School (Bronze)

International Olympiad in Informatics (IOI) in Bulgaria

From the left;
Motoki Takigiku* 12th grade, Komaba Senior High School, Attached to University of Tsukuba (gold)
Kazuhiro Hosaka* 12th grade, Kaisei Senior High School (Gold)
Makoto Soejima* 12th grade, Komaba Senior High Schoolt, Attached to University of Tsukuba (Silver)
Yuichiro Hirano 12th grade, Nada Senior High School (Bronze)

Indicate academic grades at the time of award.

Photos: 【Math】 The Mathematical Olympiad Foundation of Japan【Physics】Japan Physics Olympiad Committee【Chemistry】 Project "Chemistry Makes Our Dreams Come True," Council of Chemical Education 【Biology】Japan Biology Olympiad Committee【Informatics】Japanese Olympiad in Informatics
*Soejima, Takigiku, and Hosaka participated in both mathematic and informatics, and they were awarded in both Olympiads.

Section 2 Creating Scientific Development and Persistent Innovation

The term "innovation" is not a narrow-defined concept of simple "technological innovation," but it implies extensively creating new values, including social systems, thereby causing substantial changes at all social levels. The "innovation nation," which Japan aiming at is the society in which capacity of each individual person can be fully exerted, the society full of vitality, and the society in which we can actually feel richness.

The Cabinet Office determined that social system reform and technical renovation, which establish the social environment toward creation and promotion of innovation, will be promoted in an integrated and continuous manner based on the Basic Plan. More specifically, steady approaches on measures for creation of innovation will be promoted through the (1) Pioneering Projects for Accelerating Social Return; (2) follow-up of progress status of the system reform; and (3) understanding of domestic and overseas movements related to innovation and other projects.

MEXT is promoting "World Premier International Research Center (WPI) Initiative" and other projects to develop "visible research centers," which are to be boasted with their excellent research environment and superior level of research.

METI promotes the "Innovation Superhighway Plan" to build a scheme the connect the R&D outcomes with commercialization promptly.

1 Developing a Competitive Environment

(1) Increasing competitive funds and indirect costs

Competitive funds, which help create a competitive R&D environment, were increased, reaching 491.2 billion yen in the FY 2009 budget (481.3 billion yen under the FY 2008 budget). Also expanded was the indirect costs grant scheme, in which a fixed percentage of the research grant is allocated to institutions employing researchers who received competitive funds in proportion to research expenses. This represents an effective method of promoting competition among research organizations, with 45 of the 47 competitive funds available allocating 30% of the research funds and two other programs also allocating funds in some cases in FY 2009.

Table 2-3-4 shows competitive funds sponsored by government ministries and agencies.

Table 2 3 4 List of Competitive Funds

Ministry	Sponsor	Program	Program outline	FY 2008 budget (Unit: million yen)	FY 2009 budget (Unit: million yen)
CAO	Food Safety Commission	Grants-in Aid for the Food Safety Risk Assessment	To promote research related to setting forth guidelines and evaluation standards related to risk evaluation in order to promote a science-based evaluation of the effects of food on health (risk evaluation).	364	323
Cabinet Office, Government of Japan Subtotal				364	323
MIC	MIC	Strategic Information and Communications R&D Promotion Program(SCOPE)	To actively promote unique and novel R&D projects in line with strategic priority targets in order to enhance R&D capabilities regarding information and communications technologies, improve researcher quality through the establishment of a competitive research environment and create intellectual property meeting international standards of excellence.	2,573	2,179
MIC	MIC	Promotion Program	To promote R&D from ICT seeds to create ICT	-	390

		for Reducing Global Environmental Load through ICT Innovation	innovation realizing significant reduction in CO_2 emission. Excellent projects are selected by public submission or through competitive selection by an external evaluation committee, and the R&D is implemented intensively during the period of the Kyoto Protocol.		
MIC	National Institute of Information and Communications Technology	Financial aid for promotion of advanced technology development in telecommunications and broadcasting	To create new businesses in the communications and broadcasting sectors by supporting private -sector companies, including venture companies, that are engaged in R&D activities related to advanced technologies.	542	300
MIC	National Institute of Information and Communications Technology	Program for Promotion of Private-Sector key Technology	To invite proposals for experimental and research themes related to communications and broadcasting technologies from the private sector and entrust private-sector companies with experiments and research concerning selected themes in order to promote investigational efforts that will help strengthen the foundation of the national economy and people's lives.	4,200	2,600
MIC	Fire and Disaster Management Agency	promotion for Fire and Disaster Prevention Technologies	In order to promote science and technology related to prevention/mitigation of fires and other disasters to yield a safe and comfortable society, research is conducted on actual disaster prevention/mitigation activities while pursuing relevant technologies and promoting industry-academia-government coordination and research activities by local governments.	279	254
Ministry of Internal Affairs and Communications Subtotal				7,594	5,723
MEXT	MEXT/JSPS	Grants-in-Aid for Scientific Research	The Grants-in-Aid for Scientific Research aims to dramatically advance academic research (based on the free thinking of researchers) across all fields including the humanities and social sciences as well as the natural sciences, from basic through applied research. The program supports creative and pioneering research that will support the foundation of a rich society.	193,200	196,998
MEXT	JST	Basic Research Programs (incl. social technology research and development projects)	To promote basic research on "strategically prioritized science and technology" topics in line with the "strategic sector" set by the government, supporting social and economic needs, to further advance science and technology and develop technologies leading to the creation of new industries.	50,326	51,640
MEXT	MEXT	Special Coordination Funds for Promoting Science and Technology	A competitive, policy-guided fund which is operated by MEXT in line with CSTP. Toward the full-scale execution of the Third Basic Science and Technology Plan, public participation related to science and technology system reform will be invited for agile and strategic utilization.	33,800	36,340
MEXT	MEXT	21st Century COE Program	To render Japanese universities internationally competitive and raise their quality to a world-class level by providing targeted support for the establishment of global research and educational centers by national, public and private universities through competition based on third-party evaluation.	3,905	-
MEXT	MEXT	Global COE Program	To selectively support formation of excellent world-class education and research centers, while accomplishing the basic concept of the “21st Century COE Program,” which aims to foster young researchers and create international centers.	33,986	34,228
MEXT	MEXT	World Premier International Research Center (WPI) Initiative	To establish “visible centers” which boast excellent research environments and an elevated research level to attract front-line researchers from all over the world by strongly supporting initiatives boosting formation of research centers with a core of high-level researchers and by prompting the introduction of system reform.	7,109	7,109
MEXT	MEXT	Promotion of R&D for Key Technologies	To promote 1) R&D in life sciences based on social needs, 2) R&D related to the establishment of the next-generation IT infrastructure, 3) Promotion of Novel Interdisciplinary Fields Based on Nanotechnology and Materials in order to advance R&D on key technologies facilitating activities for securing Japan’s safety, security, and economic development.	19,315	21,477
MEXT	MEXT	Japan EOS Promotion Program	To conduct technology development and observational research in fields where Japan should play the leading	373	354

			role, based on proposals selected from public submissions, with a view to the establishment of a global observation system advocated by the Earth Observation Summit.		
MEXT	MEXT	Innovative Nuclear Research and Development Program	To implement, amid a competitive environment, R&D related to nuclear reactor and fuel cycle technologies targeted for promotion by the government, plus related basic research, with a view to realizing an innovative nuclear system.	5,926	5,769
MEXT	JST	Development of Systems and Technology for Advanced Measurement and Analysis	To promote the development of pioneering measurement/analysis techniques and equipment that support unique, world- class research activities. In particular, this program aims to promote joint industry-academia development in the applied fields (manufacturing) in which users participate.	5,500	6,300
MEXT	JST	Research Program on Development of Innovative Technology	This program aims to foster innovative practical technologies supporting Japan's prosperity in the 21st century with a view to ushering in new industries.	822	-
MEXT	JST	Project to develop "Innovative Seeds"	To conduct competitive R&D in a manner suited to the relevant technology phase to promote the commercialization of the results based on research results (seeds) obtained by universities, public research institutes, etc., and to promote the return of benefits to society.	8,122	5,500
MEXT	JST	Collaborative Development of Innovative Seeds	To provide opportunities to identify potential technology seeds that may be hidden in the realm of basic research from the viewpoint of the industrial sector and conduct industry-academia joint feasibility studies (Note 2) to bring such seeds into the open. Once revealed, those seeds should be developed through industry-academia joint research (with the use of the matching-fund format) to help create innovations.	2,200	1,230
MEXT	JST	Science and Technology Incubation in Advanced Regions	To help coordinate creation of new regional industries and promote joint research towards industrialization to benefit from research results achieved by universities, with JST Innovation Plazas and JST Innovation Satellites used as footholds for such activities.	9,400	9,513
MEXT	JST	Collaboration of Regional Entities for the Advancement of Technologidal Excellence	To promote industry-academia-government joint research with a focus on specific research themes in fields where there are particularly strong regional needs for the foundation of startup companies. R&D activities will be conducted to foster new technologies and businesses, including the development of prototypes based on technology seeds created through basic research conducted by universities, etc.	2,925	2,192
MEXT	MEXT	Program for Promotion of Humanities and Social Sciences to Satisfy Policy and Social Demands - Program for promoting social science research aimed at solutions of near-future problems-	To implement solution-oriented research by assembling researchers from various fields, especially the social sciences, and by applying empirical research methods to problems that Japan will face in the near future. The results will be offered as proposals, etc. to society.	149	149
MEXT	MEXT	Program for the Promotion of Improvement of Joint Research Centers in the Humanities and Social Sciences [literal translation]	To promote the improvement and extension of nationwide joint use and joint research centers to private universities and other organizations, in order to promote joint research by exploiting the potential of existing organizations possessing academic materials, data, etc.	351	502
MEXT	MEXT	Program for the Development of Basic Tools toward the Promotion of Marine Resource Utilization	To promote technology development for tools, such as sensors, to help acquire high-precision data on existing amounts of marine resources such as submarine hydrothermal deposits and cobalt rich crust.	400	700
MEXT	MEXT	Strategic Promotion Program for Basic Nuclear Research	To promote research by clarifying policy needs and by setting more strategic programs and themes in basic and infrastructure research for the use and development of nuclear power in Japan	510	810
MEXT	MEXT	Development of Environmental Technology using	To promote basic R&D of environmental technologies to utilize the potential of nanotechnology research, in which Japan has great potential, to produce	—	205

		Nano Technology	breakthroughs in environmental technologies		
MEXT	JST	Science and Technology Research Partnership for Sustainable Development	To promote science and technology research partnerships with developing Asian and Africa countries by utilizing Japan's excellent science and technology in cooperation with ODA, in environment, energy, and other research fields.	500	1,154
MEXT	JST	Japan Regional Innovation Strategy program by the Excellence	To form R&D teams by collaboration of industry-academia-government while inviting talented researchers in related fields, mainly those working in specific fields in local universities	–	280
MEXT	JST	Strategic International Cooperative Program (Joint Research Type)	To promote international strategic S&T collaboration through support for international joint research in the target countries/regions and in the fields specified by MEXT, based on intergovernmental agreements	–	292
MEXT	JST	Adaptable and Seamless technology transfer Program for target-driven R&D	To implement comprehensive support from industry-academia matching to actual commencing of joint research, for industry-academia collaborative research by setting appropriate funding plans for each project, and to put universities' research outcomes to practical use.	–	3,200
MEXT	JST	Strategic Promotion of Innovative Research and development	To promote large-scale and long-term R&D in a consortium, including researchers from industry and academia, to establish technologies to be the core of new industry created from the outcomes of research funded by JST and other programs	–	550
MEXT	JST	Science and Engineering Entrepreneurship Development program for Vigorous researchers	To conduct R&D for creation of venture corporations by highly motivated and entrepreneurial young researchers, while attempting to create partnerships with university-related organizations that can support business establishment	–	148
Ministry of Education, Culture, Sports, Science and Technology Subtotal				378,819	386,640
MHLW	MHLW	Health and Labour Sciences Research Grants	To provide grants to researchers in universities to enhance their technical level and to maintain scientific promotion of administrative policies regarding medical care, welfare, and hygiene for people.	40,692	45,160
MHLW	Pharmaceuticals and Medical Devices Agency	Program for Promotion of Fundamental Studies in Health Sciences	To promote research to establish a broad technical foundation for development and discovery of innovative medicines, based on seeds and know-how of universities.	7,498	7,498
Ministry of Health, Labour, and Welfare Subtotal				48,191	52,659
MAFF	MAFF	Program for new technology development to activate agriculture, forestry, fisheries and the food industry by cooperating industry-academia and the government	To promote R&D projects jointly conducted by private-sector companies and public research organizations, including universities and incorporated administrative agencies, to create new industries and businesses in the agriculture, forestry, fisheries and food sectors and resolve immediate policy challenges.	380	198
MAFF	MAFF	Research and development projects for application in promoting new policy of Agriculture	To promote technology development for practical application by using the proposal and public participation method in order to promote agricultural, forestry, and fishery policies and solve field problems, for agriculture, forestry and fisheries, and food industry development as well as regional revitalization.	5,200	6,516
MAFF	National Agriculture and Food Research Organization	Program for Promotion of Basic and Applied Researches for Innovations in Bio-oriented Industry	To supply funds for the development of technology seeds leading to the creation of new technology and business in the agriculture, forestry, fishing, and food industries,, plus R&D to yield applied results by inviting proposals from the public.	6,805-	6,800
Ministry of Agriculture, Forestry, and Fisheries Subtotal				12,385	13,514
METI	NEDO	New Energy and Industrial Technology Development	To invite research theme proposals from young researchers at universities, incorporated administrative agencies, etc., fund individual research efforts to discover technology seeds and develop human resources that meet the needs of the	4,779	4,445

		Organization	industrial sector as well as society from the viewpoint of enhancing Japan's success in industrial technology.		
METI	NEDO	Grant for Practical Application of University R&D Results under the Matching Fund Method	To provide financial aid for industry-academia joint R&D projects aimed at commercialization of university research results.	1,750	2,100
METI	NEDO	Strategic Development of Energy Conservation Technology Project	To publicly invite wide-ranging energy-conservation technology from leading research to practical application development and empirical research, and to implement subsidies for technology.	6,900	7,000
METI	NEDO	The eco-innovation project aimed at discovering innovative technologies that promote sustainable innovation and global warming countermeasures	To implement research and surveys (feasibility studies) regarding T&D contributing to the creation of low carbon society and eco-innovation (environment- and human-oriented technology reform and social innovation), and regarding the technology seeds leading to innovative countermeasures against global warming.	420	400
METI	METI	Innovative and Viable Nuclear Energy Technology (IVNET) Development Project	To identify research themes supporting practical use of unique and innovative technologies by publicly inviting proposals, and furthering technology development to improve the safety and economy of nuclear power generation and the nuclear fuel cycle.	800	-
METI	METI	R&D for promotion of regional resources utilization	To implement R&D for practical application in cooperation with enterprises, universities, and other organizations toward new product development, etc. by utilizing regional resources (regional products and technology) for creating new business in regions.	1,706	-
METI	METI	R&D for promoting innovation in regions	To implement R&D for practical technology by establishing research entities blending regional resources for the purpose of regional economy revitalization by new business and industry creation.	7,400	6,508
METI	Japan Oil, Gas and Metals National Corporation	R&D for promotion of oil and natural gas development	To conduct basic to applied research, based on proposals selected from public submissions, for unique and innovative technologies concerning oil and natural gas exploration and development.	471	417
Ministry of Economy, Trade, and Industry Subtotal				24,226	20,870
MLIT	MLIT	Construction Technology Research and Development Subsidy Program	To publicly recruit proposals from researchers concerning research and development of technologies contributing to the sophistication and enhancement of international competitiveness of construction technologies.	500	500
MLIT	Japan Railway Construction, Transport and Technology Agency	Program for Promoting Fundamental Transport Technology Research	To seek to establish new technologies contributing to traffic safety, the preservation of the environment and the development of advanced traffic services by publicly inviting unique and innovative research proposals.	348	341
Ministry of Land, Infrastructure, Transport and Tourism Subtotal				848	841
MOE	MOE	Global Environmental Research Fund	To bring together the talents of researchers in various fields to promote comprehensive investigations and research from interdisciplinary and global viewpoints and to contribute to the preservation of the global environment.	3,197	3,955
MOE	MOE	Environmental research and technology development fund	To promote environmental research and technology development by recruiting proposals concerning R&D that broadly utilize the wisdom of industry, academia and the government, to develop a positive growth cycle of the environment and the economy and to build a sustainable 21st century society	836	1,160
MOE	MOE	Research grants for promoting the sound material-cycle society	To promote research on S&T related to treatment of disposals, and then to promote administrative policies regarding the safety and appropriate treatment of disposals and formation of a recycling society. Also, to support enhancement of technical capabilities.	1,135	1,803
MOE	MOE	Program for development of technologies to prevent global warming	To invite proposals from a wide range of society and to promote R&D of effective technical measures for energy saving and alternative energy to reduce emissions of energy-derived CO2.	3,710	3,805

Ministry of the Environment Subtotal		8,878	10,723
Total		481,305	491,293

The figures in the "total" column may differ from the sum of the amounts for each column due to round-off.
(Note 1) FS (feasibility study): An experiment or an investigation conducted to examine whether a planned project can be carried out successfully.
(Note 2) Matching fund: A scheme in which subsidies are provided to cover the project costs to be borne by universities and other parties involved, in an amount not exceeding the amount of funds provided by the companies involved.
Source: Prepared by MEXT

(2) Cultivation of competitive environments within organizations

At Japanese universities, basic funding plays an important role in supporting the foundation of the organization (personnel, education and research environment, etc), while competitive funds support a diverse range of excellent research and education programs.

Taking account of the fact that basic and competitive research funds thus have their respective functions, with each playing an important role, MEXT aims to expand the competitive fund scheme while endeavoring to secure sufficient basic funds (such as government subsidies for national university corporations and subsidies for private universities) as it considers how best to mix the two types of funds.

(3) Implementation of institutional reform related to competitive funds

CSTP has implemented measures for further promoting system reform including use, allocation, and evaluation of research funds, such as competitive funds, according to the Promotion Strategy PT compiled by the Expert Panel on Basic Policy Promotion in June 2007, and is currently following up on progress.

In addition, the related government ministries, funding agencies, universities, etc. have met 12 times since March 2008 to discuss effective utilization of research funds [literal translation] in order to unify rules across government ministries and to address system improvement issues by continuously exchanging opinions on easier use of research funds. In terms of plans for key S&T policies, rules are to be unified for competitive funding. (Refer to Part 2, Chapter 1, Section 2)

Furthermore, in January 2010, the CSTP Expert Panel on Basic Policy published a proposal regarding research funding reform to reinforce basic research, including systematic rearrangement and increased flexibility for competitive funding.

Establishment of a fair and transparent screening system

When allocating competitive funds, each program attempts to develop a fair and highly transparent selection system for research projects, focusing on the contents of application and the capacity to implement it. Organizational restructuring for many programs promoted until 2009 has been recommended, including nominating examiners from a variety of fields. For instance, in relation to the Science and Technology Promotion Adjustment Expenses, the issues adopted in the "Program to Develop Strategic Research Centers [literal translation]" included developing research centers and recruiting talented individuals meeting international standards of excellence. These individuals were evaluated in the mid-term and again at the end of the program, with committee members from other countries invited to make an evaluation in English. In addition, in the MAFF's "Practical Technology Development Program for Promotion of New Agricultural,

Forestry and Fishery Policies," experts and journalists will be increased in the field, at farming, forestry, and fishing sites, as well as in the food industry, to enhance examination and evaluation systems.

Feedback of screening results

Regarding each competitive funding program, efforts are underway to promote disclosure of detailed screening results to ensure appropriate feedback to researchers. In FY 2009, feedback of screening results, including comments by screeners to unsuccessful applicants, was implemented for 37 of the 41 programs available.

Enhancement of the functions of funding agencies

In relation to competitive funding, fund allocating functions will be shifted to independent allocation institutions, while considering effective fund allocation and professional examinations. In FY 2009, 21 out of 47 total competitive funding institutions (23% in yen) were funded by IAIs, indicating that the shift is progressing steadily. In addition, funding agencies in charge of allocating competitive funds strengthen their systems by appointing program officers[1] and program directors[2] and enhancing research and analysis functions as well as administrative functions related to screening, fund distribution and management. JSPS, the funding agency under the jurisdiction of MEXT, established the Research Center for Science Systems, which conducts surveys and research on how to promote science in order to support JSPS activities. JST established the Center for Research and Development Strategy (CRDS), which determines the research fields that should be promoted as priorities.

In FY 2009, 44 out of 47 institutions were allowed to sign a multi-year contract or renew their contract beyond the fiscal year, with the Special Coordination Funds for Promoting Science and Technology providing grants for projects newly adopted in FY 2009, while promoting efficiency and flexibility in the fund management in each competitive funding program.

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[1] Responsible people with actual experience of research including selecting programs and research projects of each program, evaluation, follow-ups, etc.

[2] Those who are placed in a superior position to administer the competitive research funding system and its management

2 Enhancing the Competitiveness of Universities

(1) Creation of universities with world-class excellence in S&T and basic research

In order to make Japanese universities competitive internationally, cultivation of a competitive environment at universities, whether national, public, or private, is required. MEXT is implementing the "Global COE Program," which further emphasizes enhancement of functions to develop young researchers and internationality of the centers to selectively support formation of international, outstanding education and research centers. As of FY 2009, MEXT has adopted 140 centers from 41 universities. In addition, in FY 2009, an interim evaluation was executed at the 63 centers adopted in 2007, with all of them deemed to be progressing according to plan despite the evaluation's demands for further effort from certain centers.

To further develop all basic research in Japan, a system must be built in which researchers can perform research cooperatively by utilizing the full potential of universities, regardless of whether the universities are national, public, or private. MEXT established a system across national, public, and private universities, where shared use and joint research centers are to be certified by the Minister of MEXT. As of FY 2009, 79 centers (70 national universities, 9 private universities) have been approved.

(2) Revitalizing universities by taking advantage of their individuality and distinctiveness

Regional universities must make greater contributions to the development of their host regions, as they are important sources of intellectual and human resources for the regions.

In relation to the regional revitalization plan utilizing the "Program for Revitalizing Regional Knowledge Centers" (decision made by the Regional Revitalization Headquarters), the Cabinet Office has approved 98 regional revitalization plans that utilize the program as of December 2009. Various projects in which universities and local communities collaborate with each other are also in progress.

MEXT has launched the SCF-funded program for the "Center Creation of Regional Revitalization Human Resources Development" to establish "regional knowledge centers" through which local universities and host regions collaborated to utilize S&T in their development of competent personnel. The ministry has adopted and is supporting such 47 projects as of March 2010.

The meeting of the Unified Headquarters for the Regional Revitalization approved the "Plan for Human Resources to Lead the Revitalization of Local Communities" [literal translation], which suggests that the local universities should not only "engage in conducting human resource training and R&D while utilizing local resources, but should also provide additional power by encouraging students to participate in community development." It also suggests that the government assist universities work on community revitalization through, among other means, the initiation of "The Local Revitalization System Theory," which aims to train human resources for local revitalization efforts.

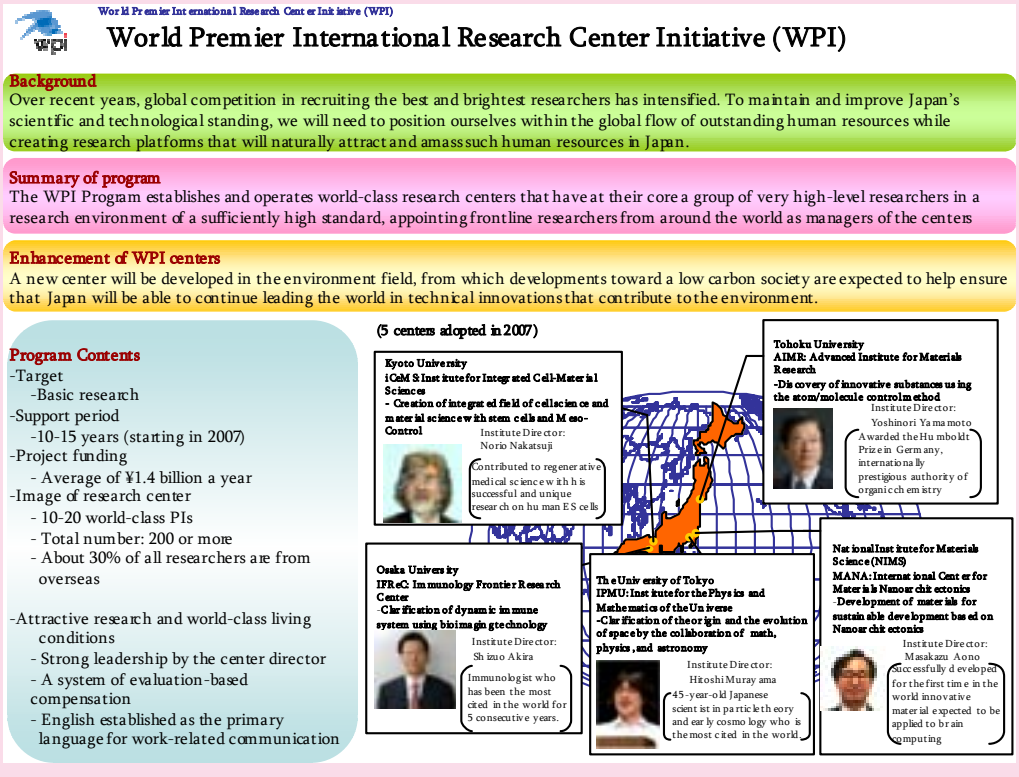
3 Enhancing Systems for Creating Innovation

(1) Establishing top world-level research centers

Over recent years, global competition in recruiting the best and brightest researchers has intensified. To maintain and improve Japan's scientific and technological standing, we will need to position ourselves within the global flow of outstanding human resources while creating research platforms that will naturally attract and amass such human resources in Japan.

Aware of this issue, MEXT has promoted its World Premier International Research Center Initiative (WPI) which aims for the establishment of "globally visible research centers," each of which providing an excellent research environment and a high level of research capable of attracting the best frontline researchers from around the world. Each research center receives 1.4 billion yen on average per year, and this support is scheduled to continue for 15 years. At present, five centers are active (Figure 2-3-5). In addition, MEXT has started inviting proposals since March 2010 to create a new center in the field of environment, which is expected to contribute to low carbon society, based on the notion that Japan will lead the world in technological innovation in the field of environment in 2010. It also aims to realize the creation of "a visible center," which will verify progress and take other appropriate action, by building a strong follow-up system centered on the "WPI Committee" as its main organization.

Figure 2 3 5 World Premier International Research Center Initiative (WPI) Schema



(2) Enhancing various research funding programs suited to the various stages of R&D

Enhancing competitive research for the creation of innovation

It is important to lead scientific discoveries and technological inventions realized by basic research beyond the confines of scientific papers so as to produce social and economic values and feedback that benefits society and its people. Therefore, it is necessary to manage purpose-specific basic research and applied research programs appropriately in order to prevent them from becoming mere tools for satisfying researchers' own intellectual curiosity. In this context, JST promotes basic research related to strategically prioritized S&T items as part of its Basic Research Programs under a program officer invested with responsibility and discretion concerning the management of research progress in order to promote the strategic emphasis set by the government toward the creation of innovation. In addition, in response to the outcomes of programs like the "Basic Research Programs," since 2009, a new "Strategic Promotion of Innovative Research and development" [literal translation] to create innovations through long-term, consistent, R&D that progresses seamlessly from basic research to commercialization is being newly implemented, as is the "Adaptable and Seamless Technology Transfer Program for Target-Driven R&D" targeting industry-academia collaborative research.

In the Basic Research Promotion Program for Creation of Innovation NARO implements, the evaluation committee conducts screenings of proposed research plans and evaluates plans already in place through its members' understanding of these projects' objectives toward agricultural contribution, forestry, fisheries and food industries, etc. Interim evaluation is conducted on ongoing research projects, on which research outcomes were evaluated and, based on the results, the research plans revised. Program offices will convey the results of the evaluation to the researchers concerned in order to ensure that research plans are implemented in accordance with the objectives of these projects.

Establishment of advanced research centers in the interdisciplinary fields

The Science and Technology Basic Plan points out that it will be effective to make intensive investments with the support of the industrial sector toward the establishment of research and education centers emphasizing advanced fields of research based on the view that Japan should pioneer the development of new research fields to foster innovation,.

In FY 2006, MEXT launched the SCF-funded program Creation of Innovation Centers for Advanced Interdisciplinary Research Areas, which supports organizations endeavoring to establish centers that would conduct R&D, starting from the basic research stage, in advanced interdisciplinary fields through industry-academia collaboration with to the goal of achieving commercialization in the future. Currently, 21 research organizations are engaged in such efforts. The four centers, which were evaluated for continuation in the re-examination of FY 2008, have begun to make efforts toward full-scale operation. In 2009, a total of 13 projects, including the projects newly adopted in FY 2007 (9 projects) and those permitted for re-entry into the re-examination of FY 2008 (4 projects), were re-examined. As a result of the re-examination, 5 ongoing projects were chosen for full-scale implementation in FY 2010, 3 re-entry projects were

allowed application for the re-examination of FY 2010 though not fully implemented, and 5 projects were neither given permission for application for re-entry in FY 2010 nor implemented.

METI is conducting development of "advanced innovation centers" [literal translation] (joint R&D facilities), which will be used to work on the development of applied technologies from research, product tests, and for other purposes, while cooperating with universities, research institutions, and corporations to construct structures. As of FY 2009, 19 centers have been adopted as centers to implement joint research on low carbon society and medical and health care and progress is being made in their installation.

Reform of research funding systems across ministerial boundaries

CSTP reforms the public research funding systems by building a "National R&D Database" utilized for macro analysis, which is necessary for formulating the Science and Technology Basic Plan and the research and deliberations concerned with resource allocation.

The research funding systems sponsored by government ministries and agencies and R&D programs conducted by research organizations in the industrial, academic and government sectors cover various stages of development, from basic research to commercialization, and it is necessary to establish a mechanism that advances development persistently across various programs and organizations right up to the final stage of commercialization. In FY 2009, collaboration cases with projects of other ministries were created across ministries and agencies for the Okinawa Innovation Creation Project [literal translation] of the Cabinet Office. In addition, JST and the New Energy and Industrial Technology Development Organization (NEDO) held a "JST-NEDO Technical Information Exchange Program" [literal translation] to provide information to each other in relation to research outcomes of common interest under the aim of creating more seamless research results.

(3) Establishment of a sustainable and advanced industry-academia-government collaboration system

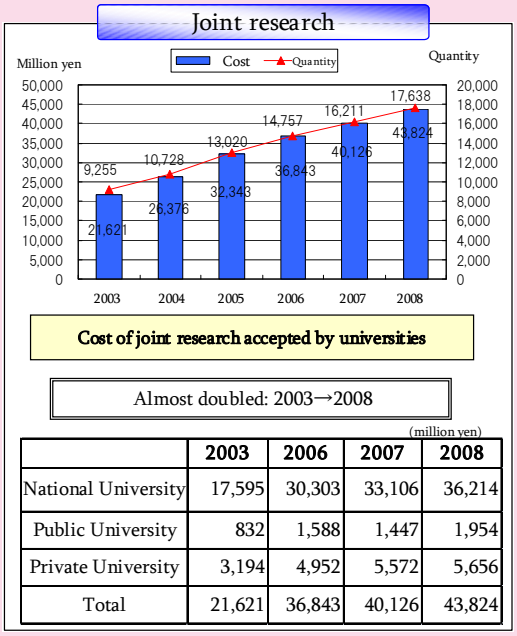
As the 21st century is often referred to as the "century of knowledge," the creation and utilization of that knowledge is indispensable to the future development of Japan, and industrial-academia-government collaboration is an important mean through which the country can generate a constant stream of innovation. Although industry-academia-government collaboration in Japan has recently made significant progress, the level of collaboration falls short when compared to the world-class research potential of Japanese universities. Therefore, it is necessary to promote industry-academia-government collaboration further, and for our country to increase its efforts in this area.

Enhancement into real industry-academia-government collaboration

Since the corporatization of national universities in April 2004, the industry-academia-government collaboration has seen definite success. In FY 2008, the number of joint research between universities and the private sector exceeded 17,000, almost doubled compared to FY 2003 in terms of the prices of joint research accepted by universities. (Figure 2-3-6)

In addition, the number of patented cases in FY 2008 increased to 5,306, almost 29 times that of FY 2003.

Figure 2 3 6 Trends in the numbers of joint research, accepted prices

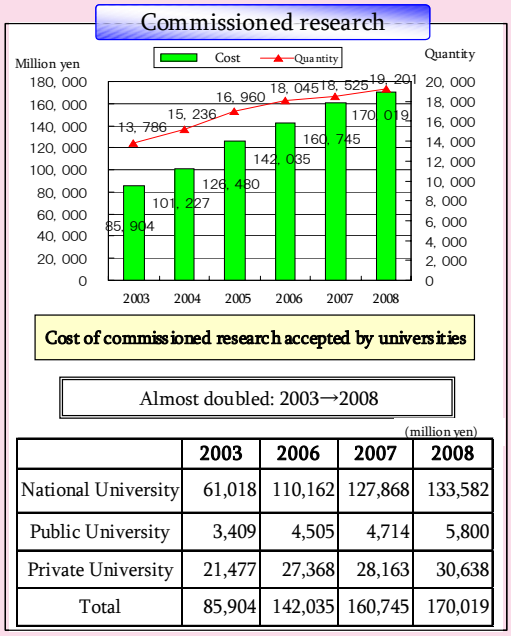


Cost of joint research accepted by universities

Almost doubled: 2003→2008

(million yen)

	2003	2006	2007	2008
National University	17,595	30,303	33,106	36,214
Public University	832	1,588	1,447	1,954
Private University	3,194	4,952	5,572	5,656
Total	21,621	36,843	40,126	43,824



Cost of commissioned research accepted by universities

Almost doubled: 2003→2008

(million yen)

	2003	2006	2007	2008
National University	61,018	110,162	127,868	133,582
Public University	3,409	4,505	4,714	5,800
Private University	21,477	27,368	28,163	30,638
Total	85,904	142,035	160,745	170,019

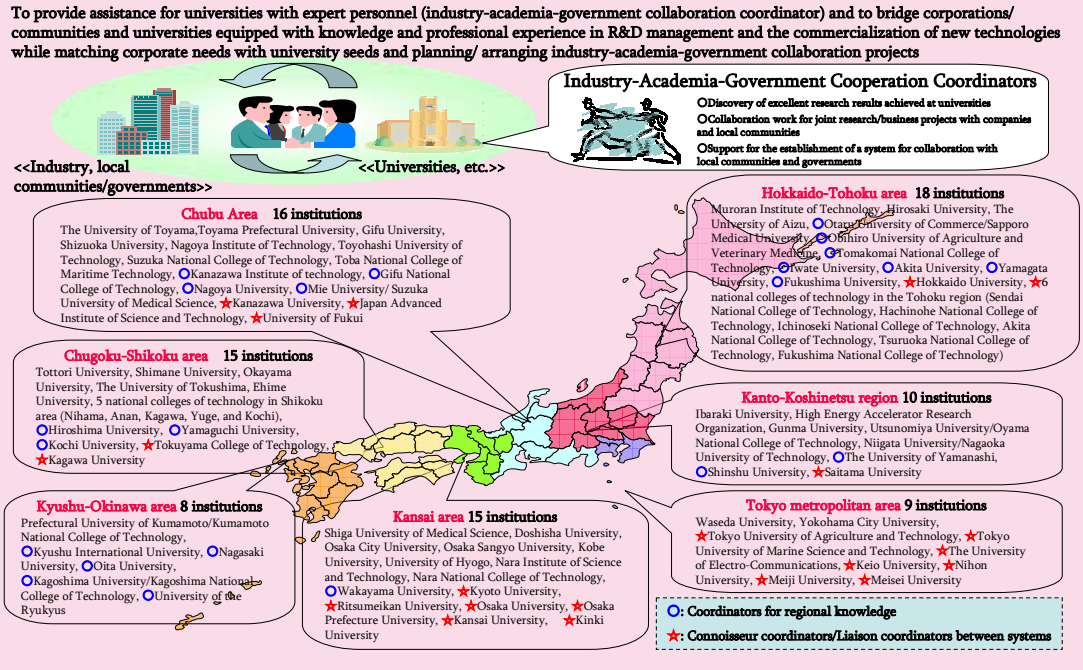
As of July 29, 2009

*Targeting national, public, and private universities
*"Universities" include universities, junior colleges, technical colleges, and inter-university research institute (corporations)
* "Total" and "sum of totals of national, public, and private universities" may not correspond completely since numbers have been rounded-off.
*The numbers of patented applications include only patent rights (including the rights to be patented) and are the sum of patented applications and transferred patents.

Source: Prepared by MEXT

MEXT is implementing the "Industry-Academia-Government Collaboration Strategic Development Project" [literal translation] to reinforce the collaborative functions of universities with industry and government. As of January 1, 2010, through 77 coordinators in universities, technical colleges, and inter-university research institutes nationwide, MEXT is supporting industry-academia-government collaboration activities (promoting the dissemination of feedback of research results to industry and regional society (Figure 2-3-7).

Figure 2 3 7 Organizations Supported by Industry-Academia-Government Cooperation Coordinators (As of July 2008)



In relation to the practical use of research outcomes of universities and research institutes, the Japan Science and Technology Agency (JST) has been implementing the "Adaptable and Seamless Technology transfer Program through target-driven R&D (A-STEP)" since FY 2009.

The National Institute of Information and Communications Technology (NICT) is promoting industry-academia-government collaboration research with advanced R&D test bed networks, which have been established by and are under the operation of NICT.

MEXT and METI have joined forces in promoting activities from human resource training/basic research to commercialization/business creation under the organic collaboration of industry-academia-government since 2009. The ministries have selected "Regional Core Industry-Academia-Government Collaboration Centers" [literal translation] and "Global Industry-Academia-Government Collaboration Centers" to construct an innovation ecosystem producing innovations in sustainable and developmental ways while intensifying allocation of funds to these centers according to their industry-academia-government collaboration policy.

MAFF promotes research intended to realize commercialization and industrial use of technological seeds through its commissioned project research, competitive funding programs, etc. At the same time, the ministry holds agricultural business creation fairs in order to provide meeting places for companies, universities, independent administrative institutions, government agencies, etc., so that they are able to find business opportunities for joint research, product development, commercialization, technology transfers and new market entries into the agriculture, forestry, fisheries and food sectors. The ministry is also implementing a variety of different activities for the promotion of industry-academia-government collaboration, including the promotion of matching through lectures, seminars, and exhibitions, and the coordinated implementation of joint research with nonprofit organizations and other institutes organized by local companies, universities, local industrial research institutes, etc.

METI announced the "Strategic Technology Roadmap 2009" in April 2009, predicting the progress and trends of our future society and people's needs and required technologies. This map will be utilized in R&D management and provided to a wide range of people in industry, academia, and government as a communication tool for those who are engaged in R&D planning and implementation.

Under the leadership of Innovation Architects[1] and the "AIST Industrial Transformation Research Initiative," which are intended to develop prototypes by concentrating technology, funds, and human resources, clear scenarios are shared covering the processes from the seeds of technology to new industries among companies, universities, and AIST. AIST has started a BioCAD project—a new tool that effectively links the ever increasing availability of biological information to the drug discovery industry to help overcome the decreasing development ratio in the drug discovery field and to aid in the rapid development of new drugs. It also held an AIST open lab to announce the outcomes of AIST to corporate management, researchers, technicians, and others, in an effort to enhance collaboration with corporations. In addition, the collaboration was further strengthened via a network of corporations with which it has collaborated in the past (AIST Innovation Partners). Meanwhile, competitive funds supporting joint R&D projects are being implemented by industry, academia and government sectors at various stages, from basic research to application/commercialization, and for a variety of purposes, through the "Adaptable and Seamless Technology transfer Program through target-driven R&D (A-STEP)" (JST), the "R&D project for creation and commercialization of university-based businesses" (NEDO), the "Environmental Technology Development Fund" (MOE), etc.

Sustainable development of industry-academia-government collaboration

- Building relationships of trust among industry, academia, and government -

To promote the strengthening of collaboration among industry, academia, and government, it is essential to bring about a state of common recognition between industry and public research institutions, including universities. To this end, the government provides opportunities for dialogue between companies and universities, while research institutions, including universities, announce research results and disclose other information by holding conferences, issuing periodical publications like annual reports, contributing papers to academic journals, and disclosing patents.

In addition, the following efforts are being conducted to foster trust among industry, academia, and government sectors.

The Cabinet Office, MIC, MEXT, METI, the Japan Business Federation (Nippon Keidanren), and the Science Council of Japan (SCJ) held the "Eight Conference for the Promotion of Collaboration among Business, Academia, and Government" in June 2009 with the leaders and executives in corporation, universities, and governments throughout Japan to promote further collaboration of industry, academia, and government sectors. In addition to the lectures of representatives of each sector, discussions were held at the working level in subcommittees regarding specific issues. In addition, people of merit were awarded at the conference for noteworthy successes that contributed

[1] Personnel with knowledge of the outcomes of research and with deep understanding of users' needs and to draw the scenario for industrialization connecting both parties adequately

greatly to industry, academia, and government sectors. (Table 2-3-8)

Table 2 3 8 7th Merit Award Winners for Industry-Academia-Government Collaboration

Award	Achievement	Award winner
Prime Minister's Award	Development of Erbium-Doped Optical Fiber Amplifier (EDFA) and its sophistication	Masataka Nakazawa Professor of Research Institute of Electrical Communication, Tohoku University Kazuo Hagimoto Director of Network Innovation Laboratories, Nippon Telegraph and Telephone Corp. Haruki Oogoshi Director of Telecommunications Group, Furukawa Electric Co., Ltd.
Minister of State for Science, Technology and Innovation Policy Award	Development of "mass production technology for human lymphocyte-driven antibodies using EB viruses"	Kenzo Takada Professor of Institute for Genetic Medicine, Hokkaido University Executive Chairman of EVEC Inc. Hisato Doi Executive President of EVEC Inc. National Institute of Advanced Industrial Science and Technology (AIST), Hokkaido Center
Minister of State for Science, Technology and Innovation Policy Award	Promotion of formation of center for "environmental friendly nanotechnology Momodzukuri"	Tsuneo Ishimaru President of Aichi/Nagoya Knowledge Cluster President of Aichi Branch Office, Japan Institute of Invention and Innovation Susumu Maruse Chief Scientist of Aichi/Nagoya Knowledge Cluster Professor emeritus of Nagoya University Aichi Science and Technology Foundation
Minister of Internal Affairs and Communications Award	R&D of autobus lines search system "Busnet" and function-integrated intelligent bus stop	Kazunori Sugahara Professor of Department of Information and Electronics, Graduate School of Engineering, Tottori University
Minister of MEXT Award	Development of new variety of development using heavy ion beam	Tomoko Abe Leader of Radiation Biology Team, Nishina Center for Accelerator-Based Science Nobuhisa Fukunishi Leader of Beam Dynamics & Diagnostics Team, Nishina Center for Accelerator-Based Science Kenichi Suzuki Director of Horticulture Division, Production SCM Group, Suntoryflowers Co., Ltd.
Minister of MEXT Award	Development of avian flu prevention materials using a new antibody mass production technology on ostriches	Yasuhiro Tsukamoto Professor of Kyoto Prefectural University, Executive Officer of Ostrich Pharma, Co., Ltd.
Minister of MEXT Award	Development of "superconductive magnet devices in a strong magnetic field without refrigerant"	Kazuo Watanabe Professor of Institute for Materials Research, Tohoku University Junji Sakuraba Chief Researcher at Sumitomo Heavy Industries, Ltd.
Minister of Health, Labour and Welfare Award	Commercialization of humanized anti-human IL-6 receptor antibody (ACTEMRA)	Tadamitsu Kishimoto Professor at Graduate School of Osaka University Osamu Nagayama President and CEO of Chugai Pharmaceutical Co., Ltd.
Minister of Health, Labour and Welfare Award	Development of a "EBUS-TBNA system"	Kenichi Nishina Deputy Manager of Supersonic Wave Technology Development Department, Olympus Medical Systems, Corp. Seiichi Tadano Deputy Manager of Endoscope Marketing Department, Olympus Medical Systems, Corp. Kazuhiro Yasufuku Assistant Professor of Surgery, Toronto General Hospital, University Health Network, University of Toronto, Toronto, Canada
Minister of Agriculture, Forestry and Fisheries Award	Development of safe shrimp (vannamei) production system/plant	Marcy Wilder Project leader in Fishery Division, Japan International Research Center for Agricultural Sciences Setsuo Nohara Executive Director at IMT Corp. Takuji Okumura Chief of Reproduction Research Group, Aquaculture Biology Division, National Research Institute of Aquaculture, Fisheries Research Agency
Minister of Economy, Trade and Industry Award	Development of world's lightest general-purpose small wind power generator	Ryosuke Ito President of Zephyr Corp. Hikaru Matsumiya Visiting Researcher at Energy Technology Research Institute, Advanced Industrial Science and Technology Chuichi Arakawa Professor of Faculty of Engineering, The University of Tokyo
Minister of Economy, Trade and Industry Award	Development of "four dimensional x-ray CT device"	Kazuhiro Katada Professor of Radiation Medical Studies, Faculty of Medicine, Fujita Health University Masahiro Endo Director of Saga Prefecture Health and Welfare Department (former director of Department of Planning and Management, National Institute of Radiological Sciences Toshiba Medical Systems Corp. CT Division, CT Development Department
Minister of Land, Infrastructure, Transport and Tourism Award	Development of next-generation low pollution large automobile	Nissan Diesel Hino Motors, Ltd. National Traffic Safety and Environment Laboratory
Minister of Land, Infrastructure, Transport and Tourism Award	Introduction/promotion of "grass roots ITS"	Yasuhiko Kumagai Professor of Kochi University of Technology Kochi Prefecture Department of Civil Engineering, Road Section Keizo Tsutsui Sokken Co., Ltd.

Minister of the Environment Award	Development of Pyrocoking technology to completely burn wooden biomass	Junichiro Hayashi Hiroyuki Uesugi	Professor of Kyushu University (former professor of Hokkaido University) Executive President of Bio Coke Lab. Co. Ltd.
Chairman of Nippon Keidanren Award	Established world's first hydrogen materials industry-academia-government collaboration center integrating the world's brightest minds	Yukitaka Murakami Yukitaka Murakami Wataru Aso	Director of Research Center for Hydrogen Industrial Use and Storage, Advanced Industrial Science and Technology Vice President and trustee of Kyushu University Governor of Fukuoka Prefecture
President of Science Council of Japan Award	Development of "large-scale glycomics device and disease marker search technology"	Shinichiro Nishimura Hirosato Kondo	Professor of Graduate School of Life Science, Hokkaido University Visiting researcher at Genome Factory, Advanced Industrial Science and Technology Executive Director of Pharmaceutical Research Division, Shionogi & Co., Ltd.. System Instruments Co., Ltd.

Furthermore, MEXT and METI, in cooperation with JST and NEDO, held the "Innovation Japan 2009: University Fair," a nationwide industry-academia matching event to disseminate research results of universities and public research institutions concerning state-of-the-art industrial technologies, etc.

- Promotion of voluntary initiatives by universities, etc. -

In order to enhance the system for the creation, protection, and utilization of strategic, intellectual property at universities (actively supporting the acquisition of basic patent rights internationally, development of intellectual property activity system through cooperation between universities, and other activities), MEXT established the "Industry-Academia-Government Collaboration Strategic Development Project" [literal translation] (59 programs, 67 organizations).

From such projects, guidelines and rules that cover entire universities have been developed to promote systematically organized industry-academia-government activities, including an industry-academia collaboration policy, a policy on conflict of interest, regulations on joint research, etc.

- Revitalization and enhancement of collaboration between University Intellectual Property Headquarters and technology licensing organizations (TLOs) -

Based on the "Act on the Promotion of Technology Transfer from Universities to Private Business Operators" (Act No. 52 of 1998), 47 TLOs were authorized as of March 21, 2010. The number of patents licensed was 2,656 as of March 2009.

In recent years, national university corporations have exerted efforts for university-TLO cooperation enhancement such as the establishment of TLOs inside corporations, the change of external TLOs into internal ones, and the funding to authorize TLOs.

- Smooth implementation of intellectual property-related activities -

JST offers a series of comprehensive programs covering the identification of exceptional research results, support for patenting, etc. JST is comprehensively implementing "Technology Transfer Support Center" projects that support technology transfer-related activities. Such projects include: the support of strategic international patenting of research results obtained at universities, the rendering of development services and licensing of research results including patents, the fostering

of the human resources who should play a fundamental part in these activities, and support for the smooth connection of research results to the next step of practical application (connecting mechanism) through the evaluation and analysis of applications and the expansibility of research results.

(4) Promotion of foundation of R&D-oriented ventures

Thanks to efforts by the industrial, academic and government sectors with regard to university-based venture companies, more than 1,900 venture companies[1] have so far been established nationwide. JST implemented the project, "Adaptable and Seamless Technology transfer Program through target-driven R&D (A-STEP)" as part of its effort to support research related to the creation of university-based start-ups, with 102 new start-ups established as of the end of January 2010. In addition, a new project, "Creation and Support Program for Start-ups from Universities," was started in FY 2009 to promote assistance for young researchers' start-ups and formation of career paths for future entrepreneurs.

RIKEN established a system to promote rapid dissemination and practical use of research results through preferential treatment in joint research intended for venture businesses, which are established by researchers based on their own research results.

The National Agriculture and Food Research Organization (NARO) has established a framework for training venture businesses using competitive funding, providing financial assistance for R&D conducted by R&D venture companies that would provide important roles in new businesses or lead to the creation of new industries.

(5) Promotion of R&D by private companies

R&D activities provide sources of sustainable socio-economical growth and stronger international competitiveness via the creation of new "knowledge" and new industries and markets through innovation. Particularly, R&D activities in the private sector make up more than 70% of all R&D activity in Japan. Thus, further encouragement of revitalization will lead to reinforcement of the foundation necessary to create innovation. The government, while respecting the principle of voluntary efforts being taken by private companies, stimulates motivation by utilizing a tax system that facilitates R&D and by enhancing technology development support programs that reduce the risks involved in the R&D process up to and including the stage of commercialization.

Promotion of private-sector R&D activities through tax support

To promote research activities by the private sector, various preferential tax measures are provided as shown in the table below. In relation to the measures against financial crisis taken on April 10, 2009 regarding the tax credit program on total experiment and research expenses, (1) the limit of the tax credit for FY 2009 and FY 2010 was increased from 20% to 30% of the total amount of corporate tax, and (2) the tax amount exceeding the limit for FY 2009 and FY 2010 will now be allowed for deduction in FY 2011 and FY 2012. (Table 2-3-9)

[1] Source: Prepared by NISTEP, MEXT

Table 2 3 9 Major Preferential Tax System for S&T Promotion

Item	Purpose	Details	Applicable law	Date of enactment and validity
R&D taxation system	Promotion of research and development investment by the private sector, etc.	Tax Credit for research and development expenditures I. Proportional Tax Credits for total research and development expenses The research and development credit is a percentage (8 to 10%) of the total of research and development expenses. The maximum amount is the sum of 20% of the corporation tax liability. II. Special Tax Credit on special research and development expenditures For joint experimentation and research with and experimentation and research commissioned to universities, public experiment and research institutes, the National Experiment and Research Institute, and other organizations, in addition to Item I above, tax equivalent to 12% of these research and development expenses regarding such experiment and research is exempted (but limited to an amount equivalent to 20% of the corporation tax, including the special tax exemption in Item I above.) (Corporation tax)	Special Taxation Measures Act, Article 10, Article 42-4, 42-4-2, Article 68-9, 68-9-2 (corporation tax), Local Tax Act, Supplementary Provision, Article 8, Item 1.	Enacted in FY2003 (Hereinafter, for private business owners, the tax credit system will remain the same.)
		III.Tax system to strengthen the technical base of SMEs (Applied instead of I or II) (1) The tax credit amount is a value equivalent to 12% of test and research expenses at SMEs (but limited to a value equivalent to 20% of corporation tax). (Remarks) 1. The tax credit amount in relation to the above I through III is a value equivalent to 30% of corporation tax only for FY 2009 and FY 2010. 2. In relation to the amount exceeding the tax credit mentioned in I through III, it can be deferred one year for deduction. However, in regards to the amount exceeding the limit occurring in FY 2009 and FY 2010, it can be deducted in FY 2011 and FY 2012. (2) The tax credit amount in (1) above is excluded from the tax base for corporate inhabitants tax (Local tax).		Enacted in FY1985
		IV Proportional Tax Credits for increased research and development expenses Either of the following (a) or (b) will be selected and applied (but limited to an amount equivalent to 10% of the corporation tax, apart from I through III) (corporation tax) (a) When the amount of experimental and research expenses exceeds the average of experiment and research expenses for the current term and for three years before the current term and exceeds the largest amount out of experiment and research expenses for two years before the current term, the tax equivalent to 5% of the amount exceeding the average is exempted. (b) When the amount of experimental and research expenses exceeds 10% of sales amount for the current term and for three years before the current term, the tax is exempted in a predefined proportion to the excessive amount.		Enacted in FY 2008

Promotion of private-sector R&D activities through government subsidies

1) Innovation commercialization support program [literal translation]

Government subsidies are provided through the New Energy and Industrial Technology Development Organization (NEDO) to support efforts for development intended for commercialization of technology seeds owned by private corporations. Recipient corporations work within fields designated as policy priorities by the Basic Plan, with due consideration for the status of utilization of other management resources. The provision of the subsidies is determined after information is obtained concerning the status of the fund recipient's management of intellectual property. This is to ensure that management of intellectual property fully exploits the research outcomes.

2) System for the support of private-sector infrastructure technology research [literal translation]

Proposals are chosen from public calls in order to promote experimental research into infrastructure technologies conducted in private sectors related to the mining, manufacturing, telecommunications, and broadcasting industries. Topics concerning telecommunications and broadcasting technologies are continuously supported through NICT, while those related to mining and manufacturing technologies fall under the NEDO in terms of the contract research program.

3) Industrial technology research development program [literal translation]

To support SMEs and venture businesses, which have developed their own technologies but which experience difficulties in marketing, public research institutions such as the National Institute of Advanced Industrial Science and Technology (AIST) serving as collaborators. Their role is to evaluate the work of such corporations to enhance the credibility of their products through the role of affiliation.

4) Program for the promotion of eco-innovation and the discovery/verification of innovative technologies against global warming [literal translation]

To realize sustainable development while balancing environmental problem solving and economic growth, through NEDO, implementing research for identifying seeds from public calls concerning eco-innovation (environmental- and human-oriented technological and social innovation) and the promotion of innovative solutions to global warming

Program for new technology development to activate the agriculture, forestry, fisheries and food industries by industry-academia-government collaboration

In order to support new industries and businesses in the agriculture, forestry, fisheries, and food sectors and resolve problems and policy issues, MAFF promotes development of new technologies through collaborations with universities and public organizations by utilizing technology seeds owned by such organizations.

Program for the promotion of private-sector commercialization research

Contract R&D programs in the commercialization stage are implemented in the private sector in order to facilitate the development of revolutionary bio-oriented technologies that help to enhance the agriculture, forestry, fisheries, food/beverage and brewing industries.

Small Business Innovation Research (SBIR)

The Small Business Innovation Research (SBIR) system is intended to provide consistent support to R&D activities of SMEs and commercialization of their research outcomes through inter-ministerial collaboration. Under this system, efforts are underway to increase opportunities for providing subsidies and paying commissions related to R&D for new technologies that enable SMEs to engage in new business operations. In addition, patent fees are reduced and the quotas for loan guarantees are expanded. In FY 2009, seven ministries (MIC, MEXT, MHLW, MAFF, METI, MLIT and MOE) designated a total of 111 cases as eligible for special subsidies, and set the goal of providing about 40.5 billion yen to SMEs.

4 Building Regional Innovation Systems and Creating Regions Full of Vitality

Regional promotion of S&T helps to revitalize local industries and enhance local residents' quality of life, which in turn contributes to the advancement and diversification of S&T in Japan as a whole and the enhancement of the competitiveness of the country's systems for innovation.

Prefectural governments establish councils in charge of deliberating S&T policies and make active contributions to the S&T promotion by formulating their own plans and guidelines related to S&T. (Table 2-3-10)

Table 2 3 10 Science and Technology Councils Established at Local Governments

	Name of CST councils (foundation)
Hokkaido	Hokkaido Science and Technology Council (September 1952 -)
Aomori	Aomori Industry, Science and Technology Council (December 1997 - May 1999) - Aomori Research and Development Conference (June 1999 - March 2007)
Akita	Akita Council for Science and Technology (August 2002 -)
Iwate	Iwate Science and Technology Promotion Council (April 1989 -)
Miyagi	Miyagi Conference on Guidelines for Promoting Science and Technology (July 1998 - March 1999)
Yamagata	Yamagata Science and Technology Council (April 1999 -)
Fukushima	Fukushima Science and Technology Promotion Council (May 1997 -)
Ibaraki	Ibaraki Science and Technology Promotion Council (September 2003 -)
Tochigi	Tochigi Science and Technology Promotion Council (July 1999 -)
Gunma	Gunma Science and Technology Promotion Headquarters (September 1999 -)
Saitama	Saitama Science and Technology Council (January 1995 -)
Chiba	Chiba Science Council (November 1994 -)
Kanagawa	Kanagawa Science and Technology Council (June 1988 -)
Niigata	Niigata Science and Technology Council (April 1998 -)
Toyama	Toyama Science and Technology Council (November 1983 -)
Ishikawa	Ishikawa Industrial Science and Technology Council (December 1997-October 2003) - Ishikawa Industrial Innovation Council (November 2003 -)
Fukui	Fukui Science and Technology Promotion Council (April 1998 - March 2004) Council for Fukui Production Planning Strategy (May 2004 -)
Yamanashi	Yamanashi Science and Technology Council (September 1991 -)
Nagano	Nagano Prefecture Investigative Commission on Science and Technology Industry Promotion Initiative (October 1999-December 1999)
Gifu	Gifu Science and Technology Promotion Council (July 1996 -)
Aichi	Aichi Science and Technology Council (February 2000 -)
Mie	Mie Science Academy Representative Conference (April 2001 - May 2005) - Science and Technology Exchange Council (June 2005 - March 2007) - Science and Technology Promotion Conference (April 2007 - January 2008)
Shiga	Shiga Science and Technology Promotion Council (April 2003 -)
Kyoto	Kyoto Science and Technology Council (September 1961 -)
Osaka	Osaka Science and Technology Roundtable (December 1986 -)
Hyogo	Hyogo Science and Technology Council (April 2000 -)
Nara	Nara Prefecture Committee on Guidelines for Science and Technology Promotion (August 2007 - March 2008) - Nara Prefecture Science and Technology Promotion Conference (To be established in FY 2008)

	Name of CST councils (foundation)
Wakayama	Wakayama Prefecture Science and Technology Strategy Council (September 2004 -)
Tottori	Tottori Science and Technology Promotion Council (March 1999 - December 2002)
Shimane	Shimane Science and Technology Promotion Council (October 1998 -)
Hiroshima	Hiroshima Science and Technology Promotion Conference (May 1992 - March 1994)
Yamaguchi	Yamaguchi Science and Technology Promotion Conference (May 1991 -)
Kagawa	Kagawa Science and Technology Council (August 1997 -)
Ehime	Ehime Science and Technology Promotion Council (July 2001 -)
Tokushima	Tokushima Forum for the Promotion of "Vision for Science and Technology" (June 1998 - March 1999) - Tokushima Prefecture Science and Technology Promotion Plan Formulation Committee (March 2008 -)
Kochi	Kochi Science and Technology Academy (January 2004 -March 2006)
Saga	Saga Science and Technology Council (February 1996 -)
Nagasaki	Nagasaki Science and Technology Promotion Council (October 1998 -)
Kumamoto	Kumamoto Science and Technology Council (September 1999 -)
Oita	Oita Science and Technology Promotion Committee (June 2002 - March 2003)
Miyazaki	Miyazaki Science and Technology Council (August 2001 -)
Kagoshima	Kagoshima Science and Technology Promotion Council (April 2003 -)
Okinawa	Council for Promotion of Science in Okinawa (January 1995- March 2007) -Okinawa Science and Technology Council (October 2007 -)
Kawasaki City	Kawasaki City Innovation Promotion Meeting (August 2003 - March 2006)
Yokohama City	Yokohama City Council for Promotion of Cooperation between Industry and Academia (October 1999 - March 2003)
Kyoto City	Kyoto City Conference on Projects for Promoting Industry, Science and Technology (August 2005 - September 2006) -Kyoto City Committee on Promotion of Industrial Science and Technology (July 2007 -)
Osaka City	Osaka Science and Technology Promotion Advisers Council (May 2000 -) [literal translation]
Hiroshima City	Hiroshima City Science and Technology Advisory Council (October 2003 -)
Kitakyushu City	Kitakyushu City Science and Technology Promotion Council (November 2002 - March 2004)
Fukuoka City	Fukuoka City Adviser Meeting on Vision for Promotion of Science and Technology (September 2001 - June 2002)

The Science and Technology Basic Plan calls for competition-based support for activities, with cluster-based regional initiatives, promoting regional systems for innovation and vital communities. The plan also calls for efforts to overcome the wall of segregation among ministries and agencies and increase inter-ministerial collaboration in order to ensure smooth implementation of regional S&T-related measures.

Here is an overview mainly of measures backed by the government to support regional S&T promotion.

(1) Formation of regional clusters

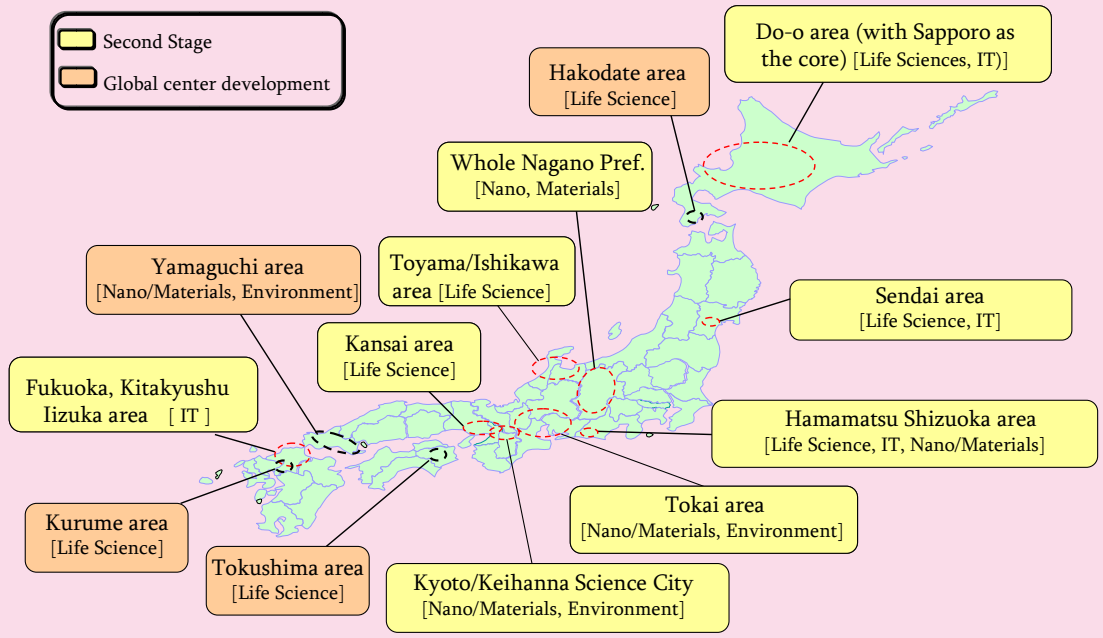
Efforts toward the formation of Knowledge Clusters

1) Efforts toward the formation of world-class clusters

MEXT is implementing the Knowledge Clusters to build a network of industry-academia-government to create sustainable innovation, with universities, which have excellent R&D potential, placed in the center. Following the existing "Knowledge Cluster Initiative: The First Stage," MEXT launched the "Knowledge Cluster Initiative: The Second Stage" while promoting local independence. It is implemented in all 9 regions in FY 2009. (Figure 2-3-11)

In addition, the "Knowledge Cluster Initiative: Global Center Developing" was begun to promote the creation of internationally-competitive medium-sized clusters, utilizing the research ideas and technological seeds displaying an international edge, and in FY 2009, four regions were newly added.

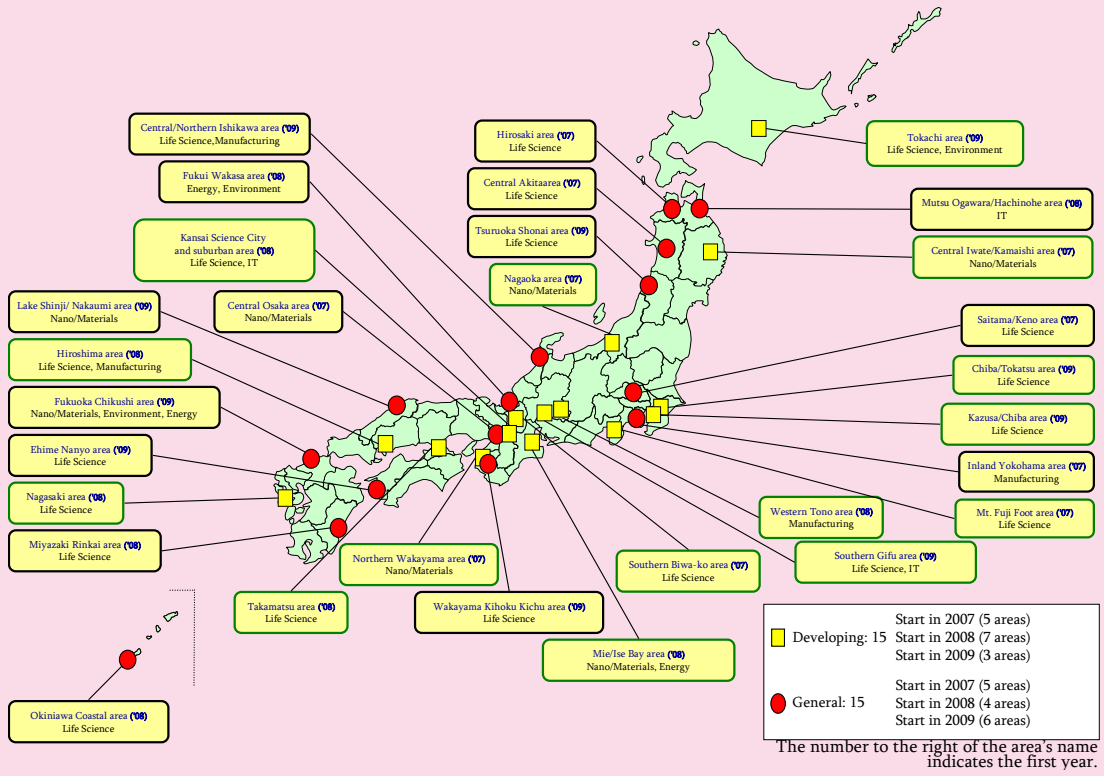
Figure 2 3 11 Map of Knowledge Cluster Initiative



2) Efforts toward the formation of clusters featuring local characteristics

In FY 2002, to exploit regional individuality, MEXT implemented the City Area Program, which aims to create new businesses and foster R&D-oriented regional industries by producing new technology seeds using the "wisdom" of universities. As of FY 2009, the program is underway in 30 regions. (Figure 2-3-12)

Figure 2 3 12 Map of urban area Industry-Academia-Government Collaboration Promotion



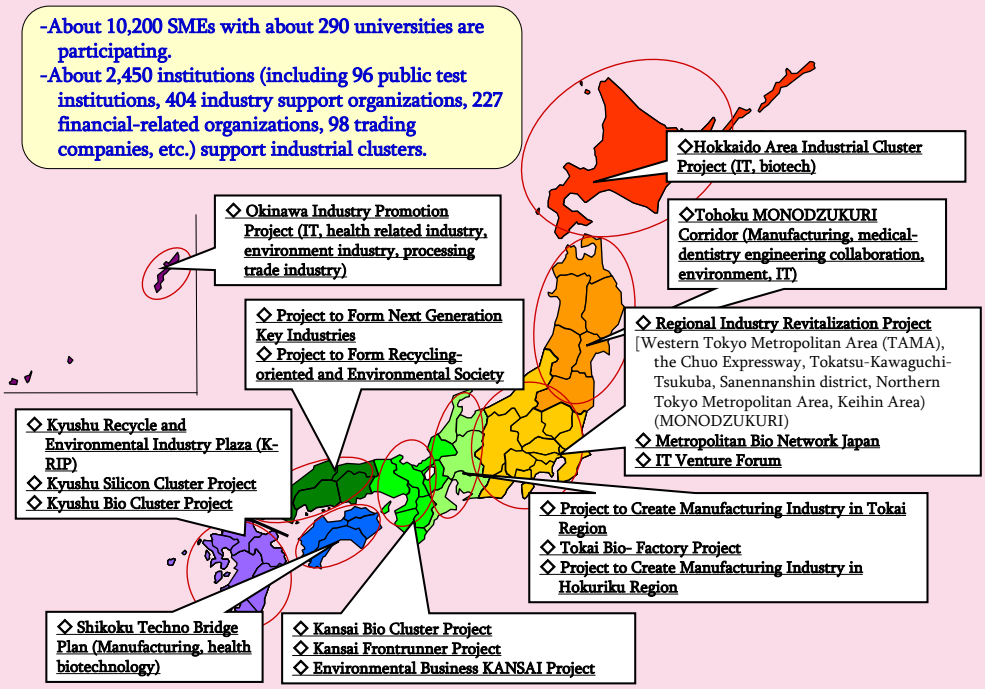
Efforts toward the formation of Industrial Clusters

METI's Industrial Cluster[1] Project involves the regional Bureaus of Economy, Trade, and Industry as the hubs of wide-area human networks of industry, academia, and government, including local enterprises, universities, etc. The networks aim at participation in world markets, requiring comprehensive, effective implementation of regional measures to form industrial clusters that can foster new business enterprises capable of competing in worldwide markets. Specifically, by executing 18 projects nationwide, METI forms wide-area personal networks of about 2,450 supporters of industrial clusters. This includes 12,000 SMEs having ambitions to enter into world markets, universities, public experiment and research organizations, industry-supporting institutions, and institutions related to finance and trading corporations. This should dramatically improve the quality and quantity of information being distributed among industry, academia and government, and complement management resources such as technologies, management information, and marketing channels, thus supporting technology development exploiting regional characteristics. Organizations to promote the clusters have been established for each project, supporting formation of the industry-academia-government network (Figure 2-3-13). Additionally, subsidies are provided to organizations that are actively promoting and other core organizations which support the creation of new enterprises through the formation of human networks in certain regions and sectors. Cluster managers are deployed for comprehensive coordination of cluster

[1] A system that takes the technological innovation of universities and other public research institutions, and of companies in the surrounding area and encourages wider area cooperation between universities and companies, and between different companies, to create a chain reaction of innovation and creation of new businesses and industries.

activities.

Figure 2 3 13 Industrial cluster project (Second Term) 18 projects



(2) Smooth development of regional measures for S&T

MEXT works to promote joint research and other efforts among industry, academia, and government, focusing on universities and other institutions in regional areas to create new technology seeds. METI works to open up new fields for businesses, and to create start-ups and new products by promoting collaborative projects among industry, academia, and government, such as technology development leading to practical applications, focusing on corporations.

The two ministries cooperatively enhancing industry-academia collaboration in regions, by providing new technology seeds, and offering feedback concerning market needs to R&D activities.

These ministries provide opportunities for information sharing and opinion exchange among concerned individuals, and they hold regional meetings of the joint achievement rollouts of projects which they have implemented. In addition, in FY 2009, they held the “Cluster Conference 2010” as a place to share know-how while learning methods to overcome issues with local people involved in industry-academia-government collaboration.

In addition, the Cabinet Office organized information on the progress of S&T promotion conducted by MEXT, METI, other multiple ministries, and local governments, and provided the information on its “Local S&T Portal Site [literal translation]”.

Projects for promotion of S&T in the community

Government ministries and agencies implement various measures for regional S&T promotion. The main measures concerned are as follows:

1) MIC

The Research and Development Promoting Info-Communications Technology for Community Development in the Strategic Information and Communications R&D Promotion Program promotes joint research in the information and communications field between SMEs and universities engaged in R&D contributing to the creation of locally-based new industries, the promotion of local industries or the reinvigoration of local communities.

2) MEXT

MEXT boosts innovation in regions through JST's Comprehensive Support Programs for Creation of Regional Innovation, under careful support from S&T coordinators, by using JST Innovation Plazas and Innovation Satellites (at eight locations nationwide) as footholds for ensuring a consistent flow of R&D activities from the discovery of seeds through commercialization.

In 2009, MEXT arranged for research facilities to promote industry-academia-government research to exploit local characteristics, while accelerating the deployment of research outcomes in medium-sized corporations, SMEs, and society. The ministry also implemented the "Project to arrange centers for local industry-academia-government collaboration research [literal translation]" to realize community revitalization with S&T, and have selected 28 areas to support conception and 12 areas to support foundation building.

3) MAFF

By determining research topics for regional revitalization and solutions for technical issues at production sites, etc. by utilizing a free flow of regional ideas in the Practical Technology Development Project for Promoting New Policy in Agriculture, Forestry and Fisheries [literal translation], MAFF promotes R&D activities through industry-academia-government collaboration mainly consisting of prefectural research institutes and regional universities. Moreover, to promote development of agriculture, forestry and fisheries and to revitalize regional economy, nonprofit and other organizations are organized in respective regional areas, and the ministry promotes state-of-the-art technologies in the fields of agriculture, forestry, fisheries and food industries in regions through collaboration and cooperation with these organizations.

4) METI

Based on advanced technological seeds that can help create new regional industries, METI implements practical-application R&D in collaborative fields within agriculture-commerce-industry through joint research entities from industry, academia, and government. In addition, to solve technological problems of regional SMEs, the ministry established a one-stop support system in cooperation with research institutes and other organizations undertaking regional innovation.

AIST invited researchers from public experiment and research organizations who understood the needs of regional SMEs (14 researchers invited in FY 2009), and cooperated with engineers of such enterprises when necessary to resolve technical problems faced in joint research programs. In addition, AIST is developing a system to support local medium-sized corporations and SMEs with open use of testing equipments and databases, while forming a community to support creation of

innovation from the community collaborating with public research institutions and universities.

5) MOE

MOE implements local environmental research - joint research with the national, independent administrative institutions and public research institutions. This focuses on research themes for which there is strong demand at the regional level, and which require study that matches the characteristics of the regional environment. In order to develop and disseminate advanced environmental technologies and promote regional environmental businesses by placing increased emphasis on R&D activities at the regional level, the ministry sets quotas for research themes (regional quotas) featuring local individuality and characteristics in strategic general research supported by the Environmental Research and Technology Development Fund. Furthermore, in model regions, the ministry has implemented a model project for establishment of environmental technology development infrastructure through industry-academia-government collaboration in respective regions.

Strengthening the activities and functions of public research institutions as R&D and technology support organizations

The relevant government ministries implement various measures directed at public research institutions. These measures are summarized in (Table 2-3-14).

Table 2 3 14 Strengthening of the Activities and Functions of Public Research Institutions as R&D and Technology Support Organizations

Ministry	Outline
Ministry of Internal Affairs and Communications	Adopts local tax allocation measures for the research and development activity expenses of prefectural industrial technology centers, sanitation research institutes, agricultural test sites, livestock test sites, fishery test sites, and other public testing and research institutions.
Ministry of Agriculture, Forestry and Fisheries	Promotes research projects consigned to prefectural institutions, and implemented as part of national research - Breeding programs for major crops - Compliant research and development on priority issues
Ministry of the Environment	- Promotes joint research with the environmental laboratory, etc., of local governments (prefectural or city governments), to contribute toward the preservation and improvement of the local environment - The National Environmental Research and Training Institute (NETI) offers training for national and local governmental officials, etc., toward the goal of acquiring environmental analysis technologies.

Interregional collaboration and exchange

JAREC was established in June 1992, based on funds provided by local governmental authorities, with the aim of supporting research exchanges and promoting regional research concerning S&T. It hosts training sessions throughout the country as well as study groups to discuss solutions to the individual issues facing each community, to assist in deploying S&T policies. Other operations include training of personnel for technical transfer.

Consolidation of R&D bases

The National Spatial Strategies[1] specifies the utilization of universities and experimental research institutions including the organizations concentrated in the Tsukuba Science City and the Kansai Science City for the purpose of contributing to nationwide development as they are important intellectual and human resources.

1) Tsukuba Science City

Tsukuba Science City was created as a center for high-level research, experiment, and education in Japan and to contribute to reducing the overcrowded status of Tokyo. At present, 31 institutions, including national experimental research and education institutions, as well as many private-sector research institutions, are located in the city. They promote various measures such as research exchange advancement and establishment of international research exchange functions.

2) Kansai Science City

The Kansai Science City was constructed as a center for contributing to the development of Japanese and world culture, science, and research, as well as development of the national economy. At the end of FY 2009, more than 110 facilities were established within the city, and are operating various research activities.

5 Effective and Efficient Implementation of R&D

(1) Effective use of research funds

Pursuant to the Guidelines for Management and Audit of Public Research Funds at Research Institutions (Implementation Standards)" (Minister of MEXT decision: February 15, 2007), MEXT called for submission of execution status reports on system improvement, determining that stronger management and supervision of research funds in research institutes are essential for preventing misuse of public research funds. (In FY 2009, about 1,800 institutions submitted such reports.) In addition, MEXT conducted an on site survey to understand the state of system development following the guidelines. Particularly in 2009, a council of experts on management was established and an audit of public research expenses in research institutions was conducted with external experts. While collaborating with the council, MEXT analyzed the submitted reports and the outcomes of the on site survey to select possible risks and related countermeasures common to many research institutions, trying to

e-Rad website
Government R&D Management System

[1] National Spatial Strategies(National Plan) (Cabinet decision: July 4, 2008)

prevent illegal use of public research funds by announcing them in the training for employees of research institutions.

In addition, each competitive funding agency positively utilized the Cross-Ministerial R&D Management System: e-Rad (URL: http://www.e-rad.go.jp/)[1], in order to eliminate unreasonable overlapping of allocations and excessive concentration of funds.

The Cabinet Office, with the support of ministries and agencies concerned, continued to collect data for the National R&D Database, which is utilized for macro analysis necessary for the formulation of Science and Technology Basic Plans and research and deliberations concerning fund allocations, by using the e-Rad.

(2) Emphasis on the development and utilization of human resources

Given that it is important to develop human resources through R&D activities, and that increased emphasis on R&D should be accompanied by increased emphasis on human resources, the number of students in doctoral courses, supported with external funds such as competitive funding, and postdoctoral researchers, employed with external funds, has been increased.

MEXT's Grants-in-Aid for Scientific Research program endeavors to expand funds for young researchers. Measures continued from the previous year to support young researchers include MIC's Strategic Information and Communications R&D Promotion Program, MHLW's Health and Labour Sciences Research Grants, MAFF's Basic Research Promotion Program for Creation of Innovation, METI's Grant for Industrial Technology Research, and MOE's Environmental Technology Development Fund.

(3) Reform of evaluation systems

In order to effectively and efficiently promote excellent, world-class R&D, R&D that contributes to society and the economy, and R&D for the development of new science fields, it is important to improve the R&D evaluation system.

All ministries and agencies conduct R&D evaluation using national budgets, based on their own detailed guidelines specifying evaluation methodologies that have been formulated in accordance with the National Guideline on the Method of Evaluation for Government R&D (Prime Minister decision of October 31, 2008). To follow up on the national guidelines, the Cabinet Office announced the outcomes of surveys on the progress of R&D evaluations conducted by each ministry. MEXT, which accounts for more than 60% of the government's total S&T-related expenses, set forth the Guideline for Evaluation of Research and Development in MEXT (Minister of MEXT decision) to be used as the basis by which appropriateness of budget request is judged by conducting preliminary evaluation which uses external evaluation. Then, interim evaluation is conducted to confirm the necessity of making changes to the plan, and post evaluation may also be necessary for application to the next deployment.

Meanwhile, independent administrative institutions and national universities conduct evaluation of their performance in accordance with the Act on General Rules of Incorporated Administrative

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[1] This system is to support a series of processes related to R&D management online (application → assessment → selection → project management → report on outcomes, etc.) to eliminate unnecessary redundancy and excessive concentration of competitive funding for researchers. (Commenced on Jan 2008)

Agency (Act No. 103 of 1999) and the National University Corporation Act (Act No. 112 of 2003), respectively. Ministries and agencies conduct policy evaluation in accordance with the Government Policy Evaluations Act (Act No. 86 of 2001).

6 Elimination of Institutional and Operational Bottlenecks for Smoother S&T-related Activities and Dissemination of Research Results

When promoting S&T, it is important to develop an institutional environment that facilitates active personnel exchanges, smoother implementation of research activities and dissemination of research results to society to increase the effects of the investment of human/physical resources in S&T. To solve the problems prevalent in the research field such as systematic obstacles to the advancement of S&T and the benefits of research results to society, the CSTP compiles 66 reform topics spanning the seven items below. The Council conducted follow-ups on respective items and reported the results on May 19, 2008.

1. System to attract talented foreign researchers to Japan
2. Environment to improve the mobility of researchers
3. Achieving effective and fair use of research funds
4. Boosting research support
5. Improving environments to promote the activities of female researchers
6. Comprehensive support for clinical research including trials
7. Improving the public's understanding of science

Section 3 Reinforcing the Platform for the Promotion of Science and Technology

1 Strategic and Prioritized Improvement of Facilities and Equipment

(1) Improvement of facilities of national universities, etc.

Facilities of national universities[1] are centers of activities for creative and cutting-edge academic R&D and the development of creative human resources, and the most advanced medical treatments and constitute an essential foundation for Japan.

MEXT in April 2006 established the Second Five-Year Program for Emergent Renovation and Building of Facilities of National Universities, etc. (hereinafter referred to as the second Five-Year Program)," which specified the facilities that should be improved over the five-year period between FY 2006 and 2010 as an emergency measure, with a view to promoting the prioritized and systematic improvement of national universities' facilities.

The second Five-Year Program promotes reconstructing the deteriorated facilities as the highest priority combined with eliminating overcrowded facilities, along with the systematic improvement of university hospitals. This program also seeks to improve about 5.4 million square meters of facilities that need urgent improvement in national universities, and such work was implemented for about 4.31 million square meters by the end of FY 2009.

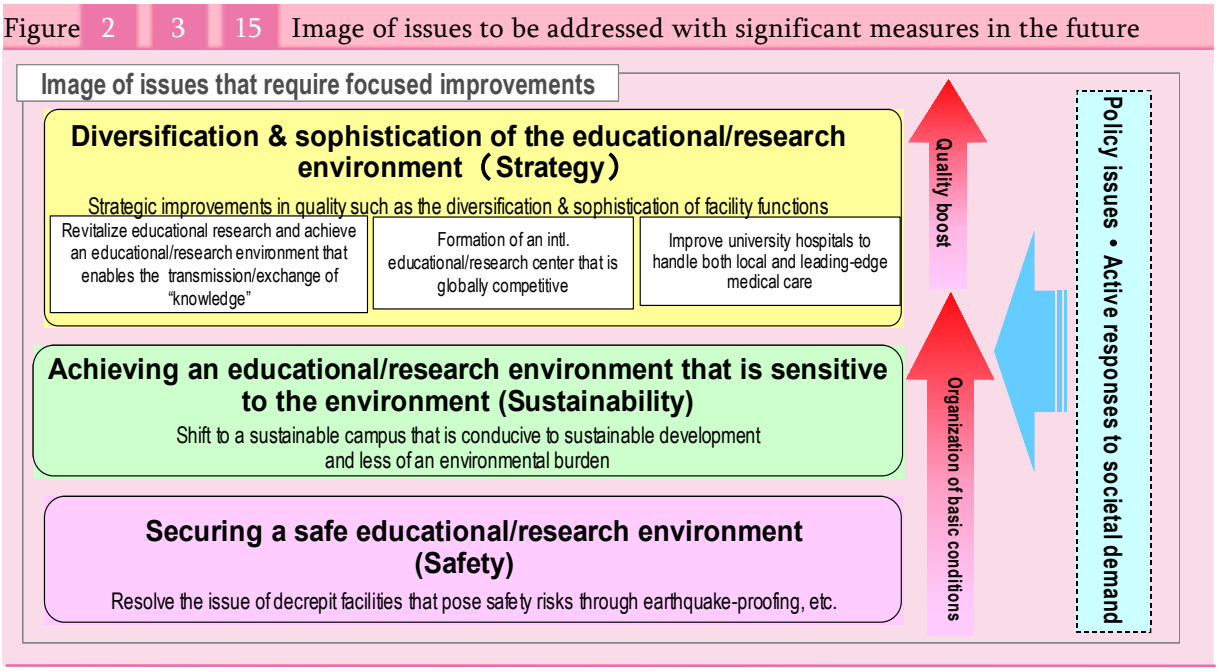
Furthermore MEXT is promoting system reform such as proper facilities management for

[1] Including Inter-University Research Institute Corporations

effective and flexible use of facilities and facilities improvement through cooperation with the private sector and local government.

Currently a new facility improvement plan following the second is under discussion to be set. The interim report of September 2009 states that it is necessary to improve strategically diversification and sophistication of the educational/research environment with consideration given to policy issues and social demands, in addition to earthquakes resistance, reconstructing of aged facilities, global warming, etc. (Figure 2-3-15)

Figure 2 3 15 Image of issues to be addressed with significant measures in the future



(2) Improvement of facilities at national university corporations, etc.

In order to promote academic research, it is essential to improve facilities that form the platform for research activities. Old and outdated research facilities are an immediate problem for national university corporations, and the Council for Science and Technology (CST) has pointed out the need to execute planned maintenance work. In response, the national government is maintaining and enhancing research facilities in efficient and effective ways based on master plans for facilities created by national university corporations.

In FY 2009, budget was appropriated for advanced research facilities necessary to promote advanced research in the first supplementary budget.

(3) Improvement of facilities and equipment at private universities

It is critical for Japan to improve its research environment, such as facilities and equipment necessary for promoting advances in academic research. Expectations of the roles to be played by private universities, which make up about 80% of Japan's higher education, are growing with the great contributions these institutions make to the advancement of higher education in Japan by serving as a diverse source of researchers and actively engaging in unique research opportunities.

In light of this situation, MEXT is working to enhance the platform of private universities'

research by implementing the "Program for Establishing Strategic Research Centers at Private Universities" [literal translation], which provides comprehensive support to research facilities and equipment related to excellent research projects.

(4) Promotion of improvement and shared use of R&D facilities and equipment

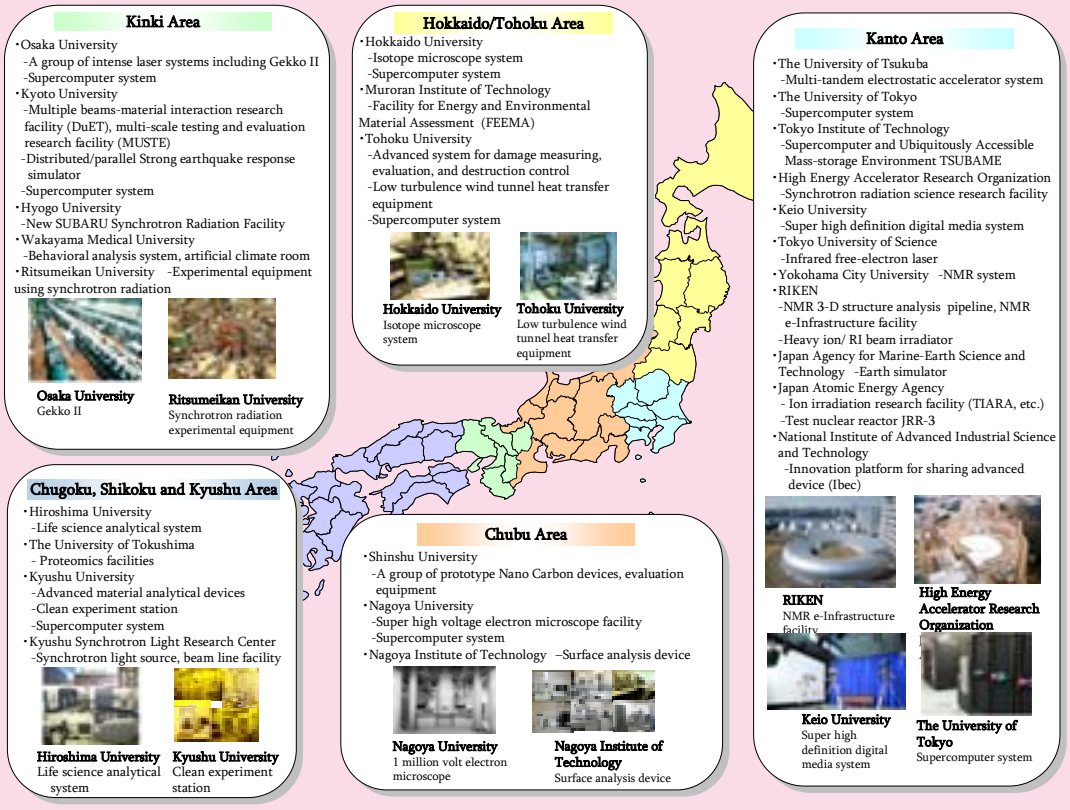
The R&D facilities and equipment that serve as the basis for S&T promotion (referred to as "R&D facilities and equipment") are indispensable for the support of the full range of S&T activities from basic research to innovation creation. Therefore, it is necessary to improve and effectively utilize R&D facilities. "The R&D-Capacity Strengthening Act"[1] [literal translation] also specifies that the government should implement the necessary measures to promote the shared use of R&D facilities and equipment owned by independent administrative agencies, universities, and other organizations.

In this context, pursuant to the Act on Promotion of Shared Use of Specified Large-Scale High Technology Research Facilities (Act No. 78 of 1994) (hereinafter referred to as "Shared Use Act"), MEXT promotes shared use by researchers of industry, academia and the government through the support of necessary expenses for facility improvement and shared use of specified large-scale high technology research facilities [specifically, next-generation supercomputers, large radiation facilities (SPring-8), and X-ray Free Electron Laser (XFEL)]. Furthermore, in July 2009, the "Shared Use Act" was partially revised by law, and the neutron ray facilities at the Japan Proton Accelerator Research Complex (J-PARC) have also been positioned as Specified Large-Scale High Technology Research Facilities [literal translation].

In addition, in order to promote the shared use of R&D facilities and equipment other than specified large-scale high technology research facilities, which are owned by other independent administrative agencies, universities, and other organizations, MEXT is implementing "The Program for Strategic Use of Advanced Large-scale Research Facilities" in FY 2009. Moreover, as basic information on utilization (location, utilization purposes, usable time, etc.) is insufficient to promote shared use of these facilities and equipment to generate results, MEXT opened its "Kyoyo Navi" (General navigation site for shared use of research facilities [literal translation]) as a general window via the internet. (Figure 2-3-16)

[1] The Act to Strengthen R&D Capacity by Advancing R&D System Reform and Promote R&D Efficiency [literal translation] (Act No. 63 of 2008)

Figure 2 3 16 Funded Organizations under the Open Advanced Facilities Initiative for Innovation



2 Enhancement of the Intellectual Infrastructure

In order to promote research, development and related activities reliably and effectively, it is necessary to ensure the safety, reliability, and stable provision of materials, standards, techniques, equipment, and related elements factoring into the knowledge base (bioresources, etc.) which supports fundamental R&D activities such as experimentation, measurement, analysis, and evaluation. For that purpose, the Basic Plan calls for prioritized efforts to achieve a world-class level in 2010.

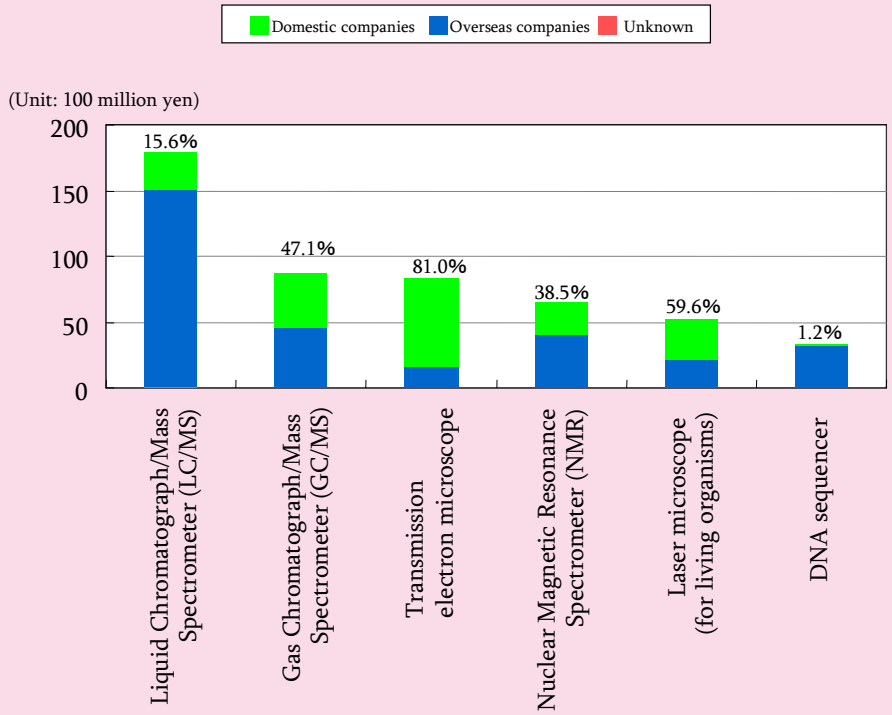
Advanced measurement/analysis instrument (Mass microscope)
An instrument to observe samples with the microscope and to conduct mass spectrometry on the observed substances
Photo: Japan Science and Technology Agency

MEXT has implemented the National BioResource Project (NBRP) and the Integrated Database Project to support research in the life sciences field [See Part 2, Chapter 2, Section 2, 1 (4)].

In addition, technologies and instruments for advanced measurement can serve as the basis for supporting significant technological innovation and discovery of new principles and materials, with R&D activities for such technologies being sufficiently advanced to lead to the Nobel Prize awards in many cases. However, Japan's dependence on foreign countries for advanced measurement and analysis instruments is still high (Figure 2-3-17), leading Japan to implement projects for the development of advanced measurement/analysis techniques and equipment that meet the needs of

researchers engaged in state-of-the-art research, and needs of manufacturers. In FY 2009, software development was also promoted for measurement/analysis instruments, as were activities supporting practical use and dissemination of such instruments.

Figure 2 3 17 Sales of Major Advanced Measurement/Analysis Instruments, by Domestic /Overseas Companies (FY2008)



Note: 1. Domestic companies: manufacture and sell instruments within Japan.
Overseas companies: sell instruments manufactured abroad.
2. Figures shown with "%" in the table show the share of domestic companies in the domestic market.
Source: Prepared by MEXT, based on *Scientific Instruments Almanac 2008,* published by R&D Co., Ltd.

MHLW established "master banks" at the National Institute of Biomedical Innovation (NIBIO), in order to collect and store the cultured cells and genes from humans and animals that are necessary for research in the life sciences, particularly in the fields of medicine and pharmacology. The ministry furnishes these cultured cells and genes to researchers and other experts through the Japan Health Sciences Foundation (JHSF). Also, the Japan Health Sciences Foundation obtained the cooperation of medical institutions to collect human tissue for research use, by given much careful consideration to bioethical issues, and commenced activities to distribute the tissues to researchers on request.

At METI, the Special Committee on Measurement Standards and Intellectual Infrastructure, a joint body composed of the Industrial Technology Subcommittee of the Industrial Structure Council and the Japanese Industrial Standards Committee (JISC), annually revises the objectives for the development of the intellectual infrastructure. The National Metrology Institute of Japan (NMIJ) of the AIST improves and expands national measurement standards, and also makes efforts toward international mutual recognition as the measurement standard is based on the instrument developed by NMIJ.

In relation to the genetic resource information infrastructure, the National Institute of Technology and Evaluation (NITE) collects, preserves, and distributes information, while integrating the databases of major generic resources in Japan to be released to the public. In addition, NITE is actively working on the development of genetic resources in Asia, including the "Asian Consortium for the Conservation and Sustainable Use of Microbial Resources (ACM)" and joint microbial search with Asian countries. [Refer to Part 2, Chapter 2, Section 2, 1 (4)] Furthermore, AIST is updating databases of human genetic and protein information and the genetic database concerning carbohydrate chains to develop a life science database by integrating these separate sources. MAFF collects, preserves, and provides genetic resources related to the industries of agriculture, forestry, and fishery as part of the Genebank project, while organizing the "MAFF Biological Genome Information Integrated Database [literal translation]." [Refer to Part 2, Chapter 2, Section 2, 1 (4)]

In terms of chemical safety management infrastructure, the ministry collects and coordinates data on hazardous chemical substances, and also develops simplified testing methods to evaluate the chemical safety accurately.

For development of infrastructure for quality life and welfare, NITE enhances, updates, maintains, and controls data related to basic human characteristics that contribute to safe and user-friendly designs of products, and develops evaluation methods concerning functions and performance of welfare equipment.

Regarding geological surveys, AIST produced twelve new kinds of geological sheet maps in FY 2009. In addition, the Institute has created and updated various geological information databases, such as the Integrated Geological Map Database (GeoMapDB), which integrates geological maps already in publication. In addition, AIST is involved in the development of an advanced database of materials. A gravity database was released as a Research Information Database (RIO-DB), and the Institute has been working on improving and updating more than 80 kinds of databases, including the organic-compound spectra database and the dispersion-type thermophysical-property database.

Table 2-3-18 shows the status for the development of facilities to preserve and provide intellectual infrastructure by the ministries and agencies.

Table 2 3 18 The State of Development of Intellectual Infrastructures

Ministry	Fiscal Year developed	Name of facility	Intellectual infrastructures
Ministry of Internal Affairs and Communications	1940	National Institute of Information and Communications Technology	Frequency standards and standard time
Ministry of Education, Culture, Sports, Science and Technology	1980	RIKEN (The Institute of Physical and Chemical Research)	Preservation of microorganism strains
	1997	Center for Genetic Resource Information, at the National Institute of Genetics	Genetic resource database
	1997	Genetic Strains Research Center, at the National Institute of Genetics	Mice, rice plants, and Escherichia coli
	1997	Cell Resource Center for Biomedical Research, at the Institute of Development, Aging and Cancer, Tohoku University	Cells for medical use

	1997	Barley and Wild Plant Resource Center, at the Research Institute for Bioresources, Okayama University	Barley and wild plants
	1997	Institute of Genetic Resources, at the Faculty of Agriculture, Kyushu University	Silkworms
	1998	Institute of Resource Development and Analysis, at Kumamoto University	Genetically engineered animals
	1999	Drosophila Genetic Resource Center, at Kyoto Institute of Technology	Drosophila
	2000	RIKEN (The Institute of Physical and Chemical Research)	Cultured cell lines and genes of higher animals and plants
	2001	Laboratory Animal Resource Center, at the University of Tsukuba	Genetically engineered animals
	2002	Institutes participating in the national bioresource project (RIKEN (The Institute of Physical and Chemical Research))	Mice, arabidopsis thaliana, ES cells, etc.
Ministry of Health, Labour and Welfare	1922	Medicinal Plant Research Stations, at National Institute of Health Sciences	Seed and cultured cells, etc., of pharmaceutical Plants
	2005	Tsukuba Primate Research Center, National Institute of Biomedical Innovation	Primates
	2005	National Institute of Biomedical Innovation	Genes (bank)
	2006	National Institute of Biomedical Innovation	Cells (bank)
Ministry of Agriculture, Forestry and Fisheries	1985	National Institute of Agrobiological Sciences, etc.	Genetic resources of plants, microorganisms, and animals
	1985	Forestry and Forest Products Research Institute	Genetic resources of forest trees
	1985	Fisheries Research Agency	Genetic resources of fisheries organisms
	1995	National Institute of Agrobiological Sciences, etc.	DNA
	2003	National Institute of Agrobiological Sciences, Rice Genome Resource Center	Rice mutant lines, cDNA, etc.
Ministry of Economy, Trade and Industry	1882	National Institute of Advanced Industrial Science and Technology, Geological Survey of Japan	Geological data (about 100% of all 124 geological maps of the country at a scale of 1:200,000, and about 74% of all 1,274 geological maps at a scale of 1: 50,000)
	1903	National Institute of Advanced Industrial Science and Technology, National Metrology Institute of Japan	National measurement standards (297 physical standards, 296 reference materials)
	1993	National Institute of Technology and Evaluation, Department of Biotechnology	Genetic resources, including effective microorganisms, their DNA information, DNA clones, etc. (about 52,000 microorganisms, about 56,000 DNA clones)
	1996	National Institute of Technology and Evaluation, Chemical Management Center	Comprehensive chemical management information on about 5,400 substances
Ministry of Land, Infrastructure, Transport and Tourism	1970	Port and Airport Research Institute	Information concerning waves and tsunamis observed along Japanese coasts through a nationwide port and ocean wave information network
	1962	Port and Airport Research Institute	Information concerning strong earthquakes in coastal areas
Ministry of the Environment	1983	National Institute for Environmental Studies	Microorganism strains and endangered algae (about 2,200 strains)

3 Creation, Protection and Utilization of Intellectual Properties

In order to make unique and innovative achievements in research and return the benefits to society and people, it is essential to revitalize the cycle of creation, protection and utilization of intellectual property, with proactive and various initiatives.

The Council for Science and Technology Policy (CSTP) adopted in June 2009 the "IP Strategies to Promote S&T Policy 2009 [Literal translation]," incorporating suggestions regarding construction of

IP systems to win the global competition, shift to pro-innovative IP systems, and enhance IP creation capacity as a national resource, and submitted it to concerned ministers.

(1) Establishment of a system for the management of intellectual properties at universities and related institutions

Under the University Intellectual Property Headquarters Development Project implemented for five years from FY 2003, progress has occurred in issues related to intellectual property, such as the unification of the management of intellectual property organizations and the establishment of intellectual property rules, and the number of patent applications and licenses has increased annually at institutions such as universities. Thus, the headquarters has been playing a more important role as an organization supporting industry-academia-government collaborations at universities and similar locations. (Table 2-3-19) (Figure 2-3-20)

In addition, the "Industry-Academia-Government Collaboration Strategic Development Project [literal translation]" was implemented to provide support, prioritizing acquisition of international basic patents for universities and construction of IP activity systems among universities in partnership, while promoting smooth return of university research achievements to society (Figure 2-3-21). In FY 2009, the same project began supporting efforts to create bio-ventures with firm technical and managerial foundations, while arranging to deploy IP strategies for IP portfolio creation. This project involves collaboration of independent administrative R&D corporations and universities, etc., for the purpose of creating promising patents that are expected to be utilized effectively within Japan and overseas.

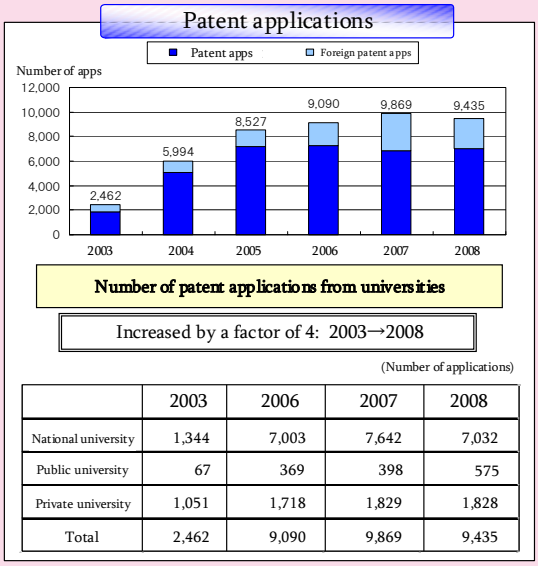
METI provides support for technology-transferring start-up businesses for approved TLOs and foreign patent acquisition in relation to universities' research achievements. It also provides assistance for a broad range of TLOs for strategic utilization and commercialization of research achievements while promoting strong partnerships between, and unification of, organizations.

Table 2 3 19 The Status of Development of System for Management/Utilization of Intellectual Properties (University Intellectual Property Headquarters, etc.) (FY 2008)

	Already developed	To be developed	Not to be developed	No. of respondents
Total number	197 (173)	170 (172)	514 (453)	881 (798)
National univ. etc.	74 (72)	3 (7)	14 (12)	91 (91)
Private univ. etc.	99 (82)	141 (145)	453 (404)	693 (631)
Public univ. etc.	24 (19)	26 (20)	47 (37)	97 (76)

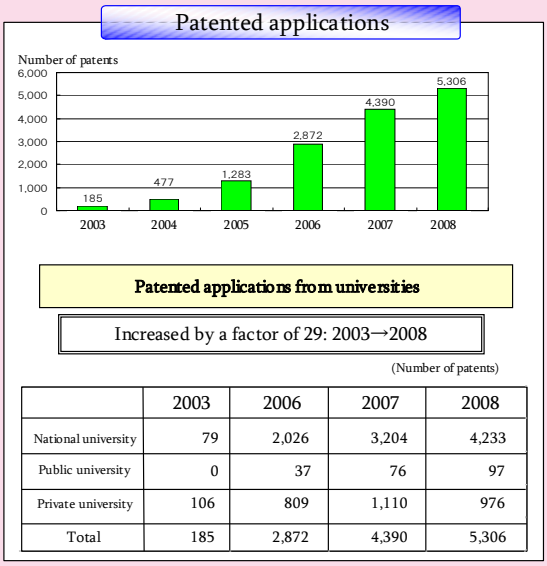
Note: Figures in parentheses refer to the previous year's numbers.
Source: Prepared by MEXT

Figure 2 3 20 Creation, Protection and Utilization of Intellectual Properties by Universities



(Number of applications)

	2003	2006	2007	2008
National university	1,344	7,003	7,642	7,032
Public university	67	369	398	575
Private university	1,051	1,718	1,829	1,828
Total	2,462	9,090	9,869	9,435

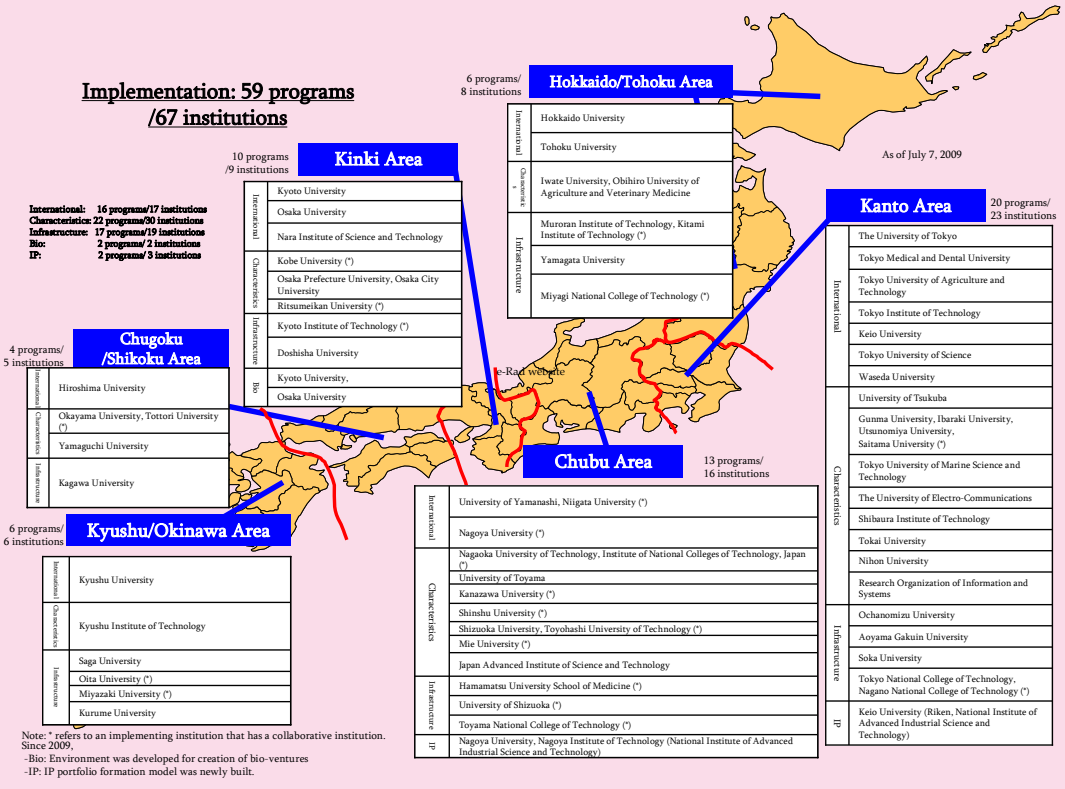


(Number of patents)

	2003	2006	2007	2008
National university	79	2,026	3,204	4,233
Public university	0	37	76	97
Private university	106	809	1,110	976
Total	185	2,872	4,390	5,306

Source: Prepared by MEXT

Figure 2 3 21 Regional Distribution of Funded Institutions under the Industry-Academia-Government Collaboration Strategic Development Project (Strategic Development Program)



Note: * refers to an implementing institution that has a collaborative institution.
Since 2009,
-Bio: Environment was developed for creation of bio-ventures
-IP: IP portfolio formation model was newly built.

(2) Promotion of activities related to intellectual property

In order to enable universities to secure and exercise rights to their excellent intellectual property, MEXT supports applications for foreign patents and etc., through JST's Technology Transfer Support

Center.

In addition, JST, with a view to facilitating excellent research outcomes, manages a database of information related to support the R&D and research outcomes and distributes such information widely through the internet. Specifically, there are databases of information related to public research organizations including universities, researchers, research themes, and research resources (ReaD), and a database that connects research outcomes achieved by public research organizations including universities with relevant patents (J-STORE). There is also a system that enables integrated searches of online information related to technology seeds made public by universities, providing enterprises with direct access to researchers (e-seeds.jp).

In light of advancing economic globalization and open innovation, JPO has been promoting international work sharing as there are calls for international coordination in the patent system and patent examination. As part of this movement, JPO launched the Patent Prosecution Highway (PPH) in cooperation with institutions in 12 countries. In addition, in January 2010, the United States and Japan launched another patent prosecution highway called the PCT-PPH, based on the positive written opinions and international preliminary reports on patentability according to the Patent Cooperation Treaty (PCT).

In addition, JPO extended the trial operation of the Super Accelerated Examination System in October 2009 to meet the needs of applicants with different demands regarding the time to obtain patent protection. It also furthered accelerated examination through the addition of patent applications for green inventions (pertaining to energy-saving, CO_2 reduction, etc.) in November 2009.

MAFF promotes creation of new demands and industries, construction of the MAFF IP network, and training of talented personnel supporting intellectual properties at a working level. In addition, it added new perspectives to the selection process for IP competitive research funding. Furthermore, MAFF provides assistance to MAFF-approved TLOs through the "Research Project for Utilizing Advanced Technologies in Agriculture, Forestry and Fisheries" for practical use regarding research outcomes produced in the test and research IAIs.

JPO sends "University IP Advisors" to universities to develop an IP management system in the future through INPIT (involving 18 universities in FY 2009), while providing matching services for local governments and technology licensing organizations (TLO) by sending patent licensing advisors (92 advisors as of March 2010) for the purpose of authorizing SMEs/venture businesses to utilize transfer-ready patents or patents licensed to be used (open patents). In addition, it provides public information of open patents through the patent license databases, while offering the research tool patent database[1] to promote the use of research tool patents, among others, in the life science field.

Coordination between IP policies and R&D is also required in the projection of R&D policies through patent information use in R&D strategies. JPO monitors technological trends and provides comprehensive analysis regarding "patent application trends," with primary consideration to "R&D trends" and "market trends" in the "four priority fields to be promoted" and "four fields to be

[1] A major database constituting the "integrated database in relation to research tool patents in the life science field [literal translation]," with research tools and other related tangible objects registered.

promoted," and ensures that results of its activities are made public.

Moreover, JPO, through INPIT, operates and manages the Industrial Property Digital Library (IPDL), which allows users to search for necessary patent-related information through the internet. In FY 2009, the IPDL added the Chinese Patent Abstract (CPA) as part of its patent and utility model search service.

The Science Council of Japan (SCJ) is carrying out discussions on IP policies considering the "IP Promotion Plan 2009 [literal translation]" (Intellectual Property Strategy Headquarters decision of June 2009) and requests from academia, while monitoring international trends and researchers' visions.

4 Active Efforts towards Standardization

MIC implements the international competitiveness strengthening-type R&D [literal translation] applications to the public on the condition that the research should contribute to enhanced future international competitiveness. The ministry newly adopted one research project in FY 2009. Furthermore, to enhance user choices and strengthen Japan's international competitiveness in the ICT industry, de jure standardization institutions, including the International Telecommunication Union (ITU), and de facto standardization entities in the private sector, should promote to cooperate on standardization of ICT and other technologies, reducing the environmental burden.

METI actively and strategically promotes international standardization based on the relevant action plan set forth by the Japanese Industrial Standards Committee, promoting innovation through dissemination of R&D achievements and reinforcing Japanese industrial competitiveness. In FY 2009, METI actively participated in the standardization efforts of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) while providing suggestions for establishing excellent Japanese technologies as the world standards.

As part of such efforts, METI implemented the "Internationally Standardized Joint R&D Project to accelerate standardization of R&D achievements in Japan. To that end, it conducted additional testing research for standardization regarding the 41 subjects selected mainly from the four priority fields to be promoted as well as "Energy" and "Manufacturing Technology" (data collection, comparative analysis, examination of re-productivity, etc.).

In May 2009, the National Institute of Advanced Industrial Science and Technology (AIST) and US National Institute of Standards and Technology (NIST) concluded an inclusive research collaboration memorandum to achieve international standards mainly in the fields of nanotechnology, energy, environment, and biotechnology. Based on this memorandum, the two countries started R&D for joint standardization in the four aforementioned areas.

Concerning human resources in standardization, learning materials and training for experts who can lead the international standardization activities are being readied for widespread use in universities (undergraduate and graduate schools) and corporate job training. In addition, AIST hosts the industrial standardization awards to foster talented people who can take the leading roles in international standards institutions.

5 Improvement of the Research Information Infrastructure

The research information infrastructure is regarded as a critical lifeline for research activities. Therefore, improving it in response to the rapid progress in information and communications technology is essential for securing the international competitiveness of Japan's R&D activities. The government is taking concrete actions towards this end, such as the development and upgrading of networks between research institutions and the development and provision of databases.

(1) Provision of networks

Computers and information networks are key systems in our modern society. These were first developed for R&D, and afterwards found a variety of different applications. In order to carry out cutting-edge R&D, performance enhancements are necessary for networks.

Using the Advanced Network Testbed for R&D (JGN2plus[1]), which is operated by NICT, MIC promotes R&D and feasibility studies in the information and communication field for the purpose of improving Japan's technological capacity, industry-academia-government collaboration enhancement, the creation of new business and industry, promotion of regional computerization, the fostering of ICT-personnel, and the creation of a wide-range ripple effect.

MEXT, through the National Institute of Informatics (NII), established and operates the world's fastest-level research network "Science Information Network 3" (SINET3[2]) as the core network for distributing research information required at universities and elsewhere. As of the end of March 2010, 721 institutions were connected to SINET3. In addition, the ministry is further discussing the next academic information network, which is expected to be put into use in FY 2011.

MAFF established and operates the Ministry of Agriculture, Forestry and Fisheries Research Network (MAFFIN), which mutually connects research institutions related to agriculture, forestry, and fisheries. As of the end of March 2010, a total of 93 institutions were connected through MAFFIN. As MAFFIN is linked to the Philippines, this network is now used as a backbone for the distribution of research information among various countries.

(2) Creation and provision of databases

Perusal, copying, lending, and other services for source materials for scientific papers and their like (primary information) are being offered at libraries and a variety of other information service organizations. In addition, constructing databases of excerpts and indexes (secondary information) through computer use facilitates swift, accurate and easy searches of increasingly large amounts of information.

In order to create a database of primary information, the National Diet Library has a database for collected materials covering every publication issued in Japan and in the library's archives.

MEXT creates and provides databases on titles and locations of academic books and magazines available at university libraries and other institutions through NII, with the cooperation of institutions nationwide such as national, public, and private universities. Furthermore, NII creates databases for academic research, and provides a database service.

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[1] JGN2plus provides an R&D environment including a nationwide IP network, light wavelength network, and optical test bed. In addition, it established communication lines to the US and Asia, and promotes R&D through collaboration with domestic and overseas research institutions.

[2] A world-class network which provides Internet access at the maximum speed of 40 Gbps

JST has established a basic information database of Japanese and overseas S&T documents, patents, researchers, etc., and initiated the J-GLOBAL service for providing mutually-related information. JST also improved a database of Japanese-language abstracts, etc. of S&T documents, and provides a document information retrieval service [(JST Document REtrieval system for Academic and Medical fields II (JDreamII)] with a fee through the internet.

MAFF creates and offers information on documents related to the agriculture, forestry, and fisheries, as well as information on the locations of books and materials, such as providing the Japanese Agricultural Sciences Index (JASI) of articles published in academic journals related to the agriculture, forestry, and fisheries fields. Furthermore, the ministry maintains and provides databases including an agricultural information database that is a full-text information database integrating digitized research reports in the agricultural, forestry, and fisheries sector written by independent administrative institutions engaged in experiments and research, national and public research organizations, and universities; a database of Japanese and foreign agricultural research documents; a database of satellite images; and a database of themes of research conducted by research organizations.

Table 2-3-22 shows the outlines of major research information infrastructure related measures implemented in FY 2009.

Table 2 3 22 Main Measures for the Research Information Infrastructure (FY 2009)

Ministry/ Agency	Organization	Subject
Diet	National Diet Library	- Acquisition and development funds for science and technology-related resources at the National Diet Library
Cabinet Office		- Strengthening the information collection function of R&D data funded through the government budget
Ministry of Internal Affairs and Communications	National Institute of Information and Communications Technology	- Establishment of an advanced network testbed for research and development (JGN2plus)
Ministry of Education, Culture, Sports, Science and Technology	Japan Science and Technology Agency	- Establishment and Utilization Promotion of Basic Science and Technology Information (J-GLOBAL, etc.) - Development of engineering ability and operation of "failure knowledge database" ("Web Learning Plaza" etc.) - Operation of Institute for Bioinformatics Research and Development (BIRD, GBIF etc.) - Computerization and Internationalization of Science and Technology Papers (J-STAGE, etc.) - Providing document information on S&T (JDream II, etc.)
	Japan Agency for Marine-Earth Science and Technology	- Information infrastructure operating costs
	National Institute of Informatics	- Development of Scientific Information Network ("SINET 3")
Ministry of Health, Labour and Welfare	National Institute of Infectious Diseases	- Budget for the Infectious Disease Surveillance Center - Research project expenses for collecting, analyzing, and assessing safety data on biological drugs
Ministry of Agriculture, Forestry and Fisheries	Agriculture, Forestry and Fisheries Research Council	- Agriculture, Forestry and Fisheries Research Information Technology Center (JASI, MAFFIN, etc.)
Japan Patent Office	National Center for Industrial Property Information and Training	- Operation of Industrial Property Digital Library (IPDL)

Ministry of Land, Infrastructure, Transport and Tourism	Hydrographic and Oceanographic Department, Japan Coast Guard	- Promotion of collection, management and provision of hydrographic and oceanographic data and information - Development of Geographic Information System (GIS) database for the coastal area
Ministry of the Environment		- Improvement of Promotional Budget for the Japan Integrated Biodiversity Information System (J-IBIS)
Cabinet Office Ministry of Education, Culture, Sports, Science and Technology Japan Patent Office	 Japan Science and Technology Agency National Center for Industrial Property Information and Training	- Improvement of a comprehensive search system for patent and document information
Cabinet Office Japan Patent Office Relevant Ministry/ Agency	National Center for Industrial Property Information and Training	- Development of Research Tool Database (RTDB)

6 Promotion of the Activities of Academic Societies

Academic societies are voluntary organizations made up of researchers of organization such as universities. They play an important role in terms of research evaluation, and also information exchange and personal interaction, beyond the framework of individual research organizations. Major contributions are made to the advancement of academic research through activities of academic societies, such as the dissemination of the latest exceptional research results via academic research meetings, lectures, and symposia, and through the publication of academic journals.

To support these types of activities by academic societies, MEXT supplies the "Grant-in-Aid for Publication of Scientific Research Results," which is one of the categories of Grants-in-Aid for Scientific Research, in order to support activities such as international conferences held in Japan with the participation of overseas researchers, symposia that provide youths and adults with up-to-date information on research trends, and the publication of academic journals. The SCJ continuously conducts deliberations on measures for promoting self-improvement of academic societies, and sponsored the "Symposium for Conforming to the New Act on Incorporated/Foundations – Towards Establishment of Public Interests of Academic Societies" [literal translation] - with the participation of academic societies and researchers, among others.

Enhancement of international competitiveness of academic societies

The JST, with a view to enhancing Japan's capability to disseminate information concerning research results, has supported globalization efforts related to academic journals and research papers by establishing the Japan Science and Technology Information Aggregator, Electronic (J-STAGE), which is a comprehensive system for transmission and distribution of S&T information that computerizes processes such as contributions of scientific papers to academic journals and examination/screening and disclosure thereof.

7 Promotion of Research and Development at Public Research Institutions

The Basic Plan states that independent administrative institutions should work on self-reliant and voluntary operations and reform, including flexible and resilient operation of research funds, as well as fair and highly transparent competitive personnel and salary systems through their own management efforts under the discretion of the director. The R&D-Capacity Strengthening Act [literal translation] advocates the strengthening of nationwide R&D capacity of public research institutes and universities, and the private sector, through R&D system reform spanning resource distribution through research outcomes stated by the government. It also specifies considerations for the handling of corporate personnel expenses and income while defining R&D corporations.

Section 4 Strategic Promotion of International Activities

With the advent of an age of fierce global competition over "knowledge" of technology and human resources that's come with the worldwide mobilization of personnel, international S&T activities are becoming more important than ever.

For its part, Japan must promote international activities in the strategic S&T fields by contributing to the international community through efforts to tackle global issues and by enhancing collaboration with other Asian countries.

From the viewpoint above, the government, in accordance with the Science and Technology Basic Plan and the "Toward the Reinforcement of Science and Technology Diplomacy" (compiled by CSTP in May 2008), clarified its strategic vision for international activities and is promoting collaboration with other Asian countries, fostering the procurement of world-class researchers, and making efforts toward international standardization (See Part 2, Chapter 3, Section 3, 4) while striving to cultivate an environment that enhances international activities that support these efforts.

1 Improvement of the Environment for the Enhancement of S&T Diplomacy and International Activity, and the Promotion of Researcher Exchanges

(1) Enhancement of S&T diplomacy

With further advancements in globalization in recent years, it is important to improve Japan's global presence through the promotion of S&T and international cooperation, because global issues that are difficult to solve for a single country have been exposed and international intellectual competition has become increasingly fierce. Under these circumstances, it is important for the government to focus on S&T diplomacy, which improves S&T cooperation through diplomacy and generates synergetic effects. MEXT is strategically promoting measures for (1) the enhancement of S&T cooperation with developing countries to solve global issues, (2) the enhancement of S&T cooperation utilizing Japan's advanced S&T, and (3) the enhancement of infrastructure for the promotion of S&T diplomacy. In particular, MEXT is implementing the "Science and Technology Research Partnership for Sustainable Development" for the promotion of S&T in cooperation with developing Asian and African countries in order to solve global issues related to the fields such as environment/energy, natural disaster prevention, infectious diseases control, through a combination

of Japan's excellent S&T and ODA. Thus, the ministry has promoted joint research programs between Japan and developing countries, through cooperation with MOFA, ODA support institutes, and other organizations.

(2) Promotion of international research activities

It is necessary to attract high-talented personnel and cutting-edge information to Japan and to promote the internationalization of S&T activities in order to respond to challenges facing human beings.

Hence, with Japan's ODA and through combination of excellent S&T of "the Science and Technology Research Partnership for Sustainable Development" (by JST/JICA),"the Dispatch of Science and Technology Researchers" (by JSPS/JICA), "Asia-Africa Strategic Science and Technology Cooperation Promoting Program"(funded by the Special Coordination Funds for Promoting Science and Technology) and the "Strategic International Cooperative Program" (by JST), mainly to promote the activities of international cooperation and International conferences.

Furthermore, JSPS supports exchange between research centers with scientifically advanced countries (in Europe and North America) as well as Asian and African countries, and tries to establish scientific research networks and foster young researchers through the JSPS "Core-to-Core Program," the "Asian CORE Program," the "AA Science Platform Program," and the "A3 Foresight Program: Japan-China-Korea," in order to contribute to the enhancement of international competitiveness of Japan's scientific research and foster researchers via measures for the global development of scientific research activities. In addition, it implemented the "Strategic Fund for Establishing International Headquarters in Universities" until FY 2009, supporting selected universities to create interdisciplinary, cross-sectional bodies like the "International Strategy Headquarters" in order to coordinate the basis for promoting strategies for international activities, while also releasing a final report on these projects.

(3) Promotion of researcher exchanges

The number of overseas researchers Japan receives as well as the number of Japanese researchers sent abroad have both stayed almost the same at national, public, and private universities, and experimental research institutions in Japan (Figure 2-3-23). Figure 2-3-24 shows region-classified researcher exchange status, in which the rate of researcher exchange with Asia, Europe, and North America is greater.

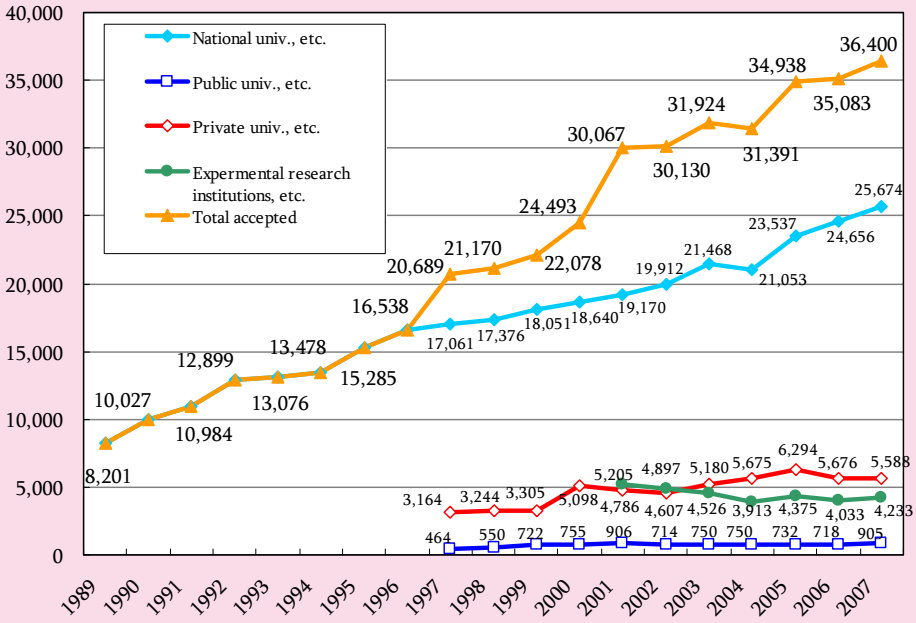
There are a variety of opportunities for researchers to exchange opinions with each other in organizational events of universities or research institutions and also in more personal settings. For further development of S&T and scientific research, it is essential for Japan to attract many excellent researchers in and outside Japan and that Japanese researchers compete at cutting-edge levels on the world stage.

For this purpose, JSPS are implementing various researcher invitation programs, such as the "Postdoctoral Fellowship for Foreign Researchers" and the "Invitation Fellowship Programs for Research in Japan," for various career stages in order to support researcher exchange. Thus, JSPS provides excellent foreign researchers with opportunities to engage in research activities at Japanese

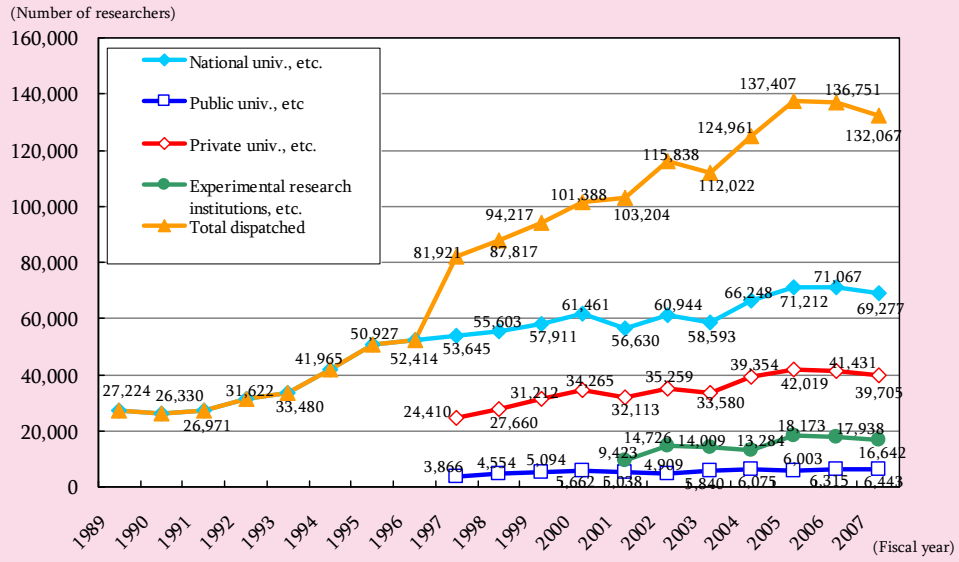
universities. In addition, to enhance opportunities of training overseas for excellent Japanese researchers, JSPS sends young Japanese researchers abroad through the "Postdoctoral Fellowships for Research Abroad," the "Lindau Nobel Laureate Meeting," and the "JSPS International Training Program (ITP)" so as to enable young researchers to engage in research at outstanding research institutions overseas and expand opportunities for them to correspond directly with foreign researchers. Furthermore, JSPS is holding the "HOPE Meeting" with the intention of serving as human capacity building and network creation in the Asia/Pacific region and offering an opportunity for graduate students and distinguished researchers to interact with each other.

Figure 2 3 23 Trends in Researcher Exchanges at Universities and Experimental Research Institutions, etc.

(1) Number of researchers received by Japanese organizations

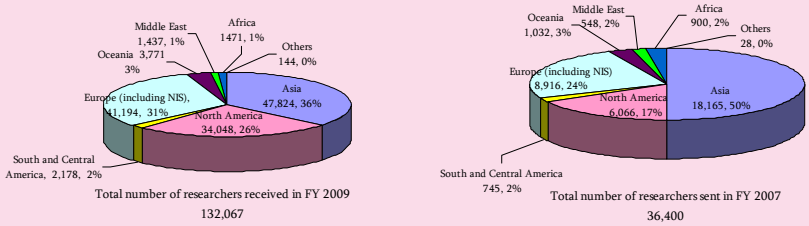


(2) Number of researchers sent by Japanese organizations



Note: Public and private universities have been participating in this survey since 1997, national colleges of technology and national experimental research institutions since 2000, and IAIs since 2001.
Source: Prepared by MEXT

Figure 2 3 24 Researcher Exchange by Region (sent, received)



Source: Prepared by MEXT

(4) Approaches to international projects

1) International Thermonuclear Experiment Reactor (ITER)

The International Thermonuclear Experiment Reactor (ITER) project is a joint international project that aims to demonstrate S&T feasibility of fusion energy through the construction and operation of a nuclear fusion experimental reactor. Currently, seven countries and region are participating: Japan, the EU, US, Russia, China, the Republic of Korea, and India. [Refer to Part 2, Chapter 2, 5 (1)]

2) 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 through the cooperation of five parties (Japan, the US, Europe, Canada and Russia). As part of this project, Japan develops, operates and utilizes the Japanese Experiment Module (JEM), also known as "KIBO," and is developing an unmanned cargo transfer spacecraft H-II Transfer Vehicle (HTV). [Refer to Part 2, Chapter 2, Section 2, 8 (2).]

3) Integrated Ocean Drilling Program (IODP)

The Integrated Ocean Drilling Program (IODP), launched in 2003, is an international program that is led by Japan and the US with 21 participating countries total. The Program aims to help researchers better understand earth's environmental changes, the internal structure of the earth's crust, and the deep biosphere in the earth's crust, by using multiple drilling platforms, including Japan's Deep-sea Drilling Vessel "CHIKYU," which is capable of drilling from the deep ocean floor to 7000m below the bottom of the ocean, partners with a non-riser drill-ship supplied and operated by the US as its main drill-ship, and is armed with Europe's "mission-specific" drilling technologies. [Refer to Part 2, Chapter 2, Section 2, 8 (2).]

4) Large Hadron Collider (LHC)

The Large Hadron Collider (LHC) project is being implemented at the European Organization for Nuclear Research (CERN) as a plant to search for and find unknown particles within the enormous

energy area produced when protons collide in an enormous circular accelerator, and, by doing so, help scientists explore and better understand the internal structure of substances. The construction of the accelerator was completed in 2008 through international cooperation among countries including the CERN member countries, Japan and the US. At present, world-leading experimental research in the field of energy is being conducted.

About 200 Japanese researchers are participating in the project, mainly in the ATLAS experiment to search for "Higgs bosons" whose discovery is essential to understand why the matter in the universe gains the mass.

2 Cooperation with Countries Abroad

(1) Cooperation with Asian countries

1) Cooperation with China and the Republic of Korea

The Committee on Scientific and Technological Cooperation are held almost every other year between Japan and China, and between Japan and Republic of Korea. They are aimed to promote bilateral cooperation in science and technology and to enhance mutual capabilities in science and technology by sharing each countries' information relating to science and technology policy and by discussing on current situation and potential of future cooperation of each other. In October 2009, the 13th Japan-Korea Committee on Scientific and Technological Cooperation was held, and, in February 2010, the 13th Japan-China Committee on Scientific and Technological Cooperation was held. In addition, the Second Trilateral Japan-China-Korea Ministerial Meeting on Science and Technology Cooperation was held in Tokyo in May 2009, with the Minister of Education, Culture, Sports, Science and Technology in Japan serving as the chair for the meeting. As a result of the discussions held at the meeting, the "Japanese-Chinese-Korean Cooperative Joint Research Collaboration Program(JRGP)" was organized to solve such important global issues as disaster prevention, climate change, water cycle, energy saving, CO_2 emission, and other issues of concern in Northeast Asia region.

In the Japan-China Ministerial Meeting on Science and Technology Cooperation, a memorandum was signed to reinforce S&T collaboration in the field of earthquake and disaster prevention. And, in the 13th Japan-China Committee on Scientific and Technological Cooperation held in February 2010, Japan made a suggestion on cooperation in the field of earthquake disaster prevention in relation to the Strategic International Cooperative Program.

In the Bilateral Summit Meeting between Japan and Korea in January 2009, both countries reached a consensus in enhancing collaboration through the "Japan-Korea Committee on Scientific and Technological Cooperation," and in October, a meeting of the committee was held. In March 2009, in the meeting between Japanese Minister of State for Science and Technology Policy and Korean Minister of Education, Science and Technology had agreed on continuing policy dialogues between Diet members from CSTP of Japan and the members of the National Science and Technology Council (NSTC) of Korea, and the dialogue was held in June 2009 in Korea.

In addition, the 2nd Japan-Vietnam Joint Committee on Cooperation in Science and Technology was also held in June 2009.

2) Cooperation with Association of South-East Asian Nations (ASEAN)

As part of the activities of the ASEAN Committee on Science and Technology (COST), Japan, China, the Republic of Korea and ASEAN countries, called ASEAN COST+3, are collaborating on this project, of which MEXT is taking leadership at the Japanese side. In November 2009, the Fourth Meeting of ASEAN COST+3 was held in Kunming, China, and opinions were exchanged regarding the joint projects among ASEAN+3 countries. In addition, the First ASEAN-Japan Cooperation Committee on Science and Technology was held in Bali, Indonesia in May 2009 to reinforce the collaborative S&T relationships between ASEAN and Japan.

3) Cooperation with Asia-Pacific Economic Cooperation (APEC)

With regard to the S&T field, information exchange on S&T projects implementation and policies for each country are made at the APEC Industrial Science and Technology Working Group (ISTWG). MEXT participates in projects, concerned with S&T human capacity building, etc., under the framework of the ISTWG.

4) Project based cooperation

From FY 1993, Japan has hosted the Asia-Pacific Regional Space Agency Forum (APRSAF) for the purpose of promoting cooperation on the development and utilization of space technology and has been conducting a variety of cooperative projects from the forum. [Refer to Part 2, Chapter 2, Section 2, 8 (1)]

In addition, research is being promoted in domestic research centers as well as in overseas centers located primarily in Asian countries (Thailand, Vietnam, China, Indonesia, India, etc.) where emerging and re-emerging infections are predicted to occur, while engaging in accumulation of knowledge and human resource development in this regard.

(2) Cooperation with European countries and the US

Cooperative activities—such as holding joint committee meetings based on bilateral agreements on cooperation in science and technology with European countries and North America—are actively promoted in the field of advanced research areas in order to resolve common challenges facing among these countries, including those in the life sciences, nanotechnology and materials, environmental sciences, nuclear energy, and space development. Regarding US, in accordance with the Agreement between the government of Japan and the government of the United States of America on Cooperation in Research and Development in Science and Technology, the 10th meeting of the Joint High Level Committee on Science and Technology was held in May 2006. From the Japan side, the Minister of State for Science and Technology Policy and the Minister of MEXT attended. In addition, Japan held the 12th meeting of the Japan-US Joint Working Level Committee on Cooperation in Science and Technology in Tokyo in July 2007. In April 2009, it held the Japan-Sweden Joint Committee on Science and Technology Cooperation, and in November, Japan-Germany Committee and Japan-Norway Committee, and in February 2010, the Intergovernmental Consultation on Cooperation in the field of Science and Technology between Japan and the Republic of Hungary were held. In March, a Japan-Russia Committee on cooperation

in Science and Technology was also held.

In addition, there are also joint committees and consultations on S&T with the UK, France, Italy, Finland, Netherlands, Switzerland, Poland, the Czech Republic, etc. based on bilateral agreements on cooperation in science and technology. (Japan has already concluded international agreements, including bilateral agreements on cooperation in science and technology, with 51 nations around the world.) In November 2009, the Agreement between the Government of Japan and European Community[1] on cooperation in Science and Technology was signed.

(3) Cooperation with African countries

At the Japan-Africa Science and Technology Ministers' Meeting, held in October 2008, Japan and African countries reaffirmed that S&T was vital to solve a variety of issues facing African countries and decided to make efforts toward deepening mutual understanding in the S&T field and to expand S&T cooperation.

(4) Cooperation with other countries

In October 2009, the agreement on cooperation in Science and Technology was concluded with New Zealand. While collaborations are also underway with a number of countries including Australia, Israel, South Africa, and Brazil, on the implementation of joint research, communication among researchers, and the exchange of information based on S&T cooperation agreements. In May 2009, a Japan-Brazil Joint Committee on cooperation in Science and Technology was held.

In addition, opinions are currently being exchanged considering the future possibilities for collaboration with other countries with which Japan has not concluded agreements on cooperation in Science and Technology yet.

3 Systematic Efforts for International Activities

Science and technology create intellectual property that can be shared by mankind and contribute to resolving various global-scale issues. Conducting S&T activities throughout the world is important for Japan to play a proactive role in the international community and to contribute to further development of the country's S&T. Therefore, the government promotes international cooperation within multilateral frameworks, such as OECD, as well as on a bilateral basis in light of the needs of the partner countries and the level of S&T.

(1) The Group of Eight Summit

The L'Aquila Summit of July 2009 discussed issues such as "Environment and Climate Change," "Development and Africa," "World Economy," and "Political Issues." With regard to Environment and Climate Change, the goal of achieving at least 50% reduction of global emission of greenhouse gases throughout the world by 2050 was manifested to be shared by all attending countries, and at the same time, as a part of the goal, an objective for all developed countries was supported by participating countries to reduce the emission of greenhouse gases by 80% or more by 2050 compared to the levels of 1990 or more recently few years.

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[1] European Community: In December 2009, the Treaty of Lisbon entered into force and the EC disappeared, integrating into the EU.

In June 2008, prior to the Hokkaido Toyako summit, the First S&T G8 Minister Meeting was held in Okinawa with all of the ministers in charge of S&T from G8 nations in participation. From Japan, the Minister of State for Science and Technology Policy attended. At the meeting, the attendees acknowledged the importance of new and innovative technologies in order to achieve a low-carbon society and reached the consensus of opinion that each country should enhance R&D activities in this field.

(2) United Nations (UN)

The United Nations takes measures regarding disaster prevention and earth observation in the S&T field. Japan particularly participates and cooperates in a variety of science projects and activities of the United Nations Educational, Scientific, and Cultural Organization (UNESCO), a specialized agency of UN.

UNESCO is conducting activities to resolve global-scale issues and to establish international rules through the International Hydrological Program (IHP), the Intergovernmental Oceanographic Commission (IOC), and the International Bioethics Committee (IBC), etc. Japan is promoting UNESCO activities by implementing human resources development projects of S&T fields in the Asia-Pacific region and by dispatching experts to commissions to participate in discussions via the contribution of the trust funds to UNESCO.

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

OECD works through its Council at Ministerial Level; Committee for Scientific and Technological Policy (CSTP); Committee for Information, Computer and Communications Policy (ICCP); Committee on Industry, Innovation and Entrepreneurship (CIIE); Committee for Agriculture (AGR); Environment Policy Committee (EPOC); Nuclear Energy Agency (NEA); International Energy Agency (IEA); and others to engage in S&T activities, including the exchange of opinions, experiences, information and personnel between participating countries, the preparation of statistical information, and the implementation of joint research.

In 2007, the Council at Ministerial Level decided to establish the OECD Innovation Strategy and is promoting efforts across different organizations.

In addition, under the CSTP there are six subgroups: Global Science Forum (GSF); Research Institutions and Human Resources (RIHR); Working Party on Innovation and Technology Policy (TIP); Working Party on Biotechnology (WPB); Working Party on Nanotechnology (WPN); and Working Party of National Experts on Science and Technology Indicators (NESTI). Representative activities of these subgroups under the leadership of Japan are as follows:

1) Global Science Forum (GSF)

GSF was established as a forum for S&T policy makers to exchange opinions and make recommendations concerning important issues in the S&T sector that require international cooperation and concerted action. Discussions are being held on subjects that are of concern throughout the world, including investigations related to international S&T collaboration with developing countries on global issues and the formulation of road maps of large research

infrastructures.

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

TIP is discussing policies related to innovation and technologies to enhance productivity, to promote creation and utilization of knowledge, to cultivate sustainable growth, and to promote creation of employment for highly skilled technicians.

In 2009, it conducted discussions and case studies on OECD innovation strategies, demand-driven innovation, green growth, compatibility of innovation with globalization, etc.

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

NESTI was established mainly to conduct adjustments and provide advice concerning S&T-related statistics provided to CSTP. It sponsors discussions and examination regarding frameworks for international comparison, investigation methods, and the development of S&T indexes such as those concerning research expenses and human resources. Japan delegates experts to the NESTI secretariat who are working on development of new indicators. In FY 2009, NESTI conducted discussions and created reports relating to outcomes from research in order to write a final report on innovation strategies.

(4) Human Frontier Science Program (HFSP)

HFSP is an international joint research fund, which was proposed by Japan at the Venice Summit in June 1987 with the aim of supporting basic international joint research to resolve complex mechanism of living organization. HFSP is now supported by a total of 14 countries, a group comprised of Japan, US, France, Germany, EU, UK, Switzerland, Canada, Italy, Australia, the Republic of Korea, New Zealand, India, and Norway. The Program provides research grants as research expenses to international joint research teams and fellowships as travel, living and other expenses to young researchers conducting research abroad. In addition, the program organizes HFSP awardees' meetings. With a total of 16 HFSP research grant awardees having been received the Nobel Prize as of FY 2009, the program has been highly acclaimed worldwide. Japan has been an active supporter of the program since its establishment.

(5) International Science and Technology Center (ISTC)

In March 1994, four countries and regions, Japan, the US, the EU, and Russia, established ISTC in order to promote the peaceful utilization of researchers who had been engaged in the development of weapons of mass destruction in former Soviet Union countries and to support their move to market economies. As of January 2010, the total amount of the support funds earmarked for approved projects totals about 836.5 million US dollars, and the number of participating researchers is more than 73 thousand. 15 years has been passed since its establishment and discussions on the role and significance of ISTC are being held to determine the necessity of its reformation.

(6) International activities conducted by the Science Council of Japan (SCJ)

On behalf of Japan, SCJ participates in 47 international scientific organizations, including the

International Council for Science (ICSU[1]) and the Inter Academy Panel on International Issues (IAP[2]). SCJ strives for cooperation with various countries by actively taking part in international academic cooperative projects.

Science councils of each country are involved in a joint statement that provides opinions from the scientific viewpoint relevant to annual G8 Summit's agenda. In June 2009, SCJ announced the joint statement "Climate change and the transformation of energy technologies for a low carbon future" in cooperation with science councils of G8 nations and other countries concerned (China, India, Brazil, South Africa, and Mexico) prior to G8 Summit in L'Aquila. In Japan, the president of SCJ delivered the statement to the Prime Minister. In 2010, G8 Academies Meeting will be held during April 6-8, 2010 in Ottawa, Canada. SCJ also holds international symposia every year to solve global issues with researchers from a wide range of fields from all over the world. In September 2009, the "International Conference on Science and Technology for Sustainability 2009" was held at the Auditorium of SCJ, with the theme "Global Food Security and Sustainability."

In addition, in June 2009 the 9th Conference of the Science Council of Asia (SCA), which is comprised of science councils of 11 Asian countries to promote partnership and collaboration between Asian countries in the field of academic research, was held in Singapore with the main theme of "Grooming Scientific Talent in Asia". Many members of SCJ participated.

(7) Other systematic efforts for international activities

The Cabinet Office held the Science and Technology Ministers' Roundtable Meeting in October 2009 with the participation of representatives from 22 countries. They discussed "The Role of Science and Technology under the Current Economic Situations" while actively conducting bilateral policy dialogues.

[1] Established in 1931 as a non-governmental and non-profitable international academic institution aiming for promotion of international activities in science and applied fields thereof for the benefit of mankind.
[2] Established in 1995 as a forum of the world science academy. SCJ assumed the position of the executive committee member from 2006 to 2009.