Chapter 3 Science and Technology System Reform

1 Fostering, Securing, and Activating Human Resources

1 Establishment of 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 for 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 who will lead future research activities. To this end, research institutes are expected to give opportunities for participation in voluntary activities and for universities to secure assistant professors and establish opportunities for them to assume active roles, under competition based on fair and transparent personnel evaluations.

In order to foster next-generation researchers in the field of information and communications technologies, the Ministry of Internal Affairs and Communications (MIC) implements the R&D through 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 themes proposed by young researchers.

MEXT implements since FY 2006 the Promotion of Environmental Improvement to Enhance Young Researchers' Independence, and Make Use of Their Abilities under the Special Coordination Funds for Promoting Science and Technology (SCF) so as to enable young researchers to play an active role. Under this program, MEXT currently provides support to 21 organizations, assisting the introduction of the tenure track system (which enables young researchers to gain experiences as independent researchers by obtaining a fixed-term position at universities, etc. and then get a more stable position after undergoing rigorous screening of their achievements) and helping efforts to improve the research environment by providing start-up funds necessary for independent research activities and securing research spaces.

MEXT also enhances its efforts to foster young researchers who have flexible mind-sets and a spirit of challenge through the provision of Grants-in-Aid for Scientific Research. In FY 2007, MEXT earmarked around 29.2 billion yen for research grants as part of its effort to expand competitive funds for young researchers and established a new grant program through the Japan Society for the Promotion of Science (JSPS) entitled Grant-in-Aid for Young Scientists (S), which is intended for researchers under 42 years of age so that they can promote research selectively by leading their teams based on past achievements.

In addition, the ministry provides through JSPS excellent young researchers with opportunities to devote themselves to research activities while independently choosing the topics without any restriction by the Research Fellowships for Young Scientists and also provides them with opportunities to gain research experiences abroad and improve themselves by competing with foreign researchers by the Postdoctoral Fellowship for Research Abroad so as to foster and secure researchers capable of

playing an active role across national borders.

The Ministry of Health, Labour and Welfare (MHLW) sets up the research for fostering young researchers who will conduct the ministry-related research activities in the future under each project funded by the Health and Labour Sciences Research Grants.

The Ministry of Agriculture, Forestry and Fisheries (MAFF) has an award as part of the Human Resources Development Program in Agriculture, Forestry and Fisheries Research [literal translation] to commend researchers aged less than 40 years old who have made excellent achievements so as to enhance young researchers' motivation.

Meanwhile, the National Agriculture and Food Research Organization implements a research promotion program aimed at supporting innovative research by young researchers. The National Institute of Agrobiological Sciences works on independence and enhancement of young researchers' research motivation by establishing a junior researcher system, which is intended for doctoral students of graduate schools to allow them to proceed to higher education while working for research institutions since FY 2007.

The Ministry of Economy, Trade and Industry (METI) provides, through the New Energy and Industrial Technology Development Organization, subsidies for young researchers' R&D activities aiming at industrial applications.

The Ministry of the Environment (ENV) supports young researchers to help improve their research by setting up a special reserve to the ministry's competitive funds.

(2) Improvement in mobility of human resources and restraint of proportion of alumni members

In order to train researchers with broad perspectives in creativity 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 that researchers in versatile sectors can gain experiences at various research sites. The Third Science and Technology Basic Plan calls for universities and public research organizations to make continued efforts to ensure widespread adoption of a fixed-term system, which is proceeding at the organizations concerned. (Tables 2-3-1 and 2-3-2). Furthermore, universities should pay sufficient attention to the proportion of alumni members of their faculty members, and it is expected that universities with an excessively high proportion of alumni members endeavor to lower the proportion.

Table 2-3-1 Status of Introduction of Fixed-term System at Research Organizations, Etc

	Number of organizations	Number of full-time researchers on fixed-term	Ratio
National experiment and research organizations	19	129	5.67%
Designated independent administrative institution-type/authorized corporation-type research organizations	3	33	21.15%
Non-designated independent administrative agency-type research organizations	30	3,058	22.20%

Source: MEXT survey (July 2007)

Table 2-3-2 Status of Introduction of Fixed-term Faculty Members

	Number of universities, etc.	Number of fixed-term members	Ratio
National universities	81	8,816	15%
Public universities	44	1,837	16%
Private universities	380	11,929	13%
Inter-university research organizations	14	199	15%

Source: MEXT survey (October 2006)

(3) Promotion of activities of female researchers

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

The Third Basic Plan aims to call for a variety of initiatives to promote activities of female researchers. In response to this, MEXT supports through the JSPS's Research Fellowships for Young Scientists establishing the environment which allows excellent female researchers who took a break in their research activities due to childbirth or child care to return to their research activities.

Moreover, since FY 2006, MEXT implements a program to publicly invite proposals for initiatives that will serve as a model project to enable female researchers to simultaneously perform the duties of researchers and mothers. Selected practices are funded by SCF at 20 organizations.

The ministry implements a project to encourage female students of lower/upper secondary schools to follow the science career paths by creating opportunities for them to mingle with female researchers and by providing experiment courses and catering lessons as a way to foster their interest in S&T. Also implemented is a project to support women's choice of S&E career paths, which examines practical initiatives to encourage female students to choose S&E courses and diffuse its findings through training of social education-related parties, etc.

Under the slogan "Challenge Champaign –Choice of S&E Courses for Female Students- [literal translation]," the Cabinet Office provides female students with information related to S&E fields and to raise their awareness about such fields.

The National Institute of Advanced Industrial Science and Technology (AIST)examined measures for supporting simultaneous pursuit of nursing and business work, including holding of gender-equal symposiums, recruitment seminars intended for female students, at its Gender Equality Office, and it also executed surveys and study meetings concerning nursing care as a means for improving the work environment.

(4) Promotion of activities of foreign researchers

In the midst of promotion of the active participation of a diverse range of personnel, it is important to prepare an environment that allows talented researchers from other countries to live and work in Japan, from the perspective of not only securing personnel, but improving the level and internationalization of research activity in Japan. However, the percentage of foreign nationals in general among highly skilled workers is extremely low in Japan relative to international levels. Among researchers, there are only about 11,000 foreign researchers [fn.1], accounting for only 1.43% of the total

fn. 1 Statistical figure for persons whose residence status falls under the category of "professor" or "research" in the Ministry of Justice's Statistics on Foreign Residents [translated from Japanese].

number of researchers in Japan.

The acquisition of talented researchers is currently the focus of fierce international competition among the US, China, and European countries. In order to attract excellent foreign researchers, Japanese government has reformed its immigration control system so as to expand the special measure of allowing foreign researchers to stay in Japan for up to five from the original three years, which was previously applied only to designated structural reform district where the programs for the promotion of acceptance of foreign researchers were conducted, to the whole of the country. MEXT implements through JSPS measures such as the Strategic Fund for Establishing International Headquarters in Universities for supporting the globalization of the research environment in Japan and the Postdoctoral Fellowship for Foreign Researchers for inviting about 1,900 excellent foreign researchers per year to this country.

(5) Appointment of ability of elderly researchers

AIST enforced the reemployment system to secure employment of persons up to 65 years of age in responding to the Revised Act concerning Stabilization of Employment of Older Persons in FY 2007 and is working positively on appointment of elderly researchers.

2 Strengthening Universities' Human Resource Development Function

(1) Human resource development at universities

Universities, which are essential institutions for the creation and utilization of knowledge, have a large role to play in fostering human resources endowed with the creativity, broad perspective and flexible thinking necessary for exercising leadership across national borders. Universities are actively working to improve education, indeed. For example, the number of universities introducing a major-minor system that enables students to study a broad range of fields systematically has been increasing over the past years, with a total of 137 universities adopting this system as of FY 2006. Furthermore, in order to improve and enhance the education environment, 628 universities executed organizational efforts for improving the educational strengths of teachers (the faculty development) in FY 2006, and 285 universities executed performance evaluations of teachers in terms of education in the same year.

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

(2) Drastic enhancement of graduate school education

In a modern society in which the specialization and segmentation of knowledge is progressing and international competition is intensifying, there is a pressing need to develop human resources equipped with both deep expertise and broad versatility that can adapt to new academic fields and rapid technology innovations. With regard to graduate schools, which should play the central role in the development of such human resources, improvement has steadily been made in quantitative terms, with the number of graduate school students rising by about 80,000 over the 10-year period between FYs 1998 and 2007. From now on, 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, to promote substantiation of graduate school education (enhancement of systematic development of education) in such a direction that systematic education programs that lead to conferral of degrees should be created and executed and that management and transparency of the processes should be strictly executed. MEXT implemented the Support Program for Improving Graduate School Education from FY 2007 and supports excellent organizational and systematic educational projects in graduate schools for developing high-level human resources who can take an active part in a variety of different fields of

society including industry. In FY 2007, MEXT adopted 126 programs from 61 universities.

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

In accordance with the Central Council for Education's recommendation paper entitled Graduate School Education in the New Age (September 5, 2005) and the Science and Technology Basic Plan (Cabinet decision: March 28, 2006), MEXT formulated the Platform for the Promotion of Graduate School Education which features systematic and intensive efforts toward enhancing graduate schools over a five-year period on March 30, 2006. This sets the direction of reform toward 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.

(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 Third Science and Technology 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. MEXT also implements scholarship projects of the Japan Student Services Organization (JASSO) not to deprive students having the will and ability to learn of opportunities for learning.

3 Development of Human Resources that Meet Social Needs

(1) Human resource development conducted 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, human resources 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 human resource development and coordinate their activities.

Therefore, in FY 2007, MEXT and METI established the Industry-Academia Human Resources Development Partnership [literal translation] to provide opportunities for dialogue and activities in human resource development at universities and industries. Furthermore, in cooperation with METI and MEXT, the Career Development Program for Foreign Students from Asia, which attracts excellent foreign students from Asian countries to Japan and promotes their activities in Japanese companies, was implemented in FY 2007.

MEXT promotes human resources development through industry-academia collaboration at universities, by developing the manufacturing engineers development and support project [literal translation], which supports development 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 human resources. METI executed examinations on evaluation and authorization of programs toward assurance of quality in such programs that aim to develop personnel involved in the management of technology (MOT personnel), to enhance dissemination and settlement of MOT personnel, and to foster such personnel.

In 2007, the baby boomers reached retirement age, and the development of technical human resources supporting SMEs is important for maintaining and strengthening the competitiveness of Japan's industries. To this end, measures were implemented to support human resource development,

including development of young engineers and the curriculum of SMEs, by utilizing the facilities of colleges of technology and 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.

Meanwhile, in response to the aging of experienced personnel, sophistication of and increasingly short life cycles of technologies used at manufacturing sites, the ministry develops programs to foster personnel with practical skills and establish a mechanism for such training through industry-academia collaboration from the viewpoint of the industrial sector, in order to maintain the "on-site expertise" that forms the basis of the manufacturing industry's competitiveness. So far, in a total of 46 projects, the ministry systematized knowledge and skills required at manufacturing sites and engaged in the development and testing of programs to train personnel to acquire practical skills through industrial activity. With the training programs thus developed starting gradually, efforts toward the development of core human resources are proceeding steadily.

In addition, under the background of diversified market needs and the shortened product cycle in recent years, basic skills as adults, communication ability, the ability to get things done, basic scholarship, and expert knowledge are required in the workplace. Therefore, in FY 2007, projects for the development of cultivation and evaluation methods of such abilities were implemented through model projects at universities.

To bring development project of environmental leaders who take active part in the world, as positioned as priority measures in the Becoming a Leading Environmental Nation Strategy in the 21st Century -Japan's strategy for a Sustainable Society and Innovation 25 (Cabinet decision: June 2007), ENV examined measures for developing environmental human resources that are executed through industry-academia collaboration. The ministry formulated and officially announced the Vision for Environmental Leadership Initiatives for Asian Sustainability in Higher Education [literal translation] in March 2008.

(2) Promotion of 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 path after a post-doctoral period is uncertain, MEXT implemented the project to promote diversification of career paths for S&T-related human resources since FY 2006, which extends organized support and cultivates a favorable environment for the diversification of the career paths of post-docs. In this project, universities, companies, academic societies, etc. form a network so as to provide a "meeting place" for young researchers, offer career consulting, and implement capability-development programs such as internships. Currently, 12 organizations participate in this project.

AIST recruited doctorate holders since 2005 based on coordination and collaboration agreement with an enterprise to develop doctorate holders recruited through joint research projects with the enterprise as personnel capable of making contributions to the company immediately. In addition, to develop human resources who can contribute to innovation in industries, AIST implemented training for developing industrial technology personnel in which knowledge, etc. that would be indispensable in industries is provided to doctorate holders, and held corporate briefing conferences.

(3) Development of diverse human resources that lead utilization of knowledge and feedback to society

(Development of human resources related to intellectual properties and management of technology)

In order to promote the creation of innovations, it is necessary to develop human resources 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 149 majors were in place as of April 2007.

(Fostering S&T communicators)

According to the Public Opinion Poll on S&T and Society (December 2007) [literal translation] conducted by the Cabinet Office, many people think that opportunities to know information or entities that provide information are insufficient, though most of them can understand information related to S&T is explained in an easy-to-understand manner. In order to address this situation, 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 science and technology communicators through the Fostering Talent in Emerging Research Fields [literal translation] program, which is funded by SCF. 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.

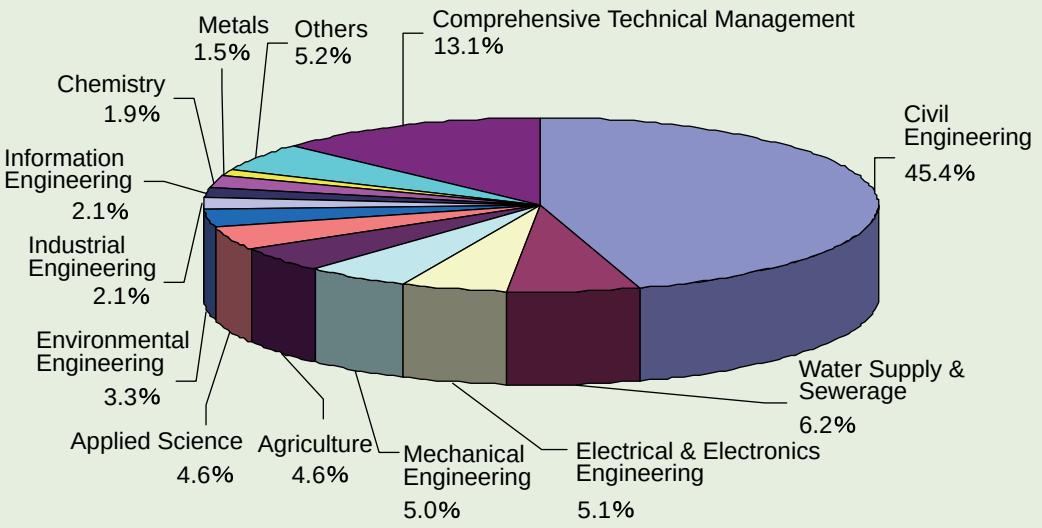
(Fostering engineers)

To become a 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. Those who apply to become a professional engineer are required to pass the national examination that is given in 21 fields of specialization, and become registered as a professional engineer. The examinations are held annually for both professional engineer and associate professional engineer. In FY 2007, the test resulted in 14,849 individuals being certified as associate professional engineers, and 3,790 being certified as professional engineers. As of the end of December 2007, there were a total of 20,977 people registered as associate professional engineers, and 60,871 registered as professional engineers. The distribution by sector is shown in Figure 2-3-3.

Figure 2-3-3 Distribution of Professional Engineers, by Field



In FY 2007, revisions were made to the second-stage examination, including selective assessment of technical experiences in an oral test, abolition of binary-choice type of tests.

2) Mutual recognition of engineering qualification

Based on the Osaka Action Agenda adopted at the APEC summit meeting of 1995, work has been progressing on the APEC Engineer Mutual Recognition Project for the promotion of mutual acceptance of professional engineer qualifications within the APEC region. Japan actively participated in studies for this project, toward the realization of mutual recognition of the professional engineer qualification with corresponding qualifications overseas.

In November 2000, the APEC Engineers Manual was published based on the results of studies at APEC. As of December 2007, there were 13 participating economies registered, including Japan.

3) Others

The Japan Patent Office (JPO) prepared complimentary texts for industrial property rights intended for students of upper secondary schools (special courses), colleges of technology, and universities for the purpose of mastering correct knowledge and basic practical affairs concerning intellectual rights through the National Center for Industrial Property Information and Training (INPIT). Furthermore, to cultivate awareness to pay regard to intellectual property during the school education stage, JPO prepared supplementary readers for teaching intellectual property rights intended for elementary, lower secondary, and upper secondary schools and provides them free of charge to schools that are interested. JPO, by utilizing these texts, holds seminars intended for children, pupils, students and teachers at various locations to cultivate and create an awareness of intellectual property rights, as well as to support related education.

Furthermore, to the students of upper secondary schools, colleges of technology, and universities, patent contests are being executed through joint hosting by MEXT, JPO, the Japan Patent Attorneys Association, and INPIT to cultivate an intellectual property mind and enhance understanding on the intellectual rights system through actual experience. Regarding excellent inventions among those applied, pupils or students will actually apply patents for acquisition of their rights.

Since FY 2007, lower secondary school student's Monodzukuri intellectual property report contest has been implemented, so that the contest will trigger them to become aware of importance of thinking

highly of intellectual property.

AIST continued the program to foster expert engineers from FY 2006 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 Human Resources for the Next Generation S&T

Executive members of the Council for Science and Technology Policy (CSTP) submitted a report titled Toward Drastically Enhancing Science and Mathematics Education [literal translation] at a meeting in April 2006. This report 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 2008 budgets of ministries and agencies.

(1) Fostering children brimming with intellectual curiosity

In order to expand the range of children fond of science and mathematics and foster children brimming with intellectual curiosity, it is necessary to cultivate a favorable environment for them at elementary and lower secondary schools to become familiar with and learn about S&T.

Therefore, to develop human resources for the next generation S&T, the following initiatives for enhancing science and mathematics education by cultivating a favorable environment for children to become familiar with S&T and thereby expanding the room for enhancing their capabilities are being promoted comprehensively:

(Science education assistants allocation program)

In order to enhance observations and experiments, the capabilities of teaching personnel, and enhance science classes at elementary schools by utilizing researchers and engineers and undergraduate (graduate) students from universities and enterprises, as well as outside personnel including retired teaching staffs as nature study support staff or special lecturers, the Japan Science and Technology Agency (JST) implements the project for placement of science support personnel intended for prefectural boards of education and those in the government-ordinance-designated cities. In the initial FY 2007, the project was implemented in 55 regions.

(Science experiments school project)

METI supported science classes at schools in cooperation with MEXT by utilizing engineers from enterprises. In FY 2007, the ministry implemented found teaching personnel, including engineers, preparation of curriculums, and other activities by utilizing coordinators in regions who go between local enterprises and schools through the Science Experiments School Project [literal translation] and enhanced science education at elementary schools in a manner that links to actual society.

(Science teacher training)

In order to improve the ability for leadership of teaching personnel involved in science and mathematics in their experimental and problem-solving activities, including observation and experiments concerning S&T, nature study, and mathematics, JST implements a project to support the training of teaching personnel of the "complete type" in which all personnel in random alumni out of science teachers from public lower secondary schools will participate, and that of the "voluntary type" in which only personnel involved in science and mathematics at lower and upper secondary schools.

(Science partnership project)

JST implements the Science Partnership Project (SPP), which supports initiatives implemented through collaboration between schools, supervisory organizations such as boards of education, and

universities, science museums, etc. to provide hands-on education and problem-solving education in order to enhance the interest of pupils and students in S&T and mathematics, and to foster their inquiring spirit. More specifically, these initiatives include educational activities such as observations and experiments supervised by researchers, science camps for hands-on S&T lessons at research organizations, the Regional Model Project for Fostering Children's Fundamental Science Literacy, which, by designating local governments actively promoting science and mathematics education, supports initiatives in which schools in respective regions and educational resources of universities and science museums are linked.

(Enhancement of facilities and equipment for science and mathematics education)

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.

(Development of advanced digital materials for S&T and science education)

JST is engaged in the development of digital materials for science education and provision of such materials to schools via the Internet, conducts demonstration tests and evaluation related to utilization of such materials at schools jointly with boards of education.

(Project for career education in independent regions through the utilization of private sectors)

METI supports systematic and effective community-based career education by utilizing experiences and ideas mainly from private sectors, including NPOs and enterprises, to encourage children to experience and understand fascinating aspects of working in manufacturing. In FY 2007, the ministry implemented the project in 28 model areas and received responses of children who participated in the project that they could understand that there were various jobs, and the relationship between learning at school and jobs.

(Others)

From the viewpoint that degradation in scientific capacity and de-motivation in learning of science and mathematics of young people is also accounted for by problems of scientific discipline of teachers who are involved in educational guidance, the Science Council of Japan (SCJ) established the committee for studying scientific discipline of teachers and fostering of teachers to study measures for dealing with the problems. On June 22, 2007, SCJ officially announced the request Approaches on Scientific Discipline of Teachers and Fostering of Teachers in the Future [literal translation], which proposes short-term policy issues for cultivating teachers' scientific discipline and long-term study issues for renovation in education of teachers.

(2) Development of talented children's individuality and capabilities

In order to develop the individuality of children interested in science and mathematics and foster personnel with outstanding proficiency in S&T, MEXT implements the following initiatives:

[Super Science High Schools (SSHs)]

Since FY 2002, MEXT steadily promoted the development of S&T-related human resources capable of playing an active role internationally by designating schools that focus on science and mathematics education as Super Science High Schools. Specifically, efforts are underway to provide advanced science and mathematics education in collaboration with universities, and develop curriculums with an emphasis on science and mathematics. In FY 2007, 101 upper secondary schools engaged in unique efforts in this regard.

(Support for international science and technology contests)

JST provides supports to activities that encourage students, mainly upper secondary school students or younger children, to participate in international science and technology contests in seven fields of mathematics, physics, chemistry, biology, informatics, robot and theme study to provide students interested in science and mathematics with opportunities to experience advanced learning. JST thereby aims to enhance students' learning motivation, expand their capabilities, and develop S&T-related human resources capable of making global contributions. Japanese students made excellent achievements in the International Mathematical Olympiad in FY 2007, for example. (Table 2-3-4).

Table 2-3-4 International Science Olympiads 2007 Japanese Medalists

International Mathematical Olympiad (IMO)

Gold:	Toshiki Kataoka*, 3rd grade, high school (Mie)
Gold:	Makoto Soejima, 1st grade, high school (Tokyo)
Silver:	Norifumi Seki, 2nd grade, high school (Hyogo)
Silver:	Takuya Inoue, 3rd grade, high school (Osaka)
Silver:	Yuki Yoshida*, 3rd grade, high school (Hyogo)
Silver:	Motoki Takigiku, 1st grade, high school (Tokyo)

International Physics Olympiad (IPhO)

Gold:	Satoru Takakura, 3rd grade, high school (Hyogo)
Gold:	Yuto Murashita, 2nd grade, high school (Hyogo)
Silver:	Kento Masuda, 3rd grade, high school (Tokyo)
Silver:	Yusuke Morita 3rd grade, high school (Tokyo)
Bronze:	Daiki Nishiguchi, 3rd grade, high school (Osaka)

International Chemistry Olympiad (IChO)

Bronze:	Naru Tanaka, 3rd grade, high school (Tokyo)
Bronze:	Shotaro Tsunoda, 3rd grade, high school (Tokyo)
Bronze:	Takashi Hiroi, 3rd grade, high school (Tokyo)
Bronze:	Kazuki Yamaguchi, 3rd grade, high school (Shizuoka)

International Biology Olympiad (IBO)

Silver:	Manatsu Hamazaki, 2nd grade, high school (Kanagawa)
Bronze:	Ryo Kariyazono, 3rd grade, high school (Tokyo)
Bronze:	Junji Takeuchi, 2nd grade, college of technology (Nara)
Bronze:	Kentaro Honda, 3rd grade, high school (Aichi)

International Olympiad in Informatics (IOI)

Gold:	Toshiki Kataoka*, 3rd grade, high school (Mie)
Silver:	Yuki Yoshida*, 3rd grade, high school (Hyodo)
Bronze:	Eiichi Matsumoto, 2nd grade, high school (Tokyo)

Note: Students with the mark "*" won medals in both IMO and IOI.

(Interconnection between upper secondary schools and universities)

It is important to develop the individuality and capabilities 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 2007, 60% or more of universities adopted the admission office (AO) entrance examination, which comprehensively evaluates the applicants' abilities, aptitudes and motivation. Moreover, upper secondary school-university interconnection initiatives that enable upper secondary school students to gain first-hand experiences of university education and research have been increasing year after year, including catering lessons, which refers to the provision of lessons by university teachers in the classrooms of upper secondary schools, and acceptance of upper secondary school students into university courses.

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 capabilities 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 reformation 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 long-term strategic guidelines Innovation 25, which had been set out for creating innovation with a view up to 2025. More specifically, steady approaches on measures for creation of innovation will be promoted through the (1) Pioneering Projects for Accelerating Social Return[fn.2]; (2) follow-up of progress status of the system reformation; and (3) understanding of domestic and overseas movements related to innovation and other projects (Figure 2-3-5).

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fn. 2 Pioneering Projects for Accelerating Social Return: The projects aim to merge various technologies as follows with the goal of bringing them up to the demonstration research stage in the near future and accelerate social return of their achievements through demonstration research. They also aim for achievement of society that is stated in the Innovation 25 and promoting technology development concerning six projects as well as the system reform posing impediments. CSTP serves as a command center promoting the combined efforts of government agencies and the collaboration of the public and private sector.

(1) Aiming for "a society where all can stay healthy throughout life"
- Realization of medical care that replaces and restores a lost function

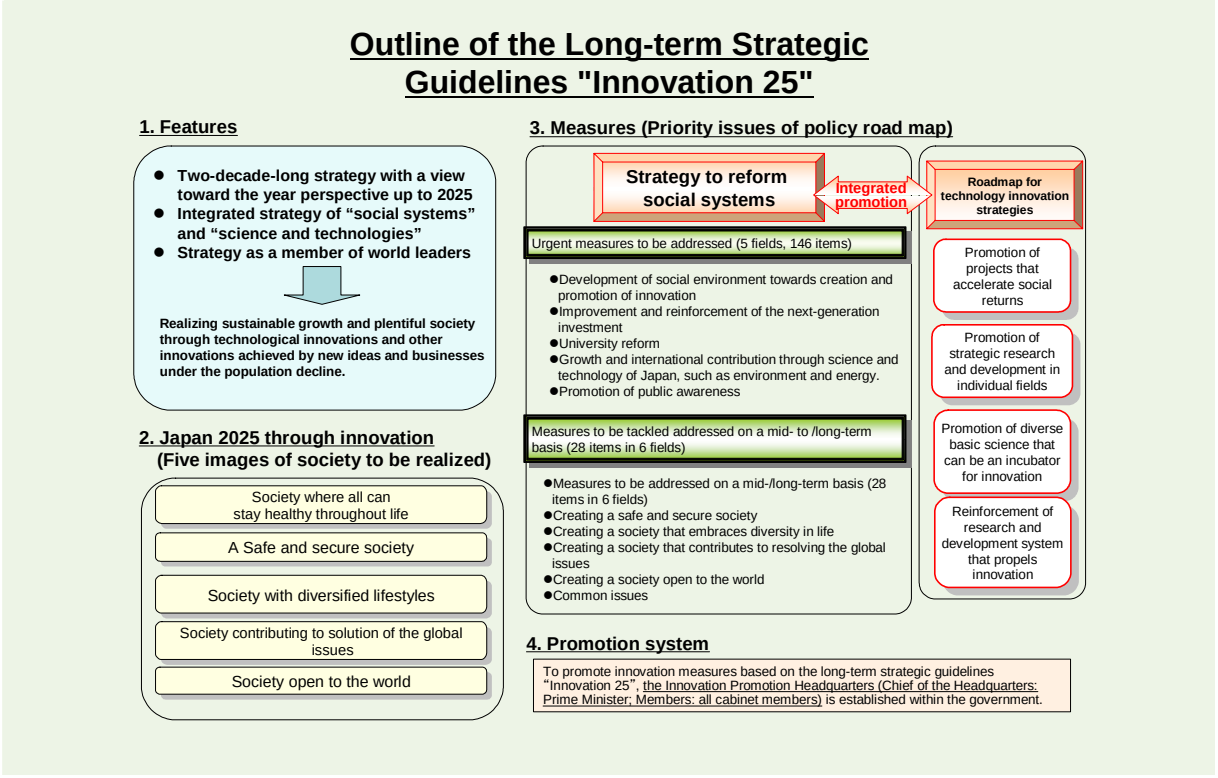
(2) Aiming for "a safe and secure society"
- Construction of the information and communication system which gives detailed disaster information to each resident, and helps disaster countermeasures
- Realization of a safe and effective road and traffic system using information and telecommunications technology

(3) Aiming for "a society with diversified lifestyles"
- Realization of advanced home medical and nursing care

(4) Aiming for "a society contributing to solution of the global issues"
- Biomass utilization for the solution of energy and environmental issue

(5) Aiming for "a society open to the world"
- Realization of audio communication technologies that overcome language barriers

Figure 2-3-5 Outline of the Long-term Strategic Guidelines "Innovation 25"



Meanwhile, CSTP formulated the Comprehensive Strategies to Create Innovation [literal translation], which called for the government to (1) enrich the sources of innovation, (2) enhance the mechanism for growing the seeds of innovation into fruits, (3) strengthen policy measures for achieving the fruition of innovation, (4) promote institutional reforms intended to create innovation and (5) enhance the development of human resources that lead innovation, and submitted it to the ministers concerned (June 14, 2006). Following the Strategies, MEXT promotes projects including the World Premier International Research Center Initiative (WPI Program), which to form visible research centers that boast excellent research environment and extremely high research levels.

METI promotes the Innovation Superhighway Plan, which seeks to establish a mechanism for quickly leading R&D achievements to commercialization, as listed in the Economic Growth Strategy (formulated on June 19, 2007 by the Council on Integrated Financial and Economic Reform [literal translation]).

1 Developing a Competitive Environment

(1) Increasing competitive funds and indirect costs

The competitive funds, which contribute to creating a competitive R&D environment, was increased, with the amount of funds granted increasing to 476.6 billion yen under the FY 2007 budget (470.1 billion yen under the FY 2006 budget). Also expanded was the indirect costs grant scheme, in which a fixed percentage of the research grant is allocated to institutions that employ researchers who received the competitive funds in proportion to the research expenses and is thus effective in promoting competition among research organizations, with 33 of the 37 competitive funds available allocating 30% of the research funds and three other programs also allocating funds in some cases. Table 2-3-6 below shows competitive funds sponsored by government ministries and agencies.

Table 2-3-6 List of Competitive Funds

Ministry	Sponsor	Program	Program outline	FY 2006 budget (million yen)	FY 2007 budget (million yen)
CAO	CAO	Program for Promotion of Industry-University-Government Joint Research in Okinawa	To support industry-academia-government joint R&D projects conducted in the biotechnology, environment, food processing sectors, etc. by taking advantage of Okinawa's resources and characteristics in order to contribute to the creation of new businesses and the promotion of local industries.	277	–
CAO	CAO	Research on Technology for Assessing Food Health Risks	To promote research related to development of evaluation standards, in order to promote science-based evaluation of effects foods on health (risk evaluation).	244	364
Cabinet Office, Government of Japan Subtotal				521	364
MIC	MIC	Strategic Information and Communications R&D Promotion Programme	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, raise the quality of researchers through the establishment of a competitive research environment and create intellectual property with global excellence.	3,209	2,950
MIC	National Institute of Information and Communications Technology	Advanced technology development for pioneering new communications and broadcasting areas (Telecom incubation)	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.	620	550
MIC	National Institute of Information and Communications Technology	Program for Supporting Private-Sector Infrastructure Technology Research	To invite proposals for experiment 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 experiments and research that will contribute to strengthening the foundation of the national economy and people's lives.	7,200	6,500
MIC	Fire and Disaster Management Agency	Program for Promotion of Science and Technology Research for Fire Safety and Disaster Prevention	In order to promote science and technology related to prevention/mitigation of fires and other disasters with a view to realizing a safe and comfortable society, it is necessary to conduct research focusing on actual disaster prevention/mitigation activities while broadening the base of relevant technologies and promoting industry-academia-government coordination and research activities by local governments. Therefore, this competitive funding program seeks to promote R&D for the purpose of putting new technologies to practical use by allocating research funds to excellent research themes related to 1) the advancement of science and technology concerning firefighting, rescue and relief activities, 2) the promotion of computerization of information concerning anti-disaster measures and 3) the protection of the environment.	350	311
Ministry of Internal Affairs and Communications Subtotal				11,379	10,311
MEXT	MEXT/JSPS	Grants-in-Aid for Scientific Research	The Grants-in-Aid for Scientific Research aims to dramatically advance academic research (research based on the free-thinking of researchers) across all fields including the humanities and social sciences as well as the natural sciences, and from basic research	189,500	191,300

			through to applied research. The program supports creative and pioneering research that will be the development foundation of rich society as they passes the peer review (Note 1) process.		
MEXT	JST	JST Basic Research Programs (incl. social technology research and development projects)	To promote basic research related mainly to "Strategic Prioritized Science and Technology" items in line with "Strategic Sector" set by the government in light of social and economic needs, with a view to further advancing science and technology and developing technologies that will lead to the creation of new industries.	47,976	48,626
MEXT	MEXT	Special Coordination Funds for Promoting Science and Technology	A competitive fund of policy-guided type which is operated by MEXT in line with the Council for Science and Technology Policy. In FY 2007, toward the full-scale execution of the Third Science and Technology Basic Plan, public participation related to science and technology system reformation will be invited for agile and strategic utilization.	39,800	36,800
MEXT	MEXT	21st Century COE Program	To make Japanese universities internationally competitive and raise their quality to the world's top level by providing targeted support for the establishment of global research and educational centers by national, public and private universities under the principle of competition based on third-party evaluation.	37,800	22,016
MEXT	MEXT	Global COE Program	To selectively support formation of excellent world-class education and research centers, while succeeding the basic concept of the "21st Century COE Program." In particular, it aims to enhance fostering functions of young researchers and formation of international centers.	—	15,758
MEXT	MEXT	World Premier International Research Center Initiative (WPI Program)	To establish "visible centers" which boast excellent research environment and very high research level to attract front-line researchers from throughout the world, by offering intensive supports to initiatives that aim for formation of centers with a core of high-level researchers and by introducing actions including system reformation.	—	3,500
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 concerning the key technologies that form the basis of activities for securing the safety and security of Japan and developing the country's economy.	8,402	15,967
MEXT	MEXT	Plan for Promotion of Global Observation Systems	To conduct technology development and observational research in fields where Japan should play the leading role, based on proposals selected from among those submitted in response to public invitations, with a view to the establishment of a global observation system advocated by the Earth Observation Summit.	849	573

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 and basic research related to such technologies, with a view to realizing a innovative nuclear system. Research proposals related to basic research are invited from young researchers.	6,267	5,205
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 and world-top-class research activities. In particular, this program aims to promote industry-academia-government joint development in applications fields (manufacturing fields) with the participation of users with regard to projects undertaken by the JST for the development of cutting-edge measurement/analysis techniques and equipment.	4,200	4,800
MEXT	JST	Research Program on Development of Innovative Technology	This program, which takes over from the Public Proposal System for Original and Innovative Technology Development Research program, terminated in FY 2006, with a view to ushering in new industries, invites from researchers working for private-sector institutions research theme proposals regarding innovative and unique technologies that will form the foundation of Japan's prosperity in the 21st century, and seeks to develop innovative practical technologies by taking advantage of excellent research themes selected from among those submitted.	2,615	1,740
MEXT	JST	Project to develop "Innovative Seeds"	To seek to contribute to the development of the society and economy as well as science and technology and to the improvement of people's living standards by facilitating feedback to the society of unique research results (seeds) obtained by universities, public research institutes, etc. by conducting R&D in a manner suited to the relevant technology phase amid a competitive environment so as to promote the commercialization of the results (foundation of university-based venture companies and technology transfers).	9,479	9,043
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) with a view to bringing such seeds into the open. The seeds thus revealed are to be developed further through industry-academia joint research (with the use of the matching-fund format) in order to help to create innovations.	1,400	1,800
MEXT	JST	Science and Technology Incubation in Advanced Regions	To undertake coordinating work necessary for the creation of regional new industries and promote joint research for the purpose of industrialization so as to take advantage of research results achieved by universities, with JST innovation plazas and JST satellites used as footholds for such activities.	5,973	8,273
MEXT	JST	Regionally Concentrated R&D Progam, etc.	To promote industry-academia-government joint research with focus on specific research themes in fields where there are particularly strong regional needs for the foundation of start-up companies. To be conducted under this program are R&D activities for the purpose of fostering new technologies and new businesses, including the development of prototypes based on technology seeds created through basic research conduced by universities, etc.	4,147	3,479

Ministry of Education, Culture, Sports, Science and Technology Subtotal				358,408	368,881
MHLW	MHLW	Health and Labour Sciences Research Grants	To provide subsidies to researchers engaged in the fields of health and welfare at universities and national and private research institutions. Under this program, research subjects are classified into 18 categories in four fields. In order to support research themes adopted, comprehensive research is to be promoted through the implementation of projects for nurturing and utilizing young researchers at public interest corporations.	39,789	40,871
MHLW	Pharmaceuticals and Medical Devices Agency	Program for Promotion of Basic Research in the Health Care Sector	To provide operating funds to the National Institute of Biomedical Innovation in order to promote basic research related to the development, based on technology seeds created by universities, of pharmaceutical products that will contribute to the maintenance and advancement of good health of Japanese people in light of the fact that the importance of basic research is growing due to the recent advance of science and technology in the medical and health fields.	7,498	7,498
Ministry of Health, Labour, and Welfare Subtotal				47,287	48,370
MAFF	Bio-oriented Technology Research Advancement Institution	Program for promotion of basic research for creation of new technologies and new sectors	To promote unique basic research through invitation of research proposals from incorporated administrative agencies, universities, private-sector companies, etc. in order to create, from a fresh viewpoint, new technologies and new industrial sectors that make full use of biological functions, thereby helping to improve Japan's food self-sufficiency rate and resolve the problem of global food shortage.	4,788	4,677
MAFF	Bio-oriented Technology Research Advancement Institution	Research and Development Program for Bio-Industry Initiatives	To develop innovative technologies through industry-academia-government joint research projects that involve researchers in different fields in order to promote the creation of new industries and the foundation of start-up companies based on biotechnology and other bio-related advanced technologies. This program also provides support for R&D activities by researchers at incorporated administrative agencies, private-sector companies, etc. that aim to found bio-venture companies based on unique ideas and research results.	2,337	2,285
MAFF	MAFF	Research project for utilizing advanced technologies in agriculture, forestry and fisheries	To promote R&D closely related to production, distribution and processing in the agriculture, forestry and fisheries sectors through invitation of R&D proposals.	4,872	5,220

MAFF	MAFF	Program for new technology development to activate agriculture, forestry, fisheries and food industry by industry-academia-government collaboration	To promote R&D projects jointly conducted by private-sector companies and public research organizations, including universities and incorporated administrative agencies, in order to create new industries and businesses in the agriculture, forestry, fisheries and food sectors and resolve immediate policy challenges.	988	661
Ministry of Agriculture, Forestry, and Fisheries Subtotal				12,985	12,843
METI	NEDO	New Energy and Industrial Technology Development Organization	To invite research theme proposals from young researchers at universities, incorporated administrative agencies, etc., select unique and innovative proposals based on rigorous third-party evaluation and provide funds to the individual researchers concerned in order to discover technology seeds and develop human resources that meet the needs of the industrial sector as well as the society from the viewpoint of enhancing Japan's prowess in industrial technology.	6,549	5,892
METI	NEDO	Grant for Application of Industrial Technology Innovation (* FY 2006: R&D for practical use of university-based technology by matching government funds and private funds)	To provide matching funds, through TLOs (technology licensing organizations) in charge of R&D management, to cover part of the cost of industry-academia joint R&D projects aiming for commercialization of research results achieved by universities on condition that the companies involved provide part of research funds and that there are clear business plans.	3,383	8,675
METI	METI	Consortium R&D Project for Regional Revitalization	To establish regional systems for industry-academia-government joint research (Regional Rebirth Consortium) by taking advantage of technologies developed by universities, and conduct advanced R&D activities with commercialization in mind.	16,292	9,918
METI	METI	Innovative and Viable Nuclear Energy Technology (IVNET) Development Project	To identify research themes that will lead to the practical use of unique and innovative technologies by publicly inviting proposals, and conduct technology development for the purpose of improving the safety and economy of nuclear power generation and the nuclear fuel cycle.	1,900	902
METI	Japan Oil, Gas and Metals National Corporation	Research for Promoting Development/ Utilization of Oil/Natural Gas	To conduct research, spanning from basic research to applications research, based on proposals selected from among those submitted in response to public invitations of proposals for unique and innovative technologies concerning oil and natural gas exploration and development.	2,392	1,204
Ministry of Economy, Trade, and Industry Subtotal				30,516	26,592
MLIT	MLIT	Construction Technology Research and Development	To publicly recruit proposals widely from researchers concerning research and development of technologies that contribute to sophistication and enhancement of international competitiveness of	400	400

		Subsidy Program	construction technologies controlled by MLIT, further promotion of R&D project implemented by MLIT, etc., in order to promote technological innovation in the construction sector.		
MLIT	Japan Railway Construction, Transport and Technology Agency	Program for Promoting Fundamental Transport Technology Research	To seek to establish entirely new technologies that will contribute to the safety of traffic, the preservation of the environment and the development of advanced traffic services by publicly inviting unique and innovative research theme proposals.	429	404
Ministry of Land, Infrastructure Subtotal				829	804
ENV	ENV	Global Environmental Research Fund	To seek to contribute to the preservation of the global environment in light of the serious impact of global environmental problems on the existence of humanity, by bringing together the talents of researchers in various fields so as to promote comprehensive investigations and research from interdisciplinary and global viewpoints.	3,256	2,960
ENV	ENV	Environmental Technology Development Fund	To promote environmental researches and technology development by recruiting proposals concerning R&D that broadly utilize wisdom of industry, academia and the government and by supporting research and development of excellent proposals, since research and technology development in the environment sector is one of important factors toward building of the sustainable 21st century society and positive growth cycle of the environment and economy.	881	881
ENV	ENV	Ministry of the Environment Waste Management Research Grants	To seek to resolve various problems related to waste by promoting research and technology development regarding the reduction of waste through curbs on waste discharges and recycling and regarding appropriate ways of disposing of waste that will contribute to the establishment of a recycling-oriented society.	1,300	1,261
ENV	ENV	Project for Development of Technology for Global Warming Countermeasures	To develop and put to practical use effective basic technologies for reducing emissions of energy-derived CO2, such as those related to energy conservation and alternative energy sources, based on proposals invited from entities equipped with the ability to implement technology development and with the necessary facilities and equipment.	2,716	3,302
Ministry of the Environment Subtotal				8,153	8,404
Total				470,078	476,569

The figures in the "total" column may differ from the sum of the amounts for each column due to round-off.
(Note 1) Peer review: Review by researchers in some fields similar to the specialized fields.
(Note 2) FS (feasibility study): An experiment or an investigation conducted to examine whether a planned project can be carried out successfully.
(Note 3) Matching fund: A scheme in which subsidies are provided to cover the project costs to be borne by universities and other parties involved, in amount not exceeding the amount of funds provided by the companies involved.

(2) Cultivation of competitive environment within organizations

(Effective mix of basic and competitive funds at universities)

At Japanese universities, basic funds play an important role in supporting the foundation of the basic organization (human resources, 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 of them playing an important role, MEXT aims to expand the competitive funding 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 finalized measures for further promoting the system reformation including use, allocation, and evaluation of research funds, such as competitive funds in the Promotion Strategy PT in June 2007. More specifically, such measures include the following: assurance of diversity and continuity of basic research that would be the seeds of innovation; establishment of seamless mechanism to lead them to the exits; establishment of research environment that is attractive to young and female researchers; enhancement of high-risk, impactful, or unique research; enhancement of mechanism and evaluation system that broaden bases of research; and establishment of fair, transparent and efficient allocation and usage system which maximizes effects of research fund. The measures also states to conduct follow-ups of execution status of system improvement.

(Establishment of fair and transparent screening system)

When allocating competitive funds, it is important to screen proposed research plans in a fair and transparent manner and by attaching importance to both the contents of the plans and the implementation capability of the applicants. Therefore, regarding each competitive funding program, efforts are underway to implement reform measures such as increasing the number of screeners, requiring the submission of more detailed plans, revisions of screening criteria and the employment of screeners from a diverse range of fields, while endeavoring to streamline the screening activities. With regard to MHLW's Health and Labour Sciences Research Grants program, national research organizations to which operations related to this program are transferred are notified of points of attention for clarifying the criteria for the selection of members of the screening committee as a way to establish a fair and transparent screening system.

(Feedback of screening results)

Regarding each competitive funding program, efforts are underway to promote disclosure of details of screening results so as to ensure appropriate feedback to researchers. In FY 2007, feedback of screening results including the provision of comments by screeners to unsuccessful applicants was implemented for 29 of the 37 programs available.

(Enhancement of functions of allocation organization)

Funding agencies in charge of allocating competitive funds strengthen their systems by appointing program officers and program directors 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 concerning how to promote science in order to support JSPS's activities. JST established the Center for Research and Development Strategy (CRDS), which is in charge of planning related to research fields that should be promoted as priorities. With regard to the Health and Labour Sciences Research Grants program, the operations related to the program are being transferred to national research organizations so as to ensure that evaluation, research planning and fund allocation are conducted by taking advantage of scientific knowledge.

2 Enhancing Competitiveness of Universities

(1) Creation of universities with world-leading excellence in S&T

In order to make Japanese universities competitive internationally, cultivation of a competitive environment at universities, whether national, public, or private universities is required. Based on the results of the Graduate School Education in the New Age (September 5, 2005), a CSTP recommendation, the Science and Technology Basic Plan (Cabinet decision: March 28, 2006) and the results of the 21st Century COE Program, launched in FY 2002, and in order to further enhance and strengthen research and education functions at graduate schools in Japan, MEXT implemented since FY 2007 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. In FY 2007, MEXT adopted 63 centers from 28 universities.

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

(Making universities more open to local communities)

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 February 2006, the Headquarters for the Regional Revitalization Headquarters decided on the Program for Revitalizing Regional Knowledge Centers [literal translation], and subsequently in March 2008, the Headquarters enhanced the program by making revisions including introduction of new measures such as the practical technology development project for promoting new agricultural, forestry, and fisheries policies and the regional innovation creation R&D project.

In response, the Cabinet Office approved 55 regional revitalization plans that utilize the program by March 2008. Various projects in which universities and local communities collaborated in making progress. Examples of such projects include: Vital Okunoto: Okunoto Revitalization Plan by Forming the Base to Create "Satoyama Meisters" [literal translation]," which develops human resources who will be involved in environmentally sound agriculture and tourism through collaboration with Kanazawa University, Ishikawa Prefectural government, municipalities in the Okunoto region, and local enterprises; the Revitalization Plan of Local Vitality and Community through the Style of Ever-involved Settlement [literal translation], which executes the stay type of learning for experiencing interpersonal communication, renovated abandoned houses through collaboration between Tanba City in Hyogo Prefecture and Kansai University.

Furthermore, MEXT launched the SCF funded program for Center Creation of Regional Revitalization Human Resources Development [literal translation] from FY 2006 to establish regional knowledge centers through which local universities and the host regions collaborated to develop excellent human resources by taking advantages of S&T. The ministry adopted 22 organizations by March 2008.

3 Enhancing Systems for Creating Innovations

(1) Establishing Top World-level Research Center

Under the circumstances that competitions for procuring superior brains are being intensified throughout the world, and also with the problem consciousness that it is necessary to establish research centers in which top world-level researchers get together in Japan, the World Premier International Research Center Initiative (WPI program) which aims for establishing "globally visible" research centers, each of which can attract and assemble a cadre of the world's best frontline researchers from around the world with its superb research environments and very high standards of research, is being promoted (Figure 1-3-2). The program was implemented in FY 2007, and it provides support of one billion yen or more for 10 to 15 years. As a totally new large-scale program in terms of both the support scale and the term, the five centers that were adopted in October 2007 started their activities:

- WPI Research Center: Advanced Institute for Materials Research (WPI-AIMR), Tohoku University
- Institute for the Physics and Mathematics of the Universe (IPMU), The University of Tokyo
- Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University
- Immunology Frontier Research Center (IFReC), Osaka University
- International Center for Materials and Nanoarchitectonics (MANA), National Institute for Material Science

After the program starts, a powerful follow-up system led by the WPI Program Committee was established to monitor the progress to be made in center projects, thus aiming to ensure that each becomes a "globally visible" research center.

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

(Enhancing competitive research for creation of innovations)

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 feed back the benefits to society and 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 strategic prioritized S&T items as part of its Basic Research Programs under a program officer invested with the responsibility and discretion concerning the management of research progress in order to achieve the strategic sector set by the government for the purpose of creating innovations. In addition, JST implements the Collaborative Development of Innovative Seeds and Project to develop "innovative seeds" as applied research programs intended to feed back the research achievements to society.

In the basic research promotion program for the creation of new technologies and fields [literal translation] and the interdisciplinary research support program for the creation of Bioindustry, [literal translation] which are being implemented by the National Agriculture and Food Research Organization (NARO), the screening and evaluation committee screen proposed research plans and evaluate implemented plans based on its members' understanding of these projects' objective of contributing to the agriculture, forestry, fisheries and food industries, etc. Interim evaluation is conducted on ongoing research projects with regard to the research results so far obtained and how they should be implemented in the future. The results of the evaluation will be conveyed by program officers to the researchers concerned so as to ensure that research plans are implemented in accordance with the objective of these projects.

(Establishment of advanced research centers for interdisciplinary fields)

Based on the view that Japan should develop pioneering research fields in order to create innovations, the Third Science and Technology Basic Plan points out that it will be effective to make intensive investments, with the support of the industrial sector, for the establishment of research and education centers with emphasis on advanced research fields. 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 a view to achieving commercialization in the future. Currently, 18 research organizations are engaged in such efforts.

(Reform of research funding systems across ministerial boundaries)

CSTP reforms the public research funding systems by building the National R&D Database utilized for macro analysis, which is necessary for formulating Science and Technology Basic Plan and research and deliberations concerning the allocation of resources.

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 commercialization. In FY 2007, for the Okinawa Innovation Creation Project [literal translation] sponsored by the Cabinet Office, information sharing was conducted with related organizations and, actually, collaboration cases with projects of other ministries were created across ministries and agencies. Under the Health and Labour Sciences Research Grants, there are projects which share the evaluation committee with projects sponsored by other ministries and agencies and which use the matching fund format. Practical use of research achievements is thus promoted through collaboration with projects sponsored by other ministries and agencies and through burden-sharing concerning development. Meanwhile, MAFF implements research programs intended to apply

technology seeds produced by basic research conducted by other ministries and agencies and research achievements in other sectors to the agriculture, forestry and fisheries sector.

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

As the 21st century is referred to as the "century of knowledge," the creation and utilization of that knowledge is indispensable to the future development of Japan, so industrial-academia-government collaboration is an important means for producing a constant stream of innovations. Although industry-academia-government collaboration in Japan has recently made significant progress, the level of collaboration is not yet necessarily sufficient compared with the top world-level research potential of Japanese universities. Therefore, it is necessary to promote industry-academia-government collaboration further, and our country increases its efforts in this regard.

In June 2007, the Sixth Conference for the Promotion of Collaboration among Business, Academia, and Government was held with the participation of leaders and working-level officials from companies, universities, and administrative organizations across Japan, in order to further promote industry-academia-government collaboration. In addition to lectured delivered by representatives from the industrial, academic and government sectors, discussions by the working-level officials were conducted in panel discussions on specific themes. Furthermore, in the Conference, 11 awards including the Prime Minister's Award were given to parties that were involved in successful cases of industry-academia-government collaboration.

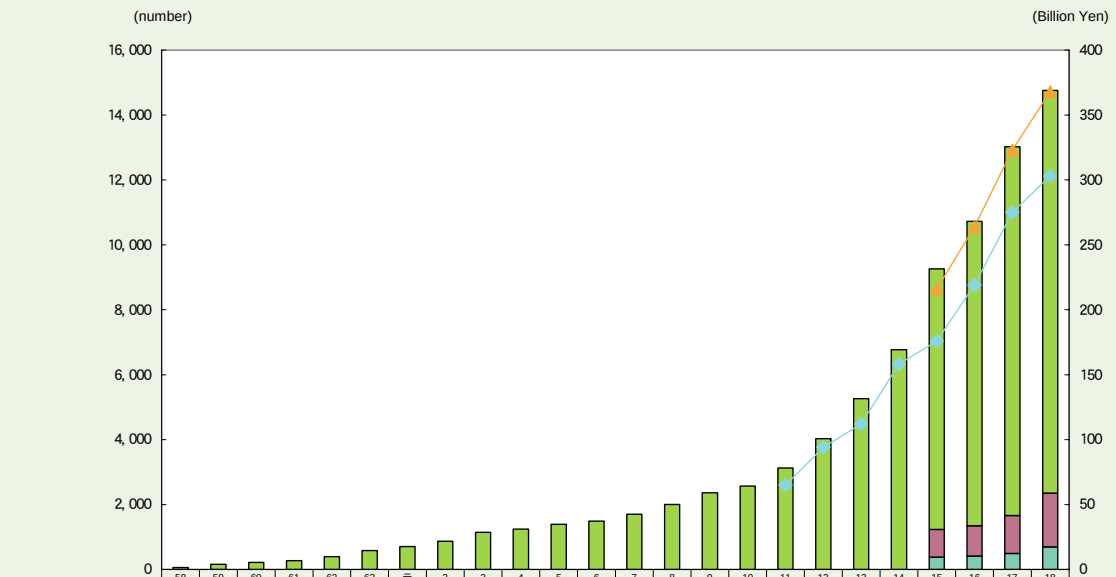
In November 2007, the 7th Business-Academia-Government Collaboration Summit was held under the sponsorship of the Cabinet Office, MIC, MEXT, METI, Nippon Keidanren (Japan Business Federation), and SCJ. Under the circumstances where sustainable creation of innovation and full-scale industry-academia-government collaboration are demanded in order to realize Japan as described in the long-term strategic policy Innovation 25, top-level officials came together to discuss roles of respective sectors and new development of their collaboration. METI, with the support of the New Energy and Industrial Technology Development Organization (NEDO), formulated the Strategic Technology Roadmap in 2005, which provides a vision of future needs of society and people as well as future technological progress and trends. METI revises the Roadmap every year, and it officially announced it under the title Strategic Technology Roadmap 2007 in April 2007. The ministry utilizes the Roadmap not only as a tool for R&D management but uses it as a means to facilitate communications between people involved in planning and implementation of R&D by distributing it widely in the industrial, academic and government sectors.

The above-mentioned projects and activities are expected to contribute to the creation of innovations in Japan.

(Deepening of industry-academia-government collaboration)

In line with the corporatization of national universities in April 2004, industry-government-academia collaboration made steady progress, with the number of research programs implemented jointly by universities and private-sector companies, etc. exceeding 14,000 in FY 2006 (Figure 2-3-7). Moreover, the number of patents licensed totaled 2,872 and the number of university-based venture companies totaled 1,565 as of the end of March 2007.

Figure 2-3-7 Trends in Number of Joint Research Projects and Amount of Funds Received

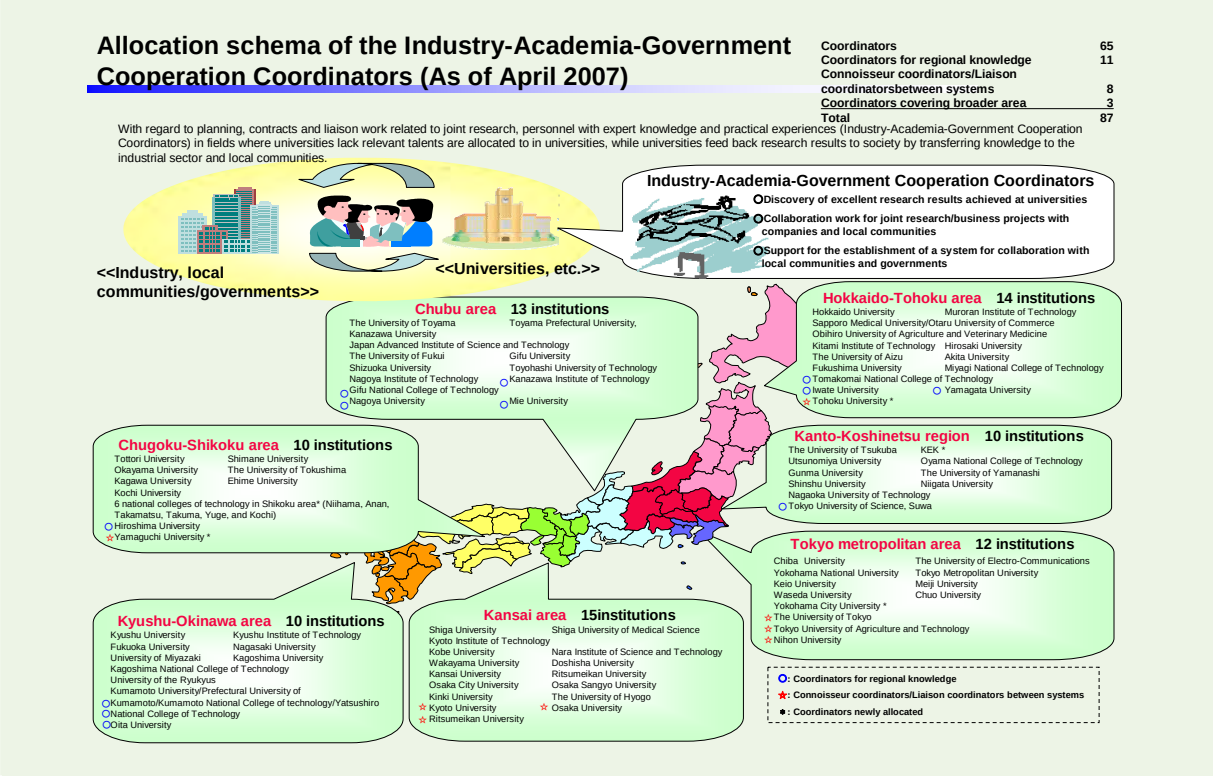


	58	59	60	61	62	63	元	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
National uni., etc.(number)	56	160	216	272	396	583	705	869	1,139	1,241	1,392	1,488	1,704	2,001	2,362	2,568	3,129	4,029	5,264	6,767	8,023	9,378	11,362	12,405
Private uni., etc.(number)																					850	938	1,165	1,655
Public uni., etc.(number)																					382	412	493	697
National uni., etc. (amount)																	65	94	112	158	176	219	275	303
Universities (amount)																					216	264	323	368

In order to further promote industry-academia-government collaboration in a strategic and organized manner in light of these results, the National Institute of Information and Communications Technology (NICT) conducts research on industry-academia-government collaboration through its Advanced Testbed Network for R&D.

MEXT supports university researchers who attempts to conduct R&D that links basic research and research for product development, a stage of R&D that has insufficient support: valley of death. The ministry targets researchers whose research results can be expected to lead to entrepreneurial activities in the future, and subsidizes their R&D expenses and the management expenses for preparing a business plan toward the establishment of a business. As of the end of April 2007, MEXT also placed 87 coordinators in universities and colleges of technology nationwide, where they serve as bridges between universities and enterprises that conduct joint research at the universities. (Figure 2-3-8)

Figure 2-3-8 Allocation Schema of the Industry-Academia-Government Cooperation Coordinators (As of April 2007)



MAFF promotes research intended to realize commercialization and industrial use of technology seeds owned by incorporated administrative agencies through its agricultural biotechnology commercialization and industrialization research program. At the same time, the ministry holds agricultural business creation fairs in order to provide meeting places for enterprises, universities, incorporated administrative agencies, government agencies, etc. so that they can find business opportunities for joint research, product development, commercialization, technology transfers and new market entry in the agriculture, forestry, fisheries and food sectors. The ministry also implements a variety of different activities for promoting industry-academia-government collaboration, including promotion of matching through lectures, seminars, and exhibitions and coordination of joint research under cooperation with regional consultation forums on biotechnology organized by local enterprises, universities, local industrial research institutes, etc.

AIST employed an additional Innovation Architect (office staff who has sufficient knowledge on research results and user needs and draw up industrialization scenarios to adequately connect the knowledge and the needs) from the industrial sector and thus enhanced its functions. With regard to the AIST Industrial Transformation Research Initiative which is executed under the leadership of Innovation Architect and intends to develop prototypes by sharing the definite scenario covering processes from technology seeds to a new industry among enterprises, universities and AIST. Under the initiative, the project started to create renewable energy industries, which should be the base of the sustainable society. Furthermore, to accelerate reduction of research results to society, AIST revised procedures for handling shared intellectual property obtained as a result of such joint research, and thus enhanced collaboration with enterprises to introduce versatile options, including the procedure that, if shared intellectual property are handled by a joint research organization that satisfies specific conditions such as provision of research funds, no compensation fee for execution will be charged.

Meanwhile, competitive funds support joint R&D projects implemented by the industrial, academia and government sectors, in various stages of development, from basic research to applications/commercialization and for various purposes. Comprehensive projects supported by

competitive funds of specific ministries include: the Collaborative Development of Innovative Seeds supported by JST, MAFF's Research Project for Utilizing Advanced Technologies in Agriculture, Forestry and Fisheries, METI's R&D project for creation and commercialization of university-based businesses [literal translation] and ENV's Environmental Technology Development Fund.

(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 enterprises and universities, while research institutions, including universities, announce research results and disclose other information by holding conferences, issuing periodical publications such as annual reports, contributing papers to academic journals and disclosing patents.

Furthermore, MEXT and METI, in cooperation with JST and NEDO, held the Innovation Japan 2007: University Fair, a nationwide industry-academia matching event to disseminate research results of universities and public research institutions in the field of the state-of-the-art technologies to industry, etc.

- Promotion of voluntary initiatives by universities, etc. -

In promoting collaboration between industry, academia, and government, it is extremely important to appropriately deal with any conflict of interest[fn.3] that may arise in universities and research institutions on a daily basis.

In particular, since clinical research and clinical trials require further more cautious reactions, MEXT entrusted the University of Tokushima and published the Example Analyses for Conflicts-of-Interest Management [literal translation] in March 2007, following the Guidelines on the Formulation of Policies concerning Conflicts of Interest in Clinical Research [literal translation] (March 2006), thus promoting formulation of policies at universities.

Moreover, the National University Corporation Act (Act No. 112 of 2003) allows investments in authorized TLOs (technology licensing organizations) as a way to facilitate a virtuous circle of knowledge creation and promote feedback of research results to society.

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

In line with the shift of attribution of patent and other university research results from individuals in principle to institutions in principle, MEXT established the University Intellectual Property Headquarters Development Project (43 organizations) and provided support since FY 2003 in order to establish a strategic management system for control and utilization of intellectual property, such as patents, produced by universities.

In addition, based on the Act on the Promotion of Technology Transfer from Universities to Private Business Operators (Act No. 52 of 1998), 46 TLOs (Table 2-3-9) were authorized at the end of March 2008. The number of patents licensed was 3,633 as of the end of March 2007.

fn. 3 Conflict of interest : A concept that includes the following two situations: (1) The situation where interest that a faculty staff or a university will obtain through industry-academia-government collaboration activities (license fee, compensation from project, unlisted stocks, etc.) and responsibility of education and research at university collide and conflict; and (2) the situation where a faculty staff holds responsibility to enterprises, etc. for performing duties mainly through project activities, and the responsibility of performing duties and that to enterprises, etc. cannot go together.

Table 2-3-9 List of Authorized TLOs

As of March 2008: 46 institutions authorized as TLOs

	TLO	Corporate status	Date of approved	Name of participating university
External-type (8)	Institute of Tsukuba Liaison Co., Ltd.	Corporation	Apr. 16, 1999	The University of Tsukuba
	Toudai TLO (CASTI)	Corporation	Dec. 4, 1998	The University of Tokyo
	The Foundation for the Promotion of Industrial Science	Foundation	Aug. 30, 2001	Institute of Industrial Sciences, The University of Tokyo
	Tokyo University of Agriculture and Technology TLO, Co. Ltd.	Corporation	Dec. 10, 2001	Tokyo University of Agriculture and Technology
	Campus Create. Co., Ltd.	Corporation	Feb. 19, 2003	The University of Electro-Communications
	Toyohashi Campus Innovation Inc.	Corporation	Sep. 5, 2005	Toyohashi University of Technology
	Yamaguchi Technology Licensing Organization Co., Ltd.	Limited company	Dec. 9, 1999	Yamaguchi University
	Kyushu TLO Company, Ltd.	Corporation	Apr. 19, 2000	Kyushu University
Regional-type (23)	Hokkaido Technology Licensing Office Co., Ltd.	Corporation	Dec. 24, 1999	Hokkaido University and other universities in Hokkaido
	Tohoku Techno Arch Co., Ltd.	Corporation	Dec. 4, 1998	Tohoku University and other universities in the Tohoku area
	Technology Advanced Metropolitan Area Technology Licensing Organization	Corporation	Dec. 4, 2000	Tokyo metropolitan area universities
	Yokohama TLO Co., Ltd.	Corporation	Apr. 25, 2001	Yokohama National University, Yokohama City University, and other universities in Kanagawa prefecture
	Niigata Technology Licensing Organization Co., Ltd.	Corporation	Dec. 25, 2001	Niigata University and other universities in Niigata prefecture
	Omni Institute Corporation Corporation	Corporation	Feb. 24, 2005	Nagaoka University of Technology, Nagaoka National College of Technology, The University of Hyogo
	KUTLO (Kanazawa University Technology Licensing Organization)	Limited company	Dec. 26, 2002	Kanazawa University and other universities in Ishikawa prefecture and the Hokuriku area
	SHINSHU Technology Licensing Organization	Corporation	Apr. 18, 2003	Shinshu University, Nagano National College of Technology
	Hamamatsu Foundation for Science and Technology PROMOTION	Foundation	Jan. 17, 2002	Shizuoka University and other universities in Shizuoka prefecture
	Nagoya Industrial Science Research institute (Chubu TLO)	Foundation	Apr. 19, 2000	Nagoya University and other universities in the Chubu area
	Mie TLO (Mie Technology Llicensing Organization)	Corporation	Apr. 16, 2002	Mie University and other universities in Mie prefecture
	Kansai Technology Licensing Organization Co., Ltd.	Corporation	Dec. 4, 1998	Kyoto University, Ritsumeikan University, etc.
	Osaka Industrial Promotion Organization	Foundation	Aug. 30, 2001	Osaka University and other universities in Osaka prefecture
	New Industry Research Organization (TLO Hyogo)	Foundation	Apr. 19, 2000	Kobe University and other universities in Hyogo prefecture
	Okayama Prefecture Industrial Promotion Foundation	Foundation	Apr. 28, 2004	Okayama University and other universities in Okayama prefecture
	Hiroshima Industrial Promotion Organization	Foundation	Oct. 09, 2003	Hiroshima University and other universities in Hiroshima prefecture
	Techno Network Shikoku Co., LTD.	Corporation	Apr. 25, 2001	Universities in the Shikoku area

	Kitakyushu Technology Center Co., LTD.	Foundation	Apr. 1, 2002	Kyushu Institute of Technology and other universities in the Northern Kyushu region
	Nagasaki Technology Licensing Organization	Corporation	Oct. 15, 2004	Nagasaki University and other universities in Nagasaki prefecture
	Kumamoto Technology and Industry Foundation	Foundation	Aug. 30, 2001	Kumamoto University and other universities in Kumamoto prefecture
	Oita Technology Licensing Organization, Ltd.	Limited company	Aug. 26, 2003	Oita University and other universities in Oita prefecture
	Miyazaki TLO	Corporation	May. 16, 2003	The University of Miyazaki and other universities in Miyazaki prefecture
	Kagoshima Technology Licensing Organization Co., Ltd.	Corporation	Feb. 19, 2003	Kagoshima University and other universities in Kagoshima prefecture
Internal -type (15)	Keio University Intellectual Property Center	School corporation	Aug. 26, 1999	Within the university organizations
	Tokyo Denki University Center for Research Collaboration	School corporation	Jun. 14, 2000	Within the university organizations
	RIDAI-SCITEC	School corporation	Sep. 30, 2003	Within the university organizations
	Nihon University Business, Research and Intellectual Property Center (NUBIC)	School corporation	Dec. 4, 1998	Within the university organizations
	NMS-TLO Center	School corporation	Feb. 19, 2003	Within the university organizations
	Meiji University Intellectual Property Center	School corporation	Apr. 25, 2001	Within the university organizations
	Waseda University Intellectual Property Center	School corporation	Apr. 16, 1999	Within the university organizations
	Gunma University TLO	National university corporation	Dec. 18, 2007	Within the university organizations
	Organization for Academic-Industrial Collaboration and Intellectual Property, Chiba University	National university corporation	Jul. 7, 2006	Within the university organizations
	Office of Industry Liaison, Tokyo Institute of Technology	National university corporation	Apr. 2, 2007	Within the university organizations
	Liaison Office, the University of Toyama	National university corporation	Jun. 12, 2007	Within the university organizations
	Saga University TLO	National university corporation	Jul. 7, 2005	Within the university organizations
	Industry-Government-Academia Collaboration Group, Nara Institute of Science and Technology	National university corporation	Dec. 18, 2007	Within the university organizations
	Research Support and Intellectual Property Headquarters, Tokai University	School corporation	Mar. 21, 2008	Within the university organizations
	TechnologyLicensing Organization, Intellectual Property Division,Tokyo Medical and Dental University	National university corporation	Mar. 31, 2008	Within the university organizations

- Smooth implementation of intellectual property-related activities -

To encourage the practical use of R&D results obtained at universities, research institutions, etc., JST offers a series of comprehensive programs covering the identification of exceptional research

results, support for patenting, etc. JST comprehensively implements the Technology Transfer Support Center projects which support technology transfer-related activities. Such projects include: support of strategic international patenting of research results obtained at universities; rendering of development services and licensing of research results including patents; fostering of human resources who should play the fundamental part of these activities; and promotion of newly building the connecting mechanism through evaluation and analysis of applications and expansibility of research results. Furthermore, concerning research results of universities and public research institutes, JST implements various R&D programs (including the creation and support for start-ups from universities) according to technology phases or styles of technology transfer, and it also implemented a program to promote development utilizing innovative R&D-type venture businesses.

(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 1,500 such venture companies have so far been established nationwide. JST implemented the Pre-Venture Project [literal translation] since FY 1999 and the Creation and Support Program for Start-ups from Universities since FY 2003 as part of its effort to support research

related to the creation of university-based start-ups, with 64 new such start-ups established by the end of January 2008.

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.

MAFF, with a view to promoting the creation of new industries and foundation of start-up companies, provides support to R&D projects by researchers at private enterprises, universities, etc. that aim to found biotechnology venture companies by taking advantage of their unique ideas and research seeds.

METI provides support for not only promoting quantitative expansion, but qualitative enhancement in building networks for supporting university-launched venture businesses by executing the Program for Development of Wide-Area Network for Supporting New Businesses [literal translation].

(5) Promotion of R&D by private enterprises

It is private enterprises that create market value from the results of R&D and industry-academia-government collaboration in the form of new products and achieve ultimate realization of innovations. Therefore, it is important to revitalize R&D activities of private enterprises.

The government, while respecting the principle of voluntary efforts by private enterprises, stimulates their motivation by utilizing a tax system that facilitate R&D and enhancing technology development support programs that reduce the risks involved in the R&D process that leads up to commercialization.

(Promotion of private-sector R&D activities through tax system)

To promote R&D by the private sector, various preferential tax measures are provided as shown in the table below. In the 2008 outline of the tax system revision, for the tax credit for experiment and research expenses, measures that allow the selection and application of tax deductions related to experiment and research expenses for which the ratio of the expenses in tax deduction or sales amount related to increased amount of experiment and research expense exceeds 10% was included as a two-year special measure to be in place until FY 2009, in addition to the conventional measure which deducts a certain percentage of gross experimental and research expenses from taxable income (Table 2-3-10).

Table 2-3-10 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 (1) 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. (2) Same for individual businesses (Income tax) II. Special Tax Credit on special research and development expenditures (1) For joint research and development with, or research and development commissioned to, universities and public research institutes (including independent administrative institutions), consistent with item I above, the tax credit amount is a value equivalent to 12% of these research and development expenses (but limited to a value equivalent to 20% of corporation tax with the special tax credit from item I. above added in). (corporation tax) (2) Same for individual businesses (Income tax)	Special Taxation Measures Act, Article 10 (income tax), Article 42-4, Article 68-9 (corporation tax), Local Tax Act, Supplementary Provision, Article 8, Item 1.	Enacted in FY2003
		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) (corporation tax). (2) Same for individual businesses (Income tax) (3) 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 (1) Either of the following (a) or (b) will be selected and applied (but limited to a value equivalent to 10% of corporation tax, apart from (a)or (b) (corporation tax) (a)The research credit is 5% of the		Enacted in FY 2008 (Effective through FY2009)

		excess of research expenses over the base amount provided that the base amount in I or III exceeds the average of annual research expenses for the previous three business years and the annual research and development expenses for the previous two business years (b) When the amount of experimental and research expenses exceeds the amount equivalent to 10% of sales amount, a specified ratio of the excessive amount will be deducted from the tax. (2)Same for individual businesses (Income tax)		

(Promoting private-sector research activities through investment and loans)

To promote research activities in the private sector, investment and loan systems for technology development are implemented by various government-affiliated organizations. The following section introduces some of the main examples.

- Development Bank of Japan

The Development Bank of Japan implements the new technology R&D loan program to provide long-term, low-interest loans to finance development costs related to new technologies in the fields designated as policy priorities by the Third Science and Technology Basic Plan, in order to enhance the international competitiveness of Japanese industry through the foundation of start-up companies based on new technologies.

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

1) Innovation commercialization support program [literal translation]

To support efforts for development intended for commercialization of technology seeds owned by private enterprises and universities, government subsidies are provided through NEDO to private enterprises and TLOs, which execute development for commercialization in the fields designated as policy priorities by the Third Science and Technology Basic Plan, with due consideration for the status of utilization of other management resources. The provision of the subsidies is conducted after information concerning the status of the fund recipient enterprises' management of intellectual property is obtained from their managers to ensure their management (intellectual property management) makes the maximum use of the research results.

2) System for supporting private-sector infrastructure technology research [literal translation]

In order to promote experimental research into infrastructure technologies conducted in private sectors related to the mining, manufacturing, electro communications and broadcasting industries, applications were accepted: subjects concerning electro-communications and broadcasting technologies are continuously supported through NICT, and those concerning mining and manufacturing technologies through NEDO under the contract research program.

3) Industrial technology research development program (SME-support type) [literal translation]

With a purpose of commercializing advanced technology seeds owned by SMEs, technology development was conducted through join research with public research institutions under contract programs. More specifically, research applications related to an inspection and measuring equipment to be procured by AIST, which received the commission, were accepted, and the procured equipment

was commercialized and market launched by the adapted research projects in cooperation with SMEs.

(Support program for intellectual fusion (Intellectual Café)

METI compiled the collection of practices concerning advanced intellectual fusion and, as part of its dissemination activities concerning the fusion of different-field technologies and intellectual fusion, which are required for creating innovation, held the Intellectual Café International Symposium under the co-sponsorship with the Organization for Economic Cooperation and Development (OECD) for the first time in Tokyo in November 2007.

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

In order to support to create new industries and businesses in the agriculture, forestry, fisheries, and food sectors and resolve various problems and policy issues faced by the food industry, the development of new technologies conducted by private enterprises is promoted through collaborations with universities and public organizations by utilizing technology seeds owned by such organizations.

(Program for 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, beverage/food and brewing industries.

(Small Business Innovation Research system)

The Small Business Innovation Research (SBIR) system is intended to provide consistent support to R&D activities of small and medium-sized enterprises (SMEs) and commercialization of their research results through inter-ministerial collaboration. Under this system, efforts are underway to increase opportunities for providing subsidies and paying entrustment fees 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 2007, seven ministries of MIC, MEXT, MHLW, MAFF, METI, Ministry of Land, Infrastructure and Transport (MLIT) and ENV designated a total of 89 cases as eligible for special subsidies, and set the goal of providing about 39 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 people's 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.

Regional promotion of S&T was designated as a priority matter by the First Science and Technology Basic Plan, and it was required that industry-academia-government collaboration be promoted in regions in accordance with the Basic Guideline on Revitalization of Regional Science and Technology Activities, which was decided by the Prime Minister in December 1995.

As regional promotion of S&T becomes increasingly important as described above, 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 (Tables 2-3-11 and 2-3-12).

Table 2-3-11 Science and Technology Councils Established at Local Governments

Prefecture/ designated city	Name
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 Headquarter (September 1999 -)
Saitama	Saitama Science and Technology Council (January 1995 -)
Chiba	Chiba Science Council (November 1994 -)
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)
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)

Kagawa	Kagawa Science and Technology Council (August 1997 -)
Ehime	Ehime Science and Technology Promotion Council (July 2001 -)
Tokushima	Tokushima Forum for the Promotion of a Vision for a 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 City Council for Promotion and Planning of Industry, Science, and Technology (May 2000 -)
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)

Table 2-3-12 Science and Technology Promotion Policies at Local Governments

Prefecture/ designated city	Name
Hokkaido	Guidelines for Promoting Science and Technology in Hokkaido (March 2000 -)
Aomori	Guidelines for Promoting Industry, Science and Technology in Aomori Prefecture (December 1998 - March 2007)
Akita	Basic Concept for Science and Technology in Akita Prefecture (June 2000 -)
Iwate	Guidelines for Promoting Science and Technology in Iwate Prefecture (May 1990 - October 2000) -New Guidelines for Promoting Science and Technology in Iwate Prefecture (November 2000 -)
Miyagi	Guidelines for Promoting Science and Technology in Miyagi Prefecture (March 1999 -)
Yamagata	General Outline of Science and Technology Strategies in Yamagata Prefecture (FY1999-FY2005) -General Outline of Science and Technology Strategies in Yamagata Prefecture (FY2006-FY2015)
Fukushima	General Outline of Science and Technology Strategies in Fukushima Prefecture (March 2002 -)
Ibaraki	General Outline of Science and Technology Strategies in Ibaraki Prefecture (March 1994 - February 2005) -Guidelines for Promoting Science and Technology in Ibaraki Prefecture (March 2005 -)
Tochigi	Tochigi Guidelines for Promoting Science and Technology in Tochigi Prefecture (December 1998 -)
Gunma	Guidelines for Promoting Science and Technology in Gunma Prefecture (March 1999 -)
Saitama	Saitama First Saitama Technology Policy for the 21st Century (February 1998 - March 2007) -Second Saitama Technology Policy for the 21st Century (April 2007 - March 2012)
Chiba	General Guidelines for Chiba Science Plan (February 1996 -)
Tokyo	Tokyo Metropolitan Government Guidelines for the Promotion of Industrial Science and Technology (February 2004 - March 2009) -Tokyo Metropolitan Government Guidelines for Promotion of Science and Technology (Revised Version) (April 2008 - March 2013)
Kanagawa	Kanagawa General Guideline for Kanagawa Science and Technology Sixth Plan (May 1990 -,January 1997 -, March 2002 -, February 2007 -)
Niigata	General Outline of Science and Technology in Niigata Prefecture (March 1998 -)
Toyama	Toyama General Guidelines for Toyama Science and Technology (October 1991- March 2001) -New Toyama Prefecture Science and Technology Plan (FY2001-FY2010) -New Toyama Prefecture Science and Technology Plan (Revised Edition) (FY2007-FY2015)
Ishikawa	Guidelines for Promoting Industry, Science and Technology in Ishikawa Prefecture (February 1999-February 2005) -Ishikawa Innovating Industry Strategies (March 2005 -)

Fukui	Guidelines for Promoting Science and Technology in Fukui Prefecture (January 1998-February 2005) -Basic Policy for Creating a Leading-Edge Technology Mecca (March 2005 -)
Yamanashi	Yamanashi Science and Technology Sixth Plan (March 1992 -) / Yamanashi Plan for Promoting Science and Technology (March 1999-February 2008) - Yamanashi Science and Technology Basic Plan (March 2008-March 2013)
Nagano	Nagano Prefecture Guidelines for Promotion of Science and Technology (April 2000 -)
Gifu	Basic Strategies for Science and Technology in Gifu Prefecture (March 1997 - February 2002, March 2002 - February 2007) -Plan for Promoting Science and Technology in Gifu Prefecture (March 2007 - February 2012)
Shizuoka	Vision for Promoting Science and Technology in Shizuoka Prefecture (February 2000 - March 2010)
Aichi	General Guidelines for Promoting Science and Technology in Aichi Prefecture (March 1999 -)
Mie	Vision for Promoting Science and Technology in Mie Prefecture (July 1999 -)
Shiga	Shiga Science and Technology Plan (October 2004 -)
Kyoto	Promotion Plan for Industry and Technology in Kyoto (February 1995 -)
Osaka	Osaka Research and Development Charter Guidelines for Industry, Science and Technology in Osaka (March 1988 - February 1998) -Guidelines for Promoting Industry, Science, and Technology in Osaka (March 1998 - February 2006) -Strategies Promoting Science and Technology in Osaka Metropolitan Area (March 2006 -)
Hyogo	General Guidelines for Hyogo Science and Technology Sixth Plan (March 1991- February 1998) -New General Guideline for Hyogo Science Technology Plan (March 1998 -)
Nara	Guidelines for Promoting Science and Technology in Nara Prefecture (April 2003- March 2008, April 2008 -)
Wakayama	Vision for Promoting Science and Technology in Wakayama Prefecture (March 2000 -)
Tottori	Investigative Report on the Promotion of Science and Technology in Tottori Prefecture (March 1998 -)
Shimane	Guidelines for Promoting Science and Technology in Shimane Prefecture (March 1999 -)
Okayama	Guidelines for Promoting Science and Technology in Okayama Prefecture (March 1998 -)
Hiroshima	Fundamental Principles of the Promotion of Science and Technology in Hiroshima Prefecture (November 1993 -)
Yamaguchi	Yamaguchi Guidelines for the Promotion of Science and Technology in Yamaguchi Prefecture (March 1994 -)
Tokushima	Vision for Promoting Science and Technology in Tokushima Prefecture (March 1999 - March 2007, April 2007 -)
Kagawa	Vision for Promoting Science and Technology in Kagawa Prefecture (March 1997- March 2001, March 2001-March 2006)
Ehime	Guidelines for Promoting Science and Technology in Ehime Prefecture (March 2001-Revised in May 2007 -)
Kochi	Guidelines for Promoting Science and Technology in Kochi Prefecture (March 1998 -)
Fukuoka	Guidelines for the Creation of a S&T Fukuoka Prefecture (March 1999 -)
Saga	Vision for Promoting Science and Technology in Saga Prefecture (March 1997 -)
Nagasaki	Vision for Promoting Science and Technology in Nagasaki Prefecture (June 1998 -)
Kumamoto	Kumamoto Guidelines for Promoting Science and Technology in Kumamoto Prefecture (May 1999-February 2004, March 2004 -)
Oita	Guidelines for Promoting Science and Technology in Oita Prefecture (April 2003-March 2013)
Miyazaki	Guidelines for Promoting Industry, Science, and Technology in Miyazaki Prefecture (March 2001 -)
Kagoshima	Guidelines for Promoting Science and Technology in Kagoshima Prefecture (March 2003 -)
Okinawa	General Guidelines for Science and Technology Promotion in Okinawa Prefecture (February 2000-July 2005) -Guidelines for Promoting Science and Technology in Okinawa Prefecture (2005-2011)
Sapporo City	Vision for Promoting Science and Technology in Sapporo City (June 2004 -)
Kawasaki City	Guidelines for Promotion of Science and Technology in Kawasaki City (March 2005 -)
Yokohama City	Guidelines for Promoting Science and Technology in Yokohama City (August 1999 -)
Kyoto City	Concept for Super Technology in Kyoto City (March 2002-2010) / Plan for Promoting Industrial Science and Technology in Kyoto City (October 2006 -2010)
Osaka City	Plan for Promoting Industrial Science and Technology in Osaka City (March 2000 -)
Hiroshima City	Hiroshima City Science and Technology Policy (June 2003 -)
Kitakyushu City	Brief Guidelines for Promotion of Science and Technology in Kitakyushu City (August 2003 -)
Fukuoka City	Vision for Promoting Science and Technology in Fukuoka City (June 2002 -)

The Second Science and Technology Basic Plan stipulated that in order to effectively and efficiently realize the establishment of Knowledge Clusters[fn.4] under regional initiatives, the government should promote R&D activities programs including joint research programs, and endeavor to enhance the functions for developing and retaining human resources and transferring technologies. The Third Science and Technology Basic Plan calls for competition-based support for activities related to the formation of clusters under regional initiatives so as to establish regional systems for innovation and build communities full of vitality. 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 S&T-relate measures in regions.

Described below is an overview mainly of measures promoted by the government to support regional S&T promotion.

(1) Formation of regional clusters

(Efforts toward formation of Knowledge Clusters)

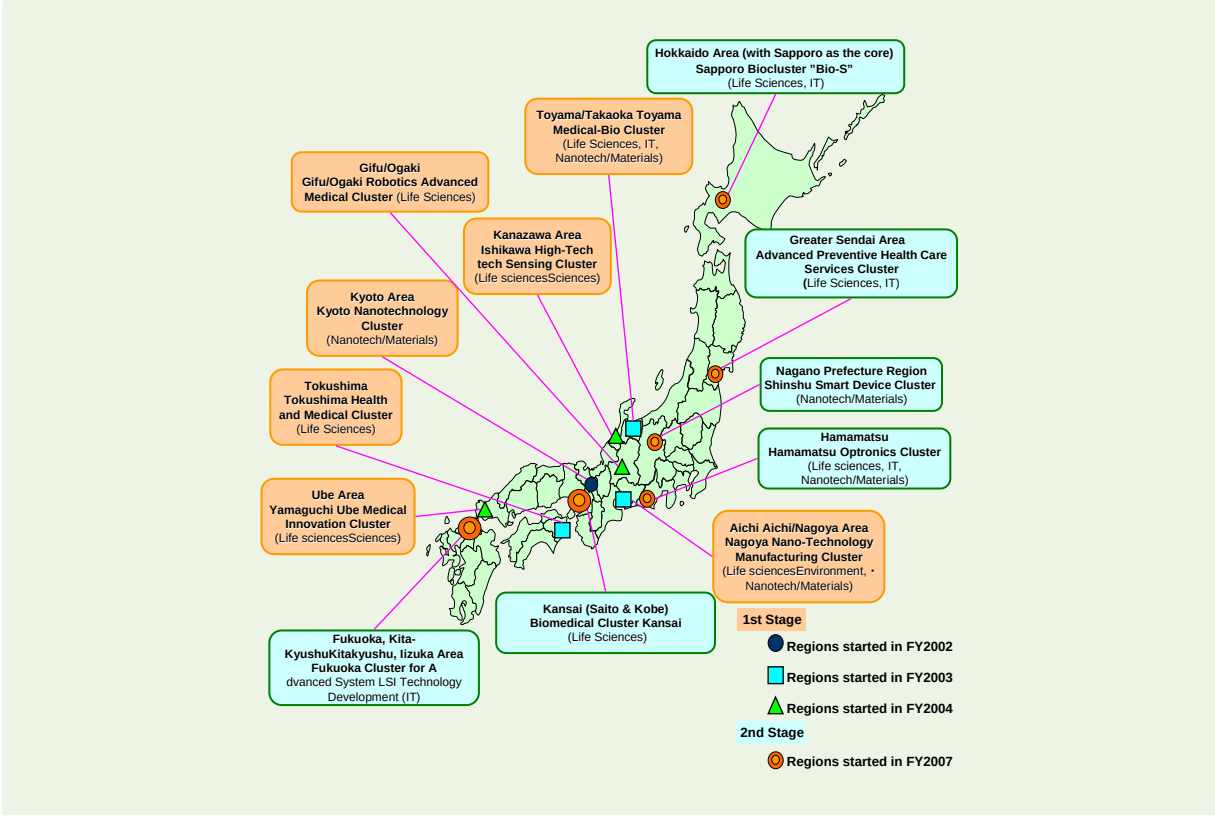
1) Efforts toward formation of world-class clusters

MEXT implemented the Knowledge Cluster Initiative: The First Stage since FY 2002: in FY 2007, projects in seven regions were implemented. In this Initiative, S&T coordinators are allocated to the knowledge cluster headquarters set up at the regions' core research organizations, which serve as the command offices. They oversee the implementation of activities such as industry-government-academia joint research for the purpose of creating new technology seeds based on corporate needs, promotion of commercialization of research results.

In FY 2007, the Second Stage was started, based on the achievements of the First Stage. It strongly promotes formation of the world-class clusters from the viewpoint of “selection and concentration” while encouraging regional autonomy (Figure 3-3-13), and newly adopted 6 regions (Figure 2-3-13).

fn. 4 Knowledge Cluster is a system for technological innovation organized by local initiative around universities and other public research institutions with original R&D topics and potential with the participation of companies inside and outside the region. This system, by forming a human network and a joint research, causes innovative technology seeds owned by the core research organization and users’ needs for commercialization to interact with each other and creates a chain of technology innovation, which would lead to the creation of new industries.

Figure 2-3-13 Map of Knowledge Clusters: The First/Second Stage



2) Efforts toward formation of clusters featuring local characteristics

Since FY 2002, MEXT implemented, from the viewpoint of taking advantage of the individuality of regions, the City Area Program, which aims to create new businesses and foster R&D-oriented regional industries by producing new technology seeds with the use of the "wisdom" of universities. This program has two categories of Basic Stage and Development Stage. The Development Stage (results-oriented type) is conducted in regions where its implementation at the Basic Stage has been completed with outstanding results. A total of 69 regions have been funded under this program by FY 2007.

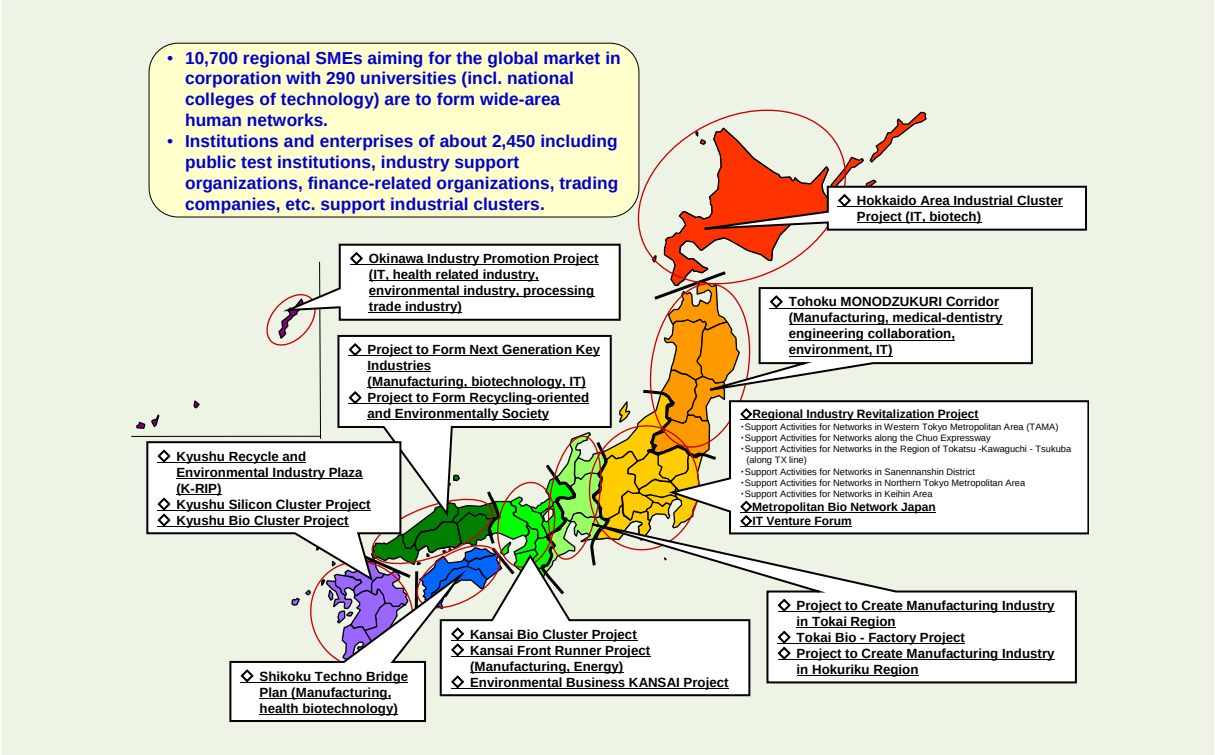
(Efforts toward formation of Industrial Clusters[fn.5])

METI's Industrial Cluster Project involves the regional Bureaus of Economy, Trade, and Industry as the hubs of the formation of wide-area human networks of industry, academia, and government, including local enterprises, universities, etc., aiming for participation in world markets, and that uses comprehensive and 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 cluster including 17,000 SMEs having ambitions to enter into world markets, universities, public test and research institutions, industry supporting institutions, institutions related to finance and trading companies, dramatically improving quality and quantity of information being distributed among industry, academia and government and complementing management resources such as

fn. 5 Industrial Cluster is a system that takes the technological innovation of universities and other public research institutions, and of business enterprises in the surrounding area, and encourages wider area cooperation between universities and business enterprises, and between different enterprises, to create a chain reaction of innovation and creation of new businesses and industries.

technologies, management information, and marketing channels, thus supporting technology development that makes the best use of regional characteristics. For the industrial cluster measures, promotion organizations have been established for each project, which promote formation of the industry-academia-government network (Figure 2-3-14). Additionally, subsidies are provided to a promotion organization and other organizations (core organizations) which support the creation of new enterprises through the formation of human net-works in certain regions and sectors, and the deployment of cluster managers who comprehensively coordinate cluster's activities.

Figure 2-3-14 Industrial Cluster Project: 18 Projects (The Second Stage)



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

(Collaboration between the Knowledge Cluster Initiative and the Industrial Cluster Project)

MEXT works to promote joint research, etc. 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 collaboration projects among industry, academia, and government, such as technology development that leads to practical applications, focusing on business enterprises.

The two ministries cooperatively enhance industry-academia collaboration in regions, provide new technology seeds and feed back information concerning market needs to R&D activities.

MEXT implements to provide opportunities for information sharing and opinion exchange among persons related to the two ministries, and they hold regional meetings of the joint achievement rollouts of projects implemented by themselves. In addition, in FY 2007, MEXT held the Cluster Japan 2007, which holds symposiums to discuss promotion measures of the cluster policy as well as exhibits achievements of the nationwide clusters in Tokyo, and also held the Regional Cluster Seminars for discussing strategies for forming clusters set out by respective regional areas in three locations in Japan.

In addition, close collaboration among ministries and agencies concerned is being promoted through CSTP's Collaboration Program of Science and Technology Projects and the Inter-ministry Liaison Conference on Regional Science and Technology [literal translation] and the Regional Block

Conference on Regional Science and Technology [literal translation].

(Various measures for regional S&T promotion)

Government ministries and agencies implement various measures for regional S&T promotion (Table 2-3-15). Main measures concerned are as follows:

Table 2-3-15 Major Regional Science and Technology Promotion Measures

Ministry	Item	Outline
Ministry of Internal Affairs and Communications	Strategic Information and Communications R&D Promotion Programme (Research and Development Promoting Info-Communications Technology for Community Development)	Joint research with SMEs, universities and other organizations which implements R&D in the telecommunication field that contribute to creation of new industries, development of local industries, vitalization of communities, etc. is promoted.
Science and Technology Policy Bureau, Ministry of Education, Culture, Sports, Science and Technology	Knowledge Cluster Initiative (1st and 2nd Stage)	13 clusters (15 regions) were selected nationwide to create internationally competitive knowledge-centered systems for technological innovation (Knowledge Clusters). Knowledge Clusters will be organized closely around the knowledge creation bases, which consist of universities or public research institutions. Other related public institutions and R&D firms are also expected to come into this program. Proper attention to the autonomy of local governments should be paid in the whole process.
	City Area Program	Through local independence, new technology seeds can be created by utilizing the "wisdom" contained in universities, achieving new industry creation and the development of R&D-type local industries. In addition, it is hoped to establish an independent and on-going industry-academia-government collaboration.
	Comprehensive Support Programs for Creation of Regional Innovation (JST project)	As a hub for JST Innovation Plazas and Innovation Satellite being developed throughout Japan, the collaboration between basic research and technology transfer projects in local governments, Bureaus of Economy, Trade and Industry, and JST is promoted to support creation of regional innovation comprehensively by continuous implementation of R&D toward stages from investigation of seeds to practical application. This program includes the "Science and Technology Incubation Program in Advanced Regions" and the "Collaboration of Regional Entities for the Advancement of Technological Excellence," which aim to create regional innovation in such organic collaboration.
Forestry and Fisheries Research Council Secretariat, Ministry of Agriculture, Forestry and Fisheries	Research Project for Utilizing Advanced Technologies in Agriculture, Forestry and Fisheries	Promotes R&D in agriculture, forestry and fisheries closely related to site of production and other relevant distribution and process, etc. by proposals.
Ministry of Economy, Trade and Industry	Regional consortium research and development Subsidies for research and development for creating new industries in the region Regional resources utilization type research and development	Research and development by a joint research system by an Industry, Academia and Government consortium is implemented by utilizing technology seeds and wisdom contained in universities. Supports high-risk research and development for expanding new lines of business by SMEs or starting businesses by ventures. Implement R&D for commercialization by utilizing regional resources (products, technology, and techniques) through industry-academia-government joint research entities in respective regions.

Environmental Policy Bureau, Ministry of the Environment	Research Funds for the National Organization for Pollution Prevention (Environment research to meet regional needs)	Implements joint research among national experimental research institutions, incorporated administrative research institutes and other public research institutions on research subjects where local needs are great and investigation into local environmental characteristics are required.
	Promotion funds for research and development and others (framework of research and development issues to utilize regional identity/characteristics)	Implements research and development issues to utilize regional identity/characteristics for developing specific advanced environmental technology promotion and regional environmental business through promotion concentrating on regional research and development.
	Model Project for Establishment of Environmental Technology Development Infrastructure through Industry-Academia-Government in Regions	To promote infrastructure development of environmental technology development through Industry-Academia-Government in Regions, the following projects were implemented: (1) formation of network of environmental technology development personnel in regions; (2) settlement of regional environmental issues by utilizing regional resources through industry-academia-government collaboration and development of environmental technologies utilizing local industries; and (3) dissemination of the results throughout Japan.

1) MIC

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

2) MEXT

MEXT provides support for the creation of innovation in regions through JST's Comprehensive Support Programs for Creation of Regional Innovation of the Japan Science and Technology Agency, by using JST Innovation Plazas and Innovation Satellites (eight locations nationwide) as footholds for ensuring a consistent flow of R&D activities from the discovery of seeds to commercialization while maintaining collaboration among local governments, regional bureaus of economy, trade and industry and people involved in basic research and technology transfer projects conducted by JST.

3) MAFF

Under the Research Project for Utilizing Advanced Technologies in Agriculture, Forestry and Fisheries, which aims to promote in-the-field experiments and research in the agriculture, forestry, and fisheries sector, a research type was established in FY 2006 in order to promote regional R&D activities through industry-academia-government collaboration. Moreover, for achieving contribution to development of agriculture, forestry and fisheries and to vitalize regional economy, regional biotechnology consultation forums 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 forums.

4) METI

In order to create new regional industries and businesses, advanced R&D is being implemented under a strong joint industry-academia-government research system (regional rebirth consortium) utilizing technology seeds and knowledge of universities. In addition, the ministry implements

projects to support SMEs advancing into new sectors, and high-risk R&D by entrepreneurial ventures. Furthermore, through the industry-academia-government joint research entities, the ministry implements R&D for commercialization, which leads to development of new products by utilizing regional resources including products, technologies and techniques.

AIST invited researchers who understand the needs of regional SMEs from public experiment and research organizations (31 researchers were invited in FY 2007) and cooperated with engineers of such enterprises when necessary to resolve technical problems faced by them in joint research programs and develop products based on technologies owned by AIST.

5) MLIT

In order to facilitate collaboration between industry, academia and government in various R&D programs that will contribute to the enhancement of international competitiveness, the realization of a safe and secure society, and solution of environmental problems, and to further promote the utilization of research results, the Fifth Advanced Technology Forum for Land, Infrastructure, and Transportation [literal translation] was held in Takamatsu in February 2008, with representatives of local industry, academia, and governments, as well as representatives of the Ministry and relevant research institutions attending. Under the Construction Technology Research and Development Subsidy Program, which is a competitive funding program, proposals for commercialization-stage R&D research themes that meet local needs are publicly invited, with subsidies provided to excellent proposals that utilize industry-academia-government collaboration.

6) ENV

ENV implements the local environmental research, which carries out joint research with the national, incorporated 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 featuring local individuality and characteristics in all technology fields covered by the commercialization R&D program sponsored by the Environmental Research and Technology Development Fund. Furthermore, in model regions, the ministry implemented the model project for establishment of environmental technology development infrastructure through industry-academia-government collaboration in respective regions.

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

The relevant government ministries implement various measures directed at public experimental research institutions. These measures are summarized in Table 2-3-16.

Table 2-3-16 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 researches and developments on priority issues
Ministry of the Environment	•Promotes joint research with the environment laboratory, etc., of local governments (prefectural or city governments), to contribute toward the preservation and improvement of the local environment •The National Environmental Training Institute offers training for local governmental officers, etc., for the objective of training in analytical relationship technologies, etc.

(Interregional collaboration and exchanges)

The following measures are being implemented in order to encourage collaboration and exchanges between the national government and local government authorities, as well as between different regions.

1) Research exchange and other programs of the Japan Association for the Advancement of Research Exchange Cooperation JAREC

JAREC was established in June 1992, based on funds provided by local government authorities, with the aim of supporting research exchanges and promoting regional research about S&T. This association implements various research support programs and nationwide research exchange programs for regions commencing cutting edge or basic research.

2) Industrial technology liaison council

The Industrial Technology Liaison Council [literal translation] was established in 1954 in order to strengthen cooperation among public research institutions and/or with national research institutions in relation to mining and manufacturing technology, to effectively promote experiments and research between institutions, and thus to improve industrial technologies. The Council is composed of six technology councils, eight regional councils, and eight regional conferences, and it implements research collaboration, information exchanges among public research institutions as well as with AIST.

(Consolidation of R&D bases)

The current Comprehensive National Development Plan: Grand Design for the 21st Century (Cabinet Decision: March 31, 1998) places priority on networking and R&D investments directed at organizations representing industry, academia, and the government. The plan promotes the development of the Tsukuba Science City and the Kansai Science City, and sets forth the development of new R&D bases of an international standard that will serve as the nucleus for the establishment of far-reaching international exchange areas.

1) Tsukuba Science City

Tsukuba Science City was created as a base to achieve balanced development of the entire Tokyo Metropolitan area and to provide research and education of a high standard, and to promote S&T and

also to enhance advanced education, as a part of national government policy. At present, 31 institutions, including national research and education institutions, as well as many private-sector research institutions, are located in the city. They promot research diplomacy, establishment of international research exchange functions, and many other measures for creating new industries.

2) Kansai Science City

The Kansai Science City is now under construction with the purpose to construct a city that should play the center role of culture, learning and research, thereby contributing to development of Japan's and the World's culture, learning and research as well as development of national economy according to the Construction Promotion Act for Kansai Science City (Act No. 72, 1987). At the end of FY 2007, a total of about 270 facilities, including private sector research facilities, were established and operating within the city.

5 Effective and Efficient Implementation of R&D

(1) Effective use of research funds

(Elimination of waste in fund allocations)

In order to promote appropriate and efficient use of research funds, CSTP in August 2006 decided upon its measures to prevent the inappropriate use of research funds. In October 2007, follow ups were conducted and it was confirmed that all related ministries and agencies conducted measures for preventing fraudulent use including maintenance and concretization, effective and efficient inspection of rules through formulation of guidelines, and that they improved systems to responsibly grant research funds only to research institute which can control the research funds.

e-Rad website

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, based on the view that stronger management and supervision of research funds are essential for preventing misuse of funds. In November 2007, the reports were submitted from about 1,600 institutions, and analysis thereof is now under way. In addition, MEXT intends to endeavor to prevent misuse of public research funds by on-site inspections with the purpose of deepening understanding on the Guidelines and grasp the present status of system improvement, establishment of investigative commissions concerning management, and audits of public research funds at research institutions composed of external experts, and other measures.

In addition, unreasonable overlapping allocations and excessive concentration of funds over one's effort must be eliminated. As a specific action, pursuant to the Operation and System Optimization Plan for R&D Administration [literal translation], the government advanced development of the Information System for the Cross Cabinet and Ministry Research and Development: e-Rad (URL: http://www.e-rad.go.jp/) by designating MEXT as the ministry responsible for the development and operation of the system under collaboration of related ministries and agencies, and the ministry started operations in January 2008.

As well, 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.

(2) Emphasis on 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, it is necessary to attach more importance to the development and utilization of human resources in the allocation of competitive research funds.

As a way to support young researchers, MEXT's Grants-in-Aid for Scientific Research program endeavors to expand its funds for young researchers with the newly launched Grant-in-Aid for Young Scientist (S) in FY 2007. Measures continued from the previous year to support young researchers include MIC' Strategic Information and Communications R&D Promotion Programme, MHLW's Health and Labour Sciences Research Grants, MAFF's Program for Promotion of Basic Research for Creation of New Technologies and New Sectors, METI's Grant for Industrial Technology Research, and ENV's Environmental Technology Development Fund.

(3) Reform of evaluation systems

To promote S&T, it is important to conduct appropriate evaluation, which stimulate researchers and encourage outstanding R&D activities. Effective evaluation will increase the efficiency and vitality of R&D activities, facilitate better R&D achievements, and nourish superior researchers. Evaluation also offer benefits to society and the economy, and also serve to provide accountability to the public.

All ministries and agencies conduct evaluation 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: March 29, 2005). MEXT, which accounts for more than 60% of the government's total S&T-related expenses, established the Guideline for Evaluation of Research and Development in MEXT (Minister of MEXT Decision: September 26, 2005). To cite an example of evaluation based on this guideline, MEXT conducts prior evaluation of key items of its budget requests by utilizing external evaluation and uses them as the criteria for judging the appropriateness of its budget requests. Interim and post evaluation are also conducted appropriately.

Meanwhile, independent administrative institutions and national universities conduct evaluation of their performance in accordance with the Act on General Rules of Incorporated Administrative 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, 2001).

Meanwhile, SCJ implemented studies on approaches for research evaluation.

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

When promoting S&T, it is very important to develop a institutional environment that facilitate active personnel exchanges, smoother implementation of research activities and dissemination of research results to society for increasing 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, CSTP compiles 66 reform topics across seven titles below. In FY 2007, the Council conducted follow-ups on respective titles:

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 environment to promote the activities of female researchers

6. Comprehensive support for clinical research including trials
7. Improving the public's understanding of science

3 Reinforcing the Platform for Promoting Science and Technology

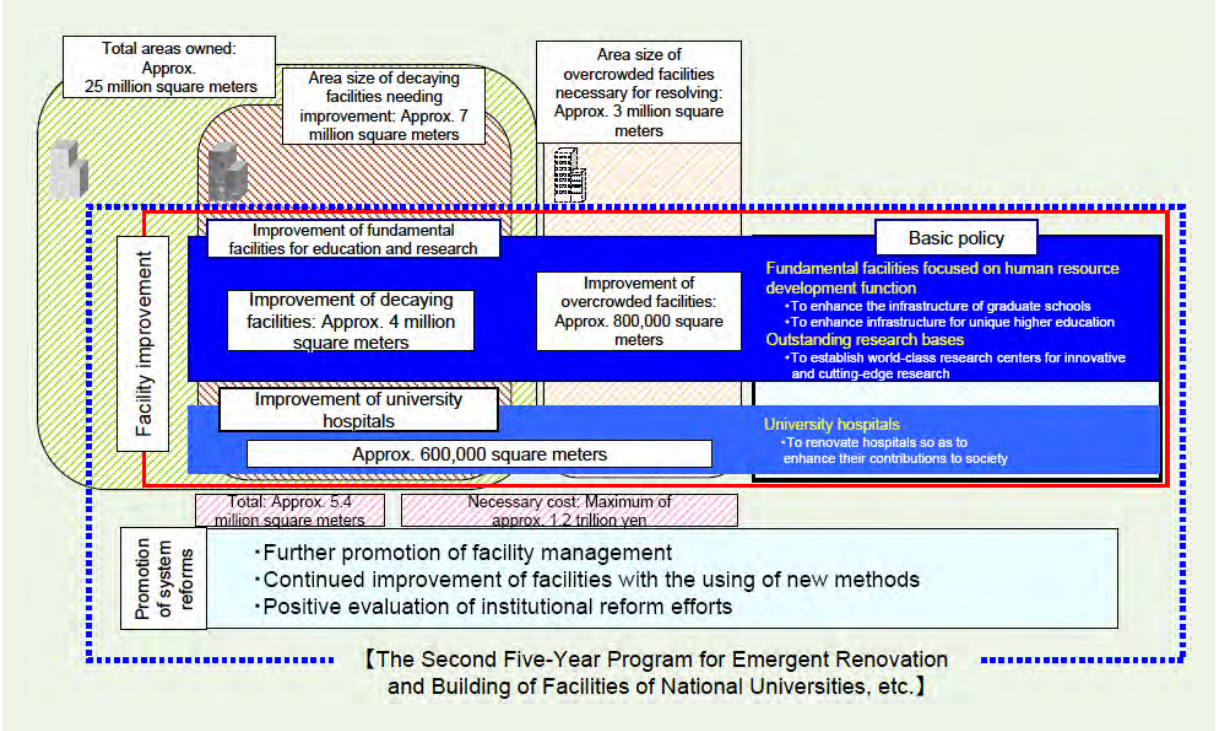
1 Strategic and Prioritized Improvement of Facilities and Equipment

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

Facilities of national universities are centers of activities for unique and state-of-the-art academic R&D of human resources rich in creativity, and constitute an essential foundation of Japan's aim to become an advanced science and technology-oriented nation by developing world-leading human resources and promoting creative and cutting-edge R&D.

Based on the Third Science and Technology Basic Plan, MEXT in April 2006 established the Second Five-Year Program for Emergent Renovation and Building of Facilities of National Universities, etc., 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 (Figure 2-3-17).

Figure 2-3-17 The Second Five-Year Program for Emergent Renovation and Building of Facilities of National Universities, etc.: FY 2006 to 2010



This program places the refurbished of deteriorated facilities as the top priority task: it seeks to regenerate facilities that form the platform of the development of excellent human resources and outstanding research centers where world-class advanced research is conducted by improving deteriorated facilities and resolving the crammed conditions of facilities. 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 1.48 million square meters by FY 2007. Furthermore, MEXT implemented surveys and research on approaches to PFI projects, and intends to

continue studies on introduction of PFI projects required for improvement of national university facilities. Furthermore, along with improvement of facilities, MEXT decided to further promote system reformations using new methods including facility management that seeks for efficient and flexible use of facilities, and improvement of facilities by accepting donations.

(2) Improvement of facilities of national universities and public research organizations

In order to promote academic research, it is essential to improve facilities that form the platform of research activities. With regard to the improvement of research facilities, MEXT held discussions to improve academic research facilities at national, public and private universities at the working group for academic research facilities, which was established under the Council for Science and Technology, and subsequently issued a report in June 2005.

In light of the report, the government endeavors to provide more effective support for projects to improve facilities that are planned as research platform from mid- to long-term perspectives and those that are necessary for promoting unique research based on facility master plans of national university corporations.

(3) Improvement of facilities and equipment of private universities

It is critical for Japan to improve the research environment, such as facilities and equipment, necessary for promoting advancement of academic research. Private universities, which account for about 80% of Japan's higher education, have been greatly contributing to the advancement of higher education by serving as a diverse source of researchers and by actively engaging in unique research activities, and expectations for their role are growing.

In light of this situation, MEXT endeavors to enhance the platform of private universities' research by implementing the Program for Promoting Advancement of Academic Research at Private Universities [literal translation], which provides comprehensive support to research facilities and equipment related to excellent research projects.

(4) Promotion of improvement and public utilization of advanced large public-utilization research facilities

The development of advanced large research facilities in state-of-the-art fields contributes greatly to the S&T progress, as such facilities themselves represent the fruits of state-of-the-art research activities. However, the important thing is to make the most of such facilities to promote Japan's R&D activities as a whole and enhance the standard of S&T in the country. It is desirable that public utilization of advanced large research facilities by researchers in the industrial, academic and government sectors in a wide range of S&T fields will help to achieve outstanding research results.

In this context, pursuant to the Act for the Promotion of Public Utilization of the Specific Advanced Large Research Facilities (Act No. 78 of 1994) [literal translation], which was enforced in July 2006 as an amendment of the Act for the Promotion of Public Utilization of the Specific Synchrotron Radiation Facility [literal translation] (hereinafter referred to as the "Public Utilization Act"), MEXT promotes public utilization through improvement in the competitive environment, enhancement of technical supports to users, and other measures, by positioning the next-generation supercomputers having the highest performance in the world and the large radiation facilities (SPring-8 and XFEL) as specific advanced large research facilities, and by allowing registered institutions to support selection of users and tasks.

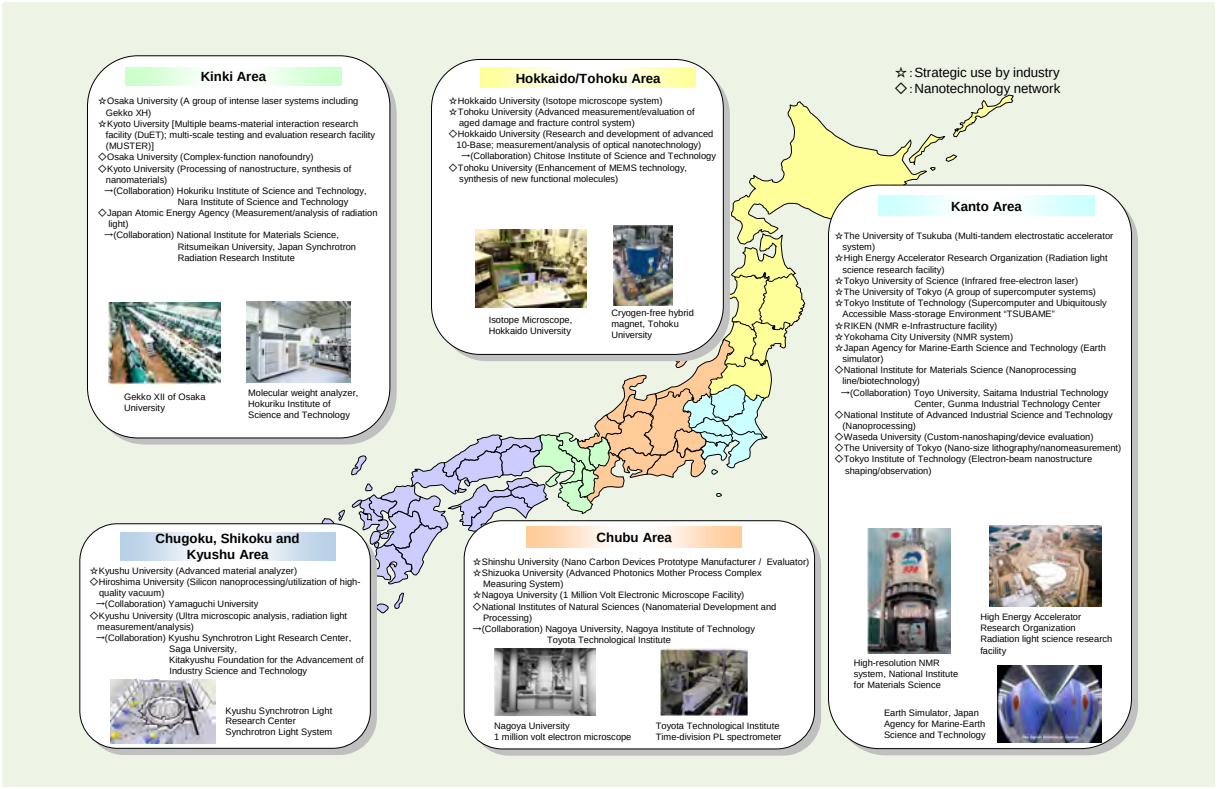
In FY 2007, the Japan Synchrotron Radiation Research Institute (JASRI), as a registered organization for the promotion of utilization of registered facilities under the Public Utilization Act, adopted about 1,300 research topics for public utilization of beam lines, bringing significant results with regard to subjects such as the discovery of a characteristic chemical bonding on high endurance to polarization fatigue for lead-free FRAM material, etc.

In addition, in order to exercise Japan's research potential to the fullest, it is important to allow a

broad range of researchers in the industrial, academic and government sectors to use not only the above-mentioned specific advanced large research facilities but advanced research facilities owned by independent administrative institutions and universities to an extent that would not disturb the operations of the owner organizations concerned.

However, to promote public utilization of these research facilities and create results, there are some problems in that basic information (location, use and application, and opening hours) are not provided sufficient, and that systems for supporting industry-academia user support are not yet developed on the side of the facilities. For this reason, in the project Open Advanced Facilities Initiative for Innovation implemented in FY 2007, the Public-Utilization NAVI was established as a general window through the Internet, thus enhancing the system for supporting users in order to broaden the reach (Figure 2-3-18).

Figure 2-3-18 Funded Organizations under the Open Advanced Facilities Initiative for Innovation



With regard to public utilization facilities and equipment that would be too large-scale and too costly to be built by the private sector, the government undertakes construction and provides such facilities for public utilization.

2 Enhancement of the Intellectual Infrastructure

In order to reliably and effectively promote research, development and other related activities, it is necessary to undertake efforts such as ensuring the stable provision in quality and quantity, as well as ensuring the safety and reliability, of materials, standards, techniques, equipment, and other elements, that support fundamental activities for R&D, including experimentation, measurement, analysis, and evaluation. For this reason, it is necessary to promote organized development of an intellectual infrastructure that includes bio-resources and other research materials, measurement standards, advanced tools for measurement, analysis, and experimentation and evaluation, and databases. Also, the Third Science and Technology Basic Plan calls for improvements toward the attainment of the

world's highest standards by 2010. In response, regarding the Intellectual Infrastructure Development Plan [literal translation], which was reported to the Minster of MEXT in August 2001, CST's Technology and Research Foundations Section finalized addition of matters on adoption of qualitative viewpoints to the strategic objectives, positioning of institutions which assume core roles in September 2007.

MEXT implemented the National BioResource Project (NBRP) to support research in the life sciences field since FY 2002 [See Part 2, Chapter 2, Section 2, 1 (4)].

Independent R&D on measurement, analysis, experimentation and evaluation, and on the state-of-the-art technologies and instruments for them, is not only the basis that upholds the R&D activities. Supported by the fact that the many researches and developments of these kinds themselves receive the Nobel Prize, it is an extremely important task for our country to serve as one of the world's front-runners in the S&T fields. However, the degree of dependence to foreign countries for advanced measurement and analysis instruments in Japan is high. In particular, the area of life sciences relies on foreign enterprises for most of the instruments for pioneering research (Figure 2-3-19). In light of this situation, since FY 2004, Japan implemented projects for the development of advanced measurement/analysis techniques and equipment, which will contribute to the promotion of world-leading technologies and equipment that meet the needs of researchers engaged in state-of-the-art research. In FY 2007, to promote manufacturing innovation incorporated in science, MEXT also promoted development of equipment that is assumed to be used at manufacturing sites.

Advanced measurement/analysis instrument (X-ray analysis system for light elements of materials by low-energy ion irradiation)

A light element analyzer which uses an electron gun, low-energy/light (gas) ion gun, and Ga ion gun as X-ray energizing sources, and energy-dispersive and compact wavelength dispersive spectrometers are used for X-ray detection.

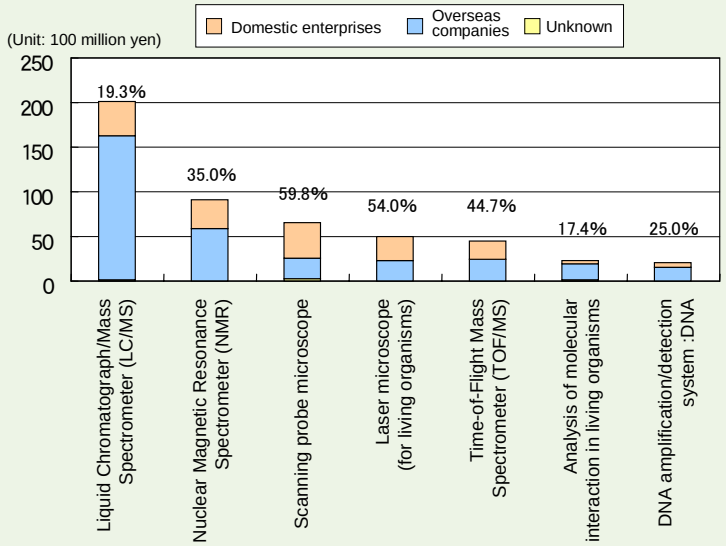
Photo: JST

MHLW established the "master banks" at the National Institute of Biomedical Innovation (NIBIO), in order to collect and store 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, in line with the conclusions reached in the State of Research and Development Using Human Tissue Obtained During Surgery, [literal translation] a recommendation on human tissue issued by the Health Science Council's Advanced Medical Care Technology Evaluation Committee on December 16, 1998, the Japan Health Sciences Foundation obtained the cooperation of medical institutions to collect human tissue for research use, doing so in careful consideration of bioethical issues, and commenced activities to dispense the tissue as necessary to researchers. Elsewhere, on the issue of plants having medicinal value, as it has become difficult to secure good quality ones, the NIBIO's Research Center for Medical Plant Resources is engaged in research into technologies for the propagation (micropropagation) of cloned plants having the same characteristics as the plants they are cloned from, and also systematically collects, preserves, and supplies medicinal plant resources. Moreover, at the NIBIO's Tsukuba Primate Research Center, the Ministry breeds Crab-eating Macaques, and furnishes them for research use to researchers in Japan using joint facilities. MAFF conducts collection, classification and identification, characteristic evaluation, breeding and preservation of biological resources including plants, animals, microorganisms, forest trees, fishery organisms related to agriculture, forestry and fisheries as the Genebank Project. The ministry also provides such biological resources and information of the biological resources to national research institutions, private enterprises, universities, etc. Furthermore, the ministry implements the DNA Bank Project which collects, accumulates and provides DNA and

DNA information which are results of gene-level research including genome research. Furthermore, MAFF establishes the Rice Genome Resource Center, National Institute of Agrobiological Sciences to improve in convenience through lump-sum control of genome research data and samples, establish the system to smoothly supply them to private enterprises, universities, etc., and provides samples and data that are associated at higher precision levels by controlling and analyzing information inherent in the lump-sum controlled samples, etc.

Regarding the Agriculture, Forestry and Fisheries-related Genomic Information Integrated Database, the ministry with a view to providing researchers at universities and private-sector enterprises with information related to genomes and genes of agricultural plants and animals like rice, silkworms, and pigs, endeavors to build up an integrated database of relevant information and establish a high-precision information search engine that utilize links with information related to genomes of other plants and animals.

Figure 2-3-19 Sales of Major Advanced Measurement/Analysis Instruments, by Domestic/Overseas Enterprises (FY2006)



Note 1. Domestic enterprises: produce and sell instruments in Japan.
Overseas companies: sell instruments produced abroad.
2. Figure shown with "%" in the table shows the share of domestic enterprises in the domestic market.
Source: Prepared by MEXT, based on
Scientific Instruments Almanac, published by R&D Co., Ltd.

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), revises the objectives for the development of intellectual infrastructure annually. The National Metrology Institute of Japan (NMIJ) of AIST improves and expands national measurement standards, and also makes efforts toward international mutual recognition. In total, 271 physical standards were established and 260 references were provided by the end of FY 2007. In addition, NEDO conducted R&D on remote calibration as part of a plan for the period from FY 2001 to 2008.

With regard to biological resources information infrastructure, the Biological Resource Center of the Department of Biotechnology at the National Institute of Technology and Evaluation (NITE) in FY 2007 adds approximately 5,000 microbial strains (totaling approximately 45,000 microbial genetic resources), which it maintains and distribute to the public and also integrates the databases of major domestic organizations that handle biological resources, takes charge of operating and managing the

integrated database, and makes it public. Furthermore, the NITE Biotechnology Development Center uses and utilizes microbial resources in accordance with the Convention on Biological Diversity, an example of which is the Center's signing on memorandums of understanding with Asian countries and establishes cooperation system to jointly explore microbes. The NITE Genome Analysis Center, with a view to promoting the utilization of biological resources, settles the base sequences of seven strains of microbes, which are useful for industrial applications, and conducts a gene analysis on the human influenza virus. The NITE Patent Microorganisms Depositary implements the reception and subdivision of microbes, animal cells, and fertilized eggs related to patents. Furthermore, at the Asian Consortium for the Conservation and Sustainable Use of Microbial Resources, which is the first framework for government-level multilateral cooperation in Asia for joint management and utilization of microbial resources, NITE promotes establishment of networks of information on microorganism cultures of participated countries by building an integrated database, and newly establishes a taskforce for preparing common guidelines concerning transfer of microbes, thus contributing to establishing of international rules concerning improvement of infrastructure for effective utilization or use of biological resources in Asian countries. Furthermore, AIST enhances its database by utilizing information related to genomes and proteomes, including newly public release of its gene database related to sugar chains. In addition, it receives and provides microbes and animal and plant cells related to patents at its International Patent Organism Depositary.

In terms of chemical safety management infrastructure, the ministry collects and coordinates data of hazardous chemical substances. The ministry also develops simplified testing methods to evaluate the chemical safety, as well as screening test methods for endocrine disruptors. In addition, the ministry carries out R&D regarding risk assessment methods of chemical substances at NEDO.

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.

AIST, regarding geological surveys, produced seven new kinds of geological sheet maps in FY 2007. It also enhanced and updated various databases related to geological information. In FY 2007, the Institute officially released the Integrated Geological Map Database (GeoMapDB), which integrates various types of geological maps already published by introducing the WebGIS technology.

In addition, it is involved in the development of an advanced database of materials. The Institute has already improved and updated various databases of about 70 kinds, including spectra of organic compounds and as the Research Information Database (RIO-DB), including dispersion type thermophysical properties.

MLIT started establishment of the infrastructure map information, which should be the reference for defining locations of national spatial data[fn.6] based on the Act concerning National Spatial Data Infrastructure, which was established in May 2007. Furthermore, the ministry implements research and studies concerning utilization of the spatial data.

The status for the development of facilities to preserve and provide intellectual infrastructure by government ministries is shown in Table 2-3-20.

fn. 6 National spatial date is the information utilized in geographic information system, such as information indicating specific points in a space or a region and information related to such points.

Table 2-3-20 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
	1978	Tsukuba Primate Center, at National Institute of Infectious Diseases	Primates
	1984	National Institute of Infectious Diseases	Genes (bank)
	1984	National Institute of Health Sciences	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 93% of all 124 geological maps of the country at a scale of 1:200,000, and about 73% 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 (271 physical standards, 260 reference materials)
	1993	National Institute of Technology and Evaluation, Department of Biotechnology	Genome information and biological resources, including microorganisms and DNA cloning of microorganisms for industrial use
	1996	National Institute of Technology and Evaluation, Chemical Management Center	Comprehensive chemical management information on about 4,600 substances
Ministry of Land, Infrastructure and Transport	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	Preservation of microorganism strains (1,717 strains)

3 Creation, Protection and Utilization of Intellectual Properties

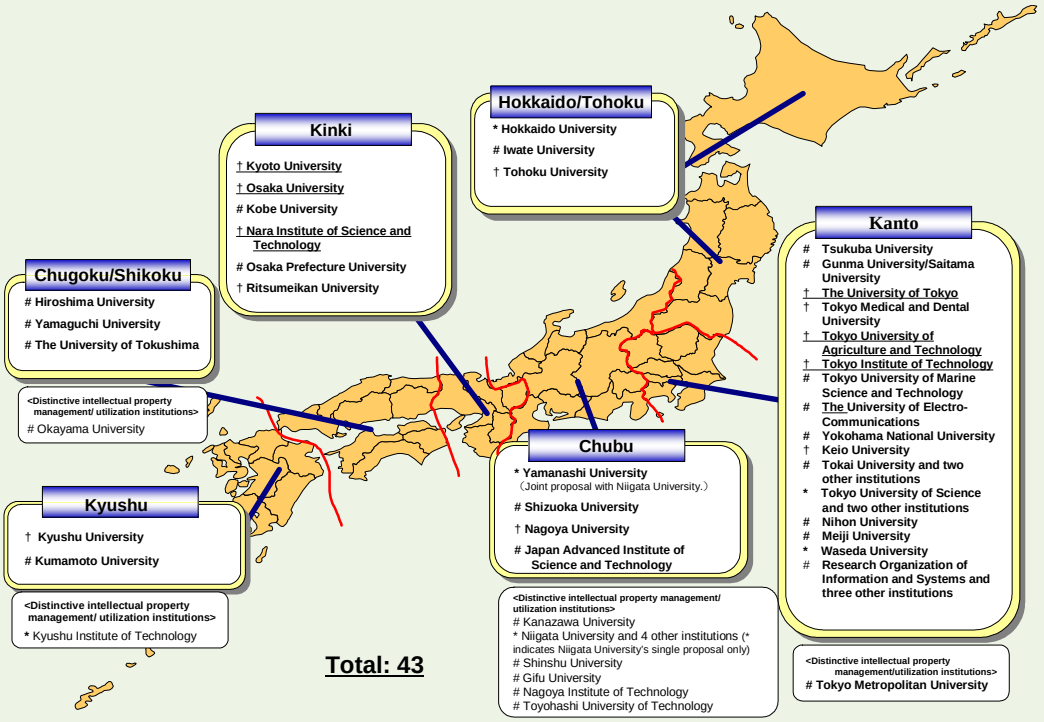
In order to make unique and innovative achievements in research and feed them back to society and people, it is essential to revitalize the cycle of creation, protection and utilization of intellectual property, and proactive and various initiatives for the purpose.

CSTP adopted the supplementary recommendation on the Intellectual property strategy [literal translation] in May 2007, which mainly called for promotion of intellectual property activities at universities, as well as creation of innovation utilizing intellectual property, enhancement of systems, and practical affairs concerning intellectual property at universities, etc., protection and utilization of intellectual property in the life sciences field.

(1) Establishment of system for managing intellectual properties at universities

Under the University Intellectual Property Headquarters Development Project, universities endeavored to establish model organizations for strategic management of the creation, protection, and utilization of intellectual properties since FY 2003, with the number of patent applications and licenses by universities increasing year after year (Figure 2-3-21, Table 2-3-22, and Figure 2-3-23). Furthermore, in FY 2007, the Committee on Promotion of Industry-Academia-Government Collaboration, Technology and Research Foundations Section of CST conducted deliberations on gas concepts concerning future industry-academia-government collaboration, and the Committee compiled the Toward Strategic Development of Industry-Academia-Government Collaboration for Creation of Innovation (Summary of Deliberations)" in August 2007 (Figure 2-3-24).

Figure 2-3-21 Regional Distribution of University Intellectual Property Headquarters Development Project



Notes 1. The underlined universities are selected as super industry-academia-government cooperation headquarters (six universities from 2005).

2. Universities with "†" are selected as the international industry-academia-government cooperation promotion system [12 universities (2007)]; * are selected under the promotion function support program for internationally distinctive industry-academia-government cooperation (five programs/six universities).

Table 2-3-22 Status of Development of System for Management/Utilization of Intellectual Properties (University Intellectual Property Headquarters, etc.) (FY 2006)

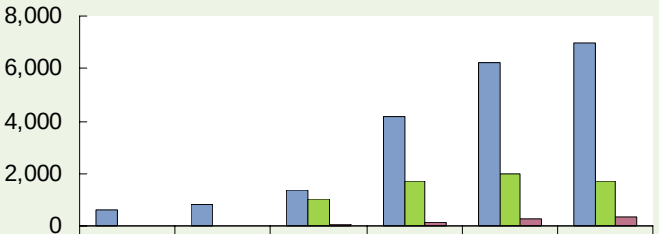
	Already developed		To be developed	Not to be developed	No. of respondents
		No. of organizations selected for the development project among them			
Total number	(Number)		(Number)	(Number)	(Number)
	(149)		(142)	(296)	(587)
	161	51	133	267	561
National uni., etc.	(72)		(10)	(10)	(92)
	72	40	8	12	92
Private uni., etc.	(63)		(113)	(248)	(424)
	73	9	109	224	406
Public uni., etc.	(14)		(19)	(38)	(71)
	16	2	16	31	63

Note: Figures in parentheses indicate the previous year's numbers.

Figure 2-3-23 Creation, Protection and Utilization of Intellectual Properties by Universities

(1) Trends in number of patent applications by universities

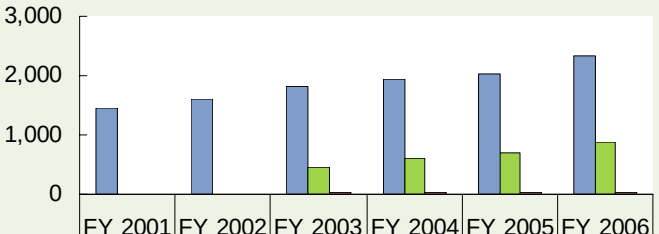
(Number)



	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006
National universities, etc.	641	829	1,344	4,152	6,255	7,003
Public universities, etc.			1,051	1,720	1,987	1,718
Private universities, etc.			67	122	285	369

(2) Trends in number of patents in force by universities

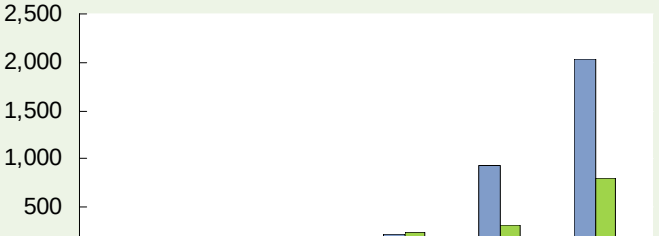
(Number)



	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006
National universities, etc.	1,462	1,592	1,829	1,947	2,021	2,330
Public universities, etc.			467	591	701	882
Private universities, etc.			17	25	33	44

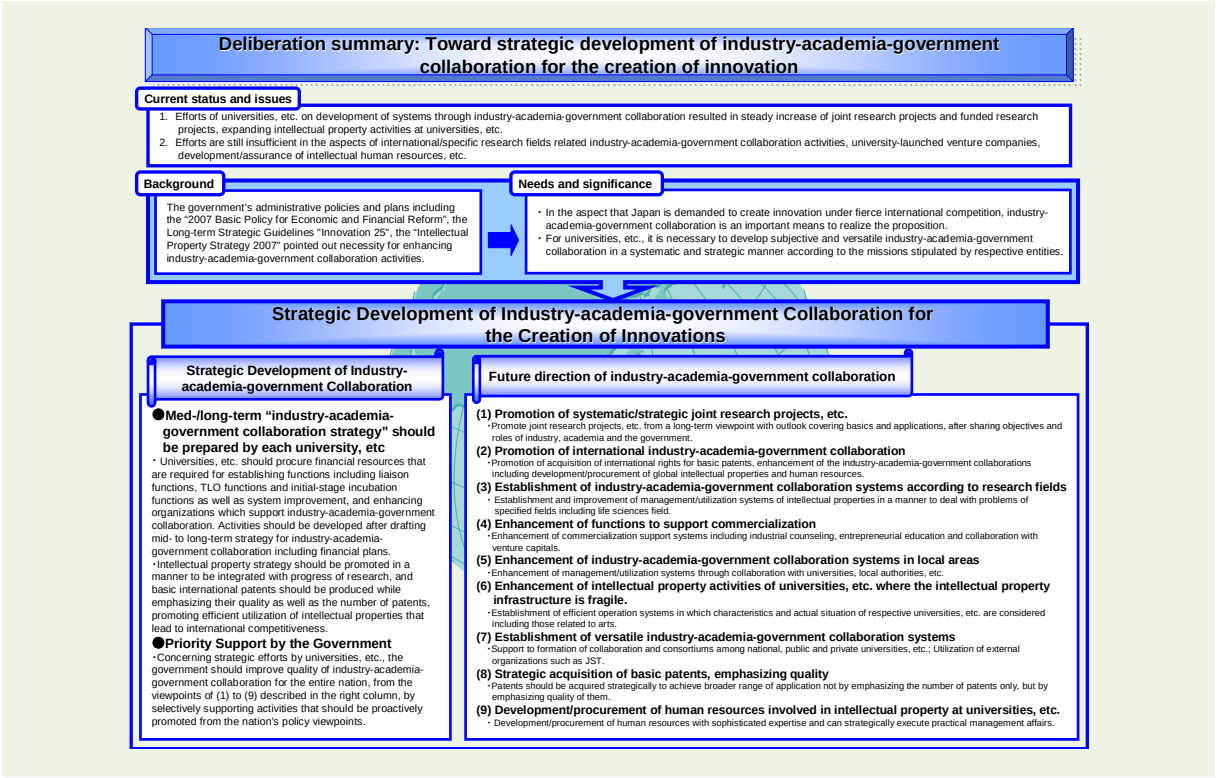
(3) Trends in number of patent licensing by universities

(Number)



	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006
National universities, etc.	59	58	79	223	932	2,026
Public universities, etc.			106	247	317	809
Private universities, etc.			0	7	34	37

Figure 2-3-24 Report on the Status of Deliberations of the Committee on Promotion of Industry-Academia-Government Collaboration, Technology and Research Foundations Section, Council for Science and Technology



In order to promote the transfer of research results achieved by universities to private business operators, create new industries and markets by taking advantage of those results and revitalize research activities conducted by universities, METI, in accordance with the Act on the Promoting of Technology Transfer from Universities to Private Business Operators (Act No.52 of 1998), which was put into force in 1998, provides TLOs (authorized TLOs) whose implementation plans have been approved with subsidies to cover part of expenses related to the transfer of technologies and applications for foreign patents based on research results achieved by universities. Currently, there are 46 authorized TLOs, which made steady progress in project implementations, with their combined licensing revenues totaling 690 million yen (FY 2006).

(2) Promotion of activities related to intellectual property

In order to enable universities to secure rights to their excellent intellectual property and exercise the rights, MEXT provides support to activities related to applications for foreign patents through JST's Technology Transfer Support Center.

In addition, JST, with a view to facilitating achievements of excellent research results, manages a database of information related to various R&D support measures and research results 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 results achieved by public research organizations including universities with relevant patents (J-STORE), and a system that enables integrated searches of online information related to technology seeds made public by universities, and provides enterprises with direct access to researchers (e-seeds.jp).

Moreover, CST's Committee on Promotion of Industry-Academia-Government Collaboration conducts deliberations on various problems related to intellectual properties in the life sciences and other advanced science fields based on hearings with experts.

Amid the ongoing globalization of the economy, it is very important, from the viewpoint of enhancing the international competitiveness of Japanese industry, to cultivate an environment that enables speedy acquisitions of intellectual property rights. Therefore, METI in December 2005 established the Headquarters for Expeditious and Efficient Patent Examination, headed by the Minister of METI. In January 2006, the headquarters drew up an action plan that specified public-private joint initiatives for increasing the number of patent applications examined and reforming enterprises' systems for submitting patent applications, and called for special consideration to be paid in the implementation of the initiatives, and promotes implementation efforts. In January 2007, the headquarters formulated the Advanced Measures for Accelerating Reform toward Innovation Plan in Patent Examination 2007, which represented an upgrade of the package of measures that have already been underway, in light of the changes that occurred in recent years such as the progress made in the international harmonization of patent systems and international cooperation regarding patent examination. This plan sets forth a total of 26 priority items with regard to 1) promotion of acquisition of intellectual property rights around the world and better protection of such properties, 2) further efforts by the Patent Office toward expeditious and efficient patent examination, 3) promotion of strategic intellectual property management by enterprises and 4) support for utilization of intellectual properties by local communities and SMEs. METI does its utmost to enhance its intellectual property policy by increasing efforts to ensure expeditious and efficient patent examination with the support of the industrial sector.

Against the background of the globalization of corporate activities, the rapid development of other East Asian countries/regions and the proliferation of counterfeited products in recent years, Japanese enterprises face a need to reform their intellectual property management strategies. The Patent Office endeavors to positively exchange opinions with corporate managers to enhance strategic intellectual property management from a global perspective and to encourage system improvement by providing information that contributes to further enhancement of the environment for preceding technology surveys and to formulation of intellectual property strategies of enterprises to cultivate an environment that facilitates such reform by encouraging them through their managers to enhance the relevant systems by further improving the environment for prior art search and by compiling a collection of case studies related to drafting of intellectual property management strategies.

Universities' activities related to intellectual properties have been revitalized in recent years. However, in order to make such activities more effective, it is important for universities to make further efforts to formulate strategies for actively acquiring foreign patents concerning critical inventions and exercising their intellectual property rights.

MAFF promotes the Intellectual Property Strategies of the Ministry of Agriculture, Forestry and Fisheries formulated in March 2007. As for the R&D fields, the ministry implements measures including creation of new demand and new industries, and establishment of the intellectual property network for agriculture, forestry and fisheries. The ministry also implemented various initiatives including new establishment of a viewpoint on intellectual property in the examination items of competitive funds in FY 2008 based on the strategies. Moreover, MAFF supports the activities of TLOs authorized by the Minister of MAFF and implements the programs for promoting technology transfer of agriculture, forestry and fisheries in order to facilitate commercialization of research results achieved by independent administrative institutions engaged in experiments and research.

The Patent Office dispatches University Intellectual Property Advisors [literal translation], through INPIT, to universities planning to establish such systems to encourage them to establish their own intellectual property management systems (advisors dispatched to 21 universities in FY 2007). In addition, in order to enable SMEs and venture enterprises to make effective use of patents acquired by universities and made available to others (licensable patents), the Patent Office, through INPIT, dispatches Patent Licensing Advisors (the number of such advisors dispatched totaled 106 as of January 2008.) to TLOs and local governments so as to match their needs and licensable patents offered by universities. In addition, it publicly discloses information related to licensable patents through a patent licensing database. In addition, to encourage smooth use of research tool patents in the life

sciences field, relevant ministries and agencies are jointly to work on establishment of the integrated database of research tool patents under the leadership of CSTP.

The viewpoint of intellectual property is becoming important for advancing R&D, and it is important to secure intellectual property including peripheral technologies. To this end, it is demanded that collaboration should be established between the intellectual property measures and R&D, such as utilization of patent information in R&D strategies even in the drafting phase of policies on R&D.

The Japan Patent Office conducts technology trend surveys on notable technologies, mainly ones in the four priority fields to be promoted and in the four fields to be promoted under the Third Science and Technology Basic Plan and technologies in industries which grown remarkably in recent years or industries whose technological innovations have a particularly great impact, with a view to grasping the status of patent applications related to those technologies and clarifying the direction of R&D activities through analysis of relevant patent information. The Office discloses the results of this survey in order to contribute to R&D activities conducted by enterprises and universities and to their formulation of patent strategies. Moreover, as a way to help them acquire and utilize patents based on their excellent research results, the Office, through INPIT, builds up and operates the Industrial Property Digital Library (IPDL), which allows users to search and identify necessary patent-related information through the Internet. IPDL continuously improves user convenience and expands the range of its services. In FY 2007, the Office added services including the one for full-text search of patent gazettes.

On May 23, 2006, CSTP formulated the Guidelines for Research Licenses for Intellectual Property Rights Stemming From Government-Funded Research and Development at Universities, etc. in order to facilitate the use of intellectual property rights by universities as centers for knowledge creation, and promote free R&D activities by them. In addition, CSTP also formulated the Guidelines for Facilitating the Use of Research Tool Patents in the Life Sciences Fields, which expresses basic ideas concerning the utilization by universities and private-sector enterprises in research of patents related to research tools such as genetically engineered animals and screening methods, with a view to promoting R&D in the advanced technology field of life sciences, leading research results to innovations and enhancing Japan's international competitiveness.

4 Active Efforts toward Standardization

MIC sent an inquiry to the Telecommunications Council in August 2007 on measures for enhancing international standardization activities in Japan, which are integrated with R&D as well as the intellectual property strategies. At present, deliberations are being conducted concerning enhancement of support measures of standardization activities, enhancement of measures for developing international standardized human resources, as a measure to strengthen Japan's international competitiveness over the medium to long term.

In addition, the ministry implements the international competitiveness strengthening-type of research and development [literal translation] as public-offering research on the condition that proposed research should contribute to enhancement of international competitiveness sometime in the future and that research results are reflected in global standards. The ministry newly adopted three research projects in FY 2007. Furthermore, the International Telecommunication Union (ITU) contributes to standardization of Next Generation Network (NGN), which is the fundamental technology that is indispensable to a ubiquitous network society and home network, Internet Protocol Television (IPTV), and promotes global-standard joint proposal to ITU by strengthening collaboration of standardization activities with Asian countries through the Asia-Pacific Telecommunity Standardization Program (ASTAP).

In order to achieve international standards originating from Japan, MEXT actively strives for international standardization in technology and manufacturing fields in which Japan excels, such as nanotechnology, robotics and photocatalysts, by setting strategic targets for international standardization. At the same time, in order to promote R&D and standardization in an integrated

manner, the ministry promotes clear positioning of standardization strategies in R&D projects. Moreover, the ministry conducts R&D for the purpose of standardization under the program for the development of international standards. In FY 2006, it started research concerning the standardization of materials for the Micro Electro Mechanical Systems (MEMS) devices, etc., bringing the total number of themes covered by standardization research to 36 as of FY 2007. NEDO implements follow-up projects to lead R&D results to international standardization.

Regarding the development of human resources related to standardization, the ministry developed education arterials concerning standardization intended for broad use at universities (undergraduate and graduate schools) and in the field of education of private-sector enterprises and provided training programs to foster personnel with expertise who can take an active part in international standardization activities.

5 Improvement of Research Information Infrastructure

The research information infrastructure is regarded as a critical life line 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 thus takes concrete actions such as the development and upgrading of networks between research institutions and the development and provision of databases.

(1) Improvement 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.

By establishing the Advanced Network Testbed for R&D (JGN2[fn.7]), operated by NICT, MIC promotes the pacesetting approaches that create an extensive ripple effect such as improvements in technological capabilities in Japan, reinforcement of collaboration between industry, academia and government, and creation of new businesses and industries, through R&D and testing.

MEXT, through the National Institute of Informatics (NII), established and operates the world's fastest-level next-generation research network Science Information Network 3 (SINET3), which connects advanced research institutions at the world best maximum speed of 40 Gbps, as the backbone network for distributing research information required by researchers at universities.

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 2007, a total of 95 institutions are connected through MAFFIN. With MAFFIN linked to the Philippines, this network becomes now a backbone for the distribution of research information among various countries.

(2) Creation and provision of databases

Perusal, copying, lending, and other clearing services for source materials for scientific papers, etc. (primary information) are being implemented at libraries and a variety of other information service organizations. In addition, constructing databases of excerpts and indexes (secondary information) by using computers enables the swift, accurate and easy search of increasingly large amounts of information.

In order to create a database of primary information, the National Diet Library (NDL) prepares a database for collected materials that covers every publication issued in Japan and in the archives of the

fn. 1 JGN2: This provides R&D environment including 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.

library.

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.

JST collects S&T literature from both Japanese and foreign sources, compiles their summaries, builds technology document databases, and provides JST Document REtrieval system for Academic and Medical fields (JDream II) on a fee basis through the Internet. From September 2007, a service that can retrieve patent information and literature information at the same time started on the JDream II. Moreover, JST builds an electronic archive of major journals published by academic societies in the S&T fields for distribution worldwide through the Internet.

MAFF creates and offers information on documents related to the agriculture, forestry, and fisheries fields, 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 builds up 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 weather satellite images; and a database of themes of research conducted by research organizations.

The outlines of major measures implemented in FY 2007 in relation to the research information infrastructure are as shown on Table 2-3-25.

Table 2-3-25 Main Measures for the Research Information Infrastructure (FY 2007)

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 advanced network testbed for research and development (JGN II)
Ministry of Education, Culture, Sports, Science and Technology	Japan Science and Technology Agency	• Establishment of R&D databases (Project for utilization and promotion of S&D information collaboration) • Development of engineer ability and operation of "failure knowledge database" ("Web Learning Plaza" etc.) • Operation of Institute for Bioinformatics Research and Development (BIRD, GBIF etc.) • Operation of Science and technology information provision system (JDream II, J-STAGE etc.)
	Japan Agency for Marine-Earth Science and Technology	• Information infrastructure operating costs
	National Institute of Informatics	• Development of Scientific Information Network ("SINET 3", etc.)
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	National Agriculture and Bio-oriented Research Organization	• Operation of Agriculture, Forestry and Fisheries Research Ministry of Information Center (JASI etc.) • Operation of Computer Center for Agriculture, Forestry and Fisheries Research (MAFFIN etc.)
Japan Patent Office	National Center for Industrial Property Information and Training	• Industrial Property Digital Library (IPDL) • IPDL public gazette full-text retrieving service
Ministry of Land, Infrastructure and Transport	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		• Funds for development of basic information for comprehensive ecosystem management
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

6 Promotion of 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 and personal exchange, 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 promote these types of activities by academic societies, Grant-in-Aid for Publication of Scientific Research Results, which is one of the categories of Grants-in-Aid for Scientific Research, are awarded by MEXT 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. SCJ continuously conducted deliberations on measures for promoting self-improvement of academic societies, and held the symposium titled Reformation and Function Enhancement of Academic Societies Playing Active Roles in the Advanced Science and Technology-oriented Nation with participation from several areas including academic societies and researchers.

(Enhancement of international competitiveness of academic societies)

JST, with a view to enhancing Japan's capability to disseminate information concerning research results, supports globalization efforts related to academic journals and research papers by establishing the Japan Science and Technology information Aggregator, Electronic, a comprehensive system for dissemination 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 Third Science and Technology Basic Plan states that independent administrative institutions should work on self-reliant and voluntary operations and reformation, 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. In the Innovation 25 (Cabinet decision: June 1, 2007), it was arranged that reformation of R&D independent administrative institutions for accelerated innovation are referred to, and profits based on intellectual property income is regarded as management efforts, and the whole amount can be used as appropriated surplus.

4 Strategically Promoting International Activities

With the advent of an age of global fierce competition over knowledge, such as technology and human resources, international S&T activities became more important than ever.

For its part, Japan must promote international activities in the S&T fields in a strategic manner by contributing to the international community through efforts to tackle globally common problems and enhancing collaboration with other Asian countries in line with initiatives adopted at the East Asia Summit.

From such viewpoint, the government, in accordance with the Third Science and Technology Basic Plan clarified its strategic vision of international activities and promotes collaboration with other Asian countries, fostering and procurement of global-level researchers, and international standardization efforts (See Part 2, Chapter 3, Section 3, 4) while striving to cultivate the environment for enhancing international activities that support these efforts.

1 Systematic Efforts for International Activities

Science and technology create intellectual property that can be shared by humankind and contribute to resolving various global-scale problems. Conducting S&T activities across national borders is important for Japan as it seeks to play a proactive role in the international community and contribute to further development of the country's S&T. Therefore, the government promotes international collaboration both within multilateral frameworks, such as the Organization for Economic Cooperation and Development (OECD), 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

At the G8 Heiligendamm Summit in June 2007, the global economy and Africa were discussed as major topics under the subject Growth and Responsibility. In the field of global economy, discussions were held on taking action to promote and protect innovation. Concerning the climate change issue that constituted a major theme, G8 agreed to seriously study cutting greenhouse gas emissions throughout the world at least by half by 2050.

(2) United Nations (UN)

The United Nations takes measures regarding the prevention of disasters and observing the earth in the S&T field. Japan especially participates and cooperates in various science projects and activities of the United Nations Educational, Scientific, and Cultural Organization (UNESCO) which is the specialized agency of UN.

UNESCO implements activities to resolve global-scale problems and establishes international rules through the International Hydrological Program (IHP), which works on water-related problems, the Intergovernmental Oceanographic Commission (IOC), and the International Bioethics Committee (IBC). Japan promotes UNESCO activities by implementing human resources development projects in the S&T fields in the Asia-Pacific region and by dispatching experts to commissions to participate in discussions through the contribution of the trust fund of UNESCO.

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

OECD works through its Council for 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 the member countries, preparation of statistical information and implementation of joint research.

The Chairman's Summary of 2007 Council at Ministerial Level noted that activities related to eco-innovation proposed by Japan could contribute to approaches to environmental problems of respective countries. In addition, under the CSTP, there are six subgroups: the Global Science Forum (GSF); the ad hoc Working Group on Steering and Funding of Research Institutions (SFRI) and the Working Party on Innovation and Technology Policy (TIP); the Working Party on Biotechnology (WPB); the Working Party on Nanotechnology (WPN); and the Working Party of National Experts on Science and Technology Indicators (NESTI). Specific 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 policymakers to exchange opinions and make recommendations concerning important issues in the S&T sector that require international cooperation and concerted action. Taking the falsified thesis data issues in countries in the world as an opportunity, discussions are being held on subjects that are of concern throughout the world, including approaches

to prevention of inappropriate scientific activities and formulation of road maps of large research facilities.

2) Ad Hoc Working Group on the Steering and Funding of Research Institutions (SFRI)

The group was established to provide opportunities for discussions about issues concerning S&T-related human resources. Under the circumstances that a brain drain and other such issues concerning S&T-related human resources have been raised by many countries, regarding international mobility of researchers in particular. SFRI summarized lists of policies for promoting brain circulation, reports on the analysis of human resources, and mobility policy toward adaptation to the age of fierce competition of knowledge based on the Workshop on the International Mobility of Researchers, which was held in March 2007 under the sponsorship of the OECD, MEXT, and JSPS, in the 6th meeting in February 2008. It was decided that discussions will be conducted on human resources development that will contribute to governance of public research institutions, S&T, and innovation, in addition to the subject of international mobility of researchers.

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

TIP sets out its major purposes to be enhancement of productivity, promotion of creation and utilization of knowledge, and cultivation of sustainable growth. In FY 2007, TIP conducted discussions and case studies on R&D tax system, impacts of public research on economic society, globalization and open innovation, intellectual property right system, and the evaluation on innovation policies.

4) Working Party on Biotechnology (WPB)

WPB conducts deliberations on investigations and analysis related to biotechnology, and policy recommendations to be presented to the national governments of the member countries. In FY 2007, reports and discussions were conducted about implementation of a global network of biological resource centers, pursuant to the OECD Best Practice Guidelines for Biological Resources Centres that aims to enable efficient accessing to microbial resources in the member countries. Furthermore, concerning handling of clinical genetics data, including personal information, the Guidelines for Quality Assurance in Molecular Genetic Testing, which works commonly among OECD member countries was officially announced as the recommendation of the Council at Ministerial Level.

5) Working Party on Nanotechnology (WPN)

WPN was established in 2007 as proposed in the CSTP conference and conducts research, analysis and case studies in the nanotechnology field.

6) 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, as well as the development of such indexes. Japan participated in NESTI as a bureau member country and contributed to activities including the preliminary survey on patent usage by private and public research institutions. Japan also dispatches experts to the NESTI bureau and works on development of new S&T indexes in the fields of analysis of nanotechnology patents and the measurement of science linkage.

(4) Human Frontier Science Program (HFSP)

HFSP is an international research aid program that was proposed by Japan at the Venice Summit in June 1987 with the aim of promoting basic international joint research focused on elucidation of complex mechanisms of living organisms. With the addition of India joined this program in 2007, HFSP is now operated by a total of 13 countries and regions, including Japan, US, France, Germany, EU, UK, Switzerland, Canada, Italy, Australia, the Republic of Korea, New Zealand, and India. The

Program provides grants to subsidize international joint research teams, those to subsidize travel expenses, accommodation and other expenses for young researchers conducting research abroad (fellowship), and organizes meetings of HFSP grant recipients. With a total of 12 HFSP grant recipients having been awarded the Nobel Prize as of FY 2007, the program has been highly acclaimed worldwide. Japan actively supported the program since its inception.

(5) International Science and Technology Center (ISTC)

In March 1994, Japan, four countries, namely US, EU, and Russia established the International Science and Technology Center (ISTC) in order to provide an opportunity for scientists and engineers from the former Soviet Union countries, possessing knowledge and skills related to weapons of mass destruction, to engage in peaceful activities and to contribute to the resolution of technology issues, both internationally and within the nations of the former Soviet Union.

S&T in the former Soviet Union countries is high caliber and original, and in light of this, Japan is actively involved in implementation of regular projects in which the governments of respective countries support projects proposed by research institutions of the countries, and partner projects in which private-sector enterprises jointly work on research with research institutions of the countries. It should be noted that, in the Council at Ministerial Level in December 2007, Japan expressed support to the regular project Recycling Technology of Irradiated Beryllium, which as proposed by Kazakhstan.

(6) Research and Development Project for Supporting Humanitarian Demining of Anti-Personnel Mines

JST has been promoting R&D of safer and more efficient detection technology for antipersonnel mines and detection vehicles. Following the evaluation tests of prototype detection equipment in Cambodia in FY 2006, the same tests were conducted in FY 2007 in Croatia jointly with the Croatian Mine Action Centre (CROMAC).

(7) International activities conducted by SCJ

SCJ represents Japan through its affiliation with 48 international scientific organizations, including the International Council for Science (ICSU[fn.8]) and the Inter Academy Panel on International Issues (IAP[fn.9]). SCJ strives for cooperation with various countries by actively taking part in international academic cooperative projects, including the International Geosphere-Biosphere Programme (IGBP[fn.10]).

In addition, since 2005, it has been participating in the issuance of joint statements released by science councils of the G-8 countries from a scientific viewpoint with regard to the agendas of annual G-8 summits. For FY 2007, SCJ issued a joint declaration with science councils of the G-8 countries and other nations concerned (China, India, Brazil, South Africa and Mexico) regarding "energy efficiency and climate protection" and "innovation", which were major agenda items in May at the G-8 summit held in Heiligendamm in Germany, and the council's chairman handed the joint declaration to the Japanese Prime Minister in June. In FY 2008, the councils held a meeting in Tokyo on March 17 and 18, 2008 toward holding of the G8 summit in Japan. Further, the councils hold an annual international symposium for resolving global-scale problems with participation of researchers in broad fields from various countries. In September 2007, SCJ held a symposium titled International Conference on Science and Technology for Sustainability 2007: International Cooperation for Development at SCJ in Tokyo.

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fn. 8 ICSU: 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.

fn. 9 IAP: Established in 1995 as a forum of the world science academy. SCJ assumed the position of executive committee member from 2006 to 2009.

fn. 10 IGBP: A cross-disciplinary international research project hosted by ICSU. This was established in 1986 and provides international and cross-disciplinary frameworks for executing science projects concerning global changes.

Furthermore, the Science Council of Asia (SCA), which comprises science councils of 11 Asian countries, with a view to promoting collaboration among Asian countries in academic fields, held the 7th conference with "Energy and Environment" as the main theme in June 2007. In this conference, two joint declarations "Energy and Environment" and "The Future of the SCA" were adopted.

2 Cooperation with Asian Countries

(1) Cooperation with China and the Republic of Korea

For collaboration with China and the Republic of Korea, the first Trilateral Japan-China-Korea Ministerial Meeting on Science and Technology Cooperation was held in Seoul in January 2007 (from Japan, the then Minister of MEXT, Ibuki attended the meeting). At this meeting, the three countries confirmed the basic principle of attaching importance to their science and technical collaboration in efforts to tackle regional challenges related to the environment, energy, disaster prevention, and infectious diseases.

In addition, with China, along with the visit of Prime Minister Fukuda in December 2007, the Minister of MEXT Tokai and the Minister of the Ministry of Science and Technology (MOST) Wan signed the joint statement on further enhancement of science and technical cooperation intended for climate change issues by the Government of Japan and the Government of the People's Republic of China [literal translation] and the execution agreement on cooperation in the research fields related to magnetic fusion between the Ministry of Education, Culture, Sports, Science and Technology and the Ministry of Science and Technology [literal translation]. Furthermore, the 12th Japan-China Committee of Science and Technology (vice-ministerial-level) was held in Tokyo in February 2008. Furthermore, with the Republic of Korea, the meeting of directors of Japan-Korea science and technology bureaus was held in Seoul in January 2008 and an agreement was made on collaboration in the life sciences field.

Photo: Signing ceremony of the Minister of MEXT Tokai and the Minister of MOST Wan

(2) Cooperation with Association of Southeast Asian Nations (ASEAN)

For the past several years, cooperation among the ASEAN COST+3, which combines ASEAN COST (ASEAN Committee on Science and Technology) with Japan, China, and the Republic of Korea, has been implemented mainly under MEXT's leadership. In October 2007, the second meeting of the ASEAN COST+3, a ministerial-level meeting, was held in Tokyo. At this meeting, Japan proposed programs concerning the environment and energy.

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

APEC implements projects concerning development of human resources involved in S&T at the APEC Industrial Science and Technology Working Group (ISTWG). In FY 2007, the Group proposed the Disaster Reduction Hyperbase-Asian Application (DRH-Asia) as a project of APEC and ISTWG.

(4) Cooperation with various countries (major recent activities)

Regarding cooperation with India, in reaction to the 7th Japan-India Joint Committee on Science and Technology Cooperation (November 2005), support to Japan-India joint research in ICT fields was implemented in FY 2007 as a result of the Japan-India Science and Technology Initiative Meeting comprising government officials, researchers, etc. involved in S&T fields in Tokyo in 2006 under joint

co-sponsorship of MEXT and the Ministry of Foreign Affairs of Japan (MOFA).

Regarding cooperation with Thailand, since the year 2007 falls in the 120th anniversary since the signing of the Declaration of Amity and Commerce, the Japan booth was placed, as requested by the Minister of Science and Technology, at the Thailand Science and Technology Week Exhibition hosted by the Government of Thailand. Twenty-eight institutions including those related to MEXT participated in and H.R.H. Princess Maha Chakri Sirindhorn visited the Japan booth in the opening ceremony.

(5) Cooperation on a project basis

(Sentinel-Asia Project)

In order to deal with the growing incidence of large-scale natural disasters in recent years, satellite-based disaster surveillance system that is not affected by ground-level conditions works effectively. To this end, the Sentinel Asia project provides and shares information on disaster-hit areas using satellite images on the Internet through the Asia-Pacific Regional Space Agency Forum (APRSAF), which is sponsored by Japan,. Japan leads the project by executing emergency observation of disaster-hit areas by using the advanced land observing satellite DAICHI (ALOS) to provide images.

(Program to establish centers for research concerning emerging and re-emerging infectious diseases)

Japan promotes research concerning emerging and re-emerging infectious diseases at research centers established in countries where outbreaks of such diseases had occurred or are expected to occur (Thailand, Vietnam, China Indonesia, and India), as well as at domestic research centers. Japan is also engaged in accumulation of knowledge and human resource development in this regard.

(Science and Technology Ministers' Round Table Meeting)

The Cabinet Office, with a view to strategically promote international S&T activities, held a Science and Technology Ministers' Round Table Meeting in October 2007 with the participation of relevant ministers from 25 countries. In addition, the Cabinet Office proactively executed bilateral policy dialogues.

3 Cooperation with European Countries and North America

Cooperative activities such as holding joint committee meetings based on bilateral science and technology cooperation agreements with European countries and North America are actively being carried out in order to resolve common challenges faced by advanced countries, including those in the life sciences, nanotechnology and materials, environmental sciences, nuclear energy, and space development. As for the US, in accordance with Agreement between the Government of Japan and the government of the US 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 Japan, the Minister of State for Science and Technology Policy and the Minister of MEXT attended this meeting. In addition, Japan sponsored the 12th meeting of the Japan-US Joint Working Level Committee in Tokyo in July 2007.

Elsewhere, there are joint committees and consultations on S&T with the UK, Germany, France, Italy, Sweden, Finland, Norway, Netherlands, Russia, Poland, the Czech Republic, Hungary, etc. based on science and technology cooperation agreements. (Japan concluded international agreements, including science and technology cooperation agreements, with 47 nations around the world.) At present, Japan is at the final stage for negotiations with the EU for concluding the Japan-EC[fn.11] Science and Technology Cooperation Agreement.

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fn. 11 EC (European Community): In EU, the European Community is acting as the main organization for concluding treaties

4 Cooperation with Other Countries

In relations with Australia and Israel, among other countries, under the science and technology cooperation agreements, partnership is enhanced in the form of information and research personnel exchanges, and the implementation of joint research. Opinion exchanges on the possibility of future cooperation are also being pursued with other countries with which Japan has not signed an agreement.

5 Approaches to International Projects

(1) International Thermonuclear Experiment Reactor (ITER)

The International Thermonuclear Experiment Reactor (ITER) is a joint international project that, through construction and operation of a nuclear fusion experimental reactor, aims to demonstrate S&T feasibility of fusion energy expected to be one of the future permanent energy sources. Currently, seven countries and regions are participating: Japan, EU, US, Russia, China, the Republic of Korea, and India. In addition, as an advanced nuclear fusion R&D project complementing and supporting the ITER Project, Japan implements a "broader approach" in its country intended for realization of nuclear fusion energy in cooperation with EU. The Broader Approach Agreement came into effect in June 2007 and the ITER Agreement in October 2007, and full-scale activities are now being implemented.

(2) International Space Station (ISS)

The International Space Station (ISS) project, participating five parties (Japan, the US, Europe, Canada and Russia) is an international cooperation project intended to construct a space station in orbit around the Earth. As part of this project, Japan develops the Japanese Experiment Module (JEM), also known as KIBO, and an unmanned cargo transfer spacecraft H-II Transfer Vehicle (HTV). For details, refer to Part 2, Chapter 2, Section 2, 8 (1).

(3) Integrated Ocean Drilling Program (IODP)

The Integrated Ocean Drilling Program (IODP) is an international program launched in 2003 in which 21 countries participate led by Japan and the US. The Program aims to elucidate environmental change, structure of the earth's crust, and deep biosphere exploring the deep parts of the earth using multiple drilling platforms including Japan's Deep-sea Drilling Vessel CHIKYU which is capable of drilling from the deep ocean floor to 7000 m below the bottom of the ocean, partnered with the non-riser drillship supplied and operated by the US as the main drillship, with addition of Europe's "mission-specific" drilling technologies.

The CHIKYU which was completed in July 2005 started the research voyage mission in September 2007 to observe the mechanism of causing gigantic Tonankai and Nankai earthquakes in the Sea of Kumano.

(4) Large Hadron Collider (LHC)

The Large Hadron Collider (LHC) includes a huge circular accelerator whose circumference reaches 27 km, which is being constructed by the European Organization for Nuclear Research (CERN). In the accelerator, protons are accelerated from two directions almost to the speed of light. The Project aims to find unknown particles in the enormous energy area to be produced when protons collide, thus exploring and clarifying the internal structure of substances. The construction is now under way, aiming for the start of experiments in 2008 through international cooperation among countries including the CERN member countries, Japan and the US. Japan contributes to promotion of the LHC Project including funding for construction of the particle accelerator, anticipating its academic significance as well as its potential to lead the progress in advanced technology.

6 Cultivation of Environment and Researcher Exchanges for Enhancing International Activities

(1) Promotion of international research activities

It is necessary to gather excellent human resources and the latest information into Japan, and promote the internationalization of S&T activities in order to respond to challenges that human beings are facing. To this end, international joint research and international conferences are promoted through programs such as the Asia Science and Technology Strategic Cooperation Promotion Program (SCF), Strategic International Cooperative Program (JST), and JSPS Core-to-Core Program. In addition, since FY 2005, the Strategic Fund for Establishing International Headquarters in Universities was implemented, and at the selected universities, the organizational structure has been modified to create interdisciplinary, cross-sectional bodies like an International Strategy Headquarters to coordinate the basis for promoting strategies for international activities.

(2) Promotion of researcher exchanges

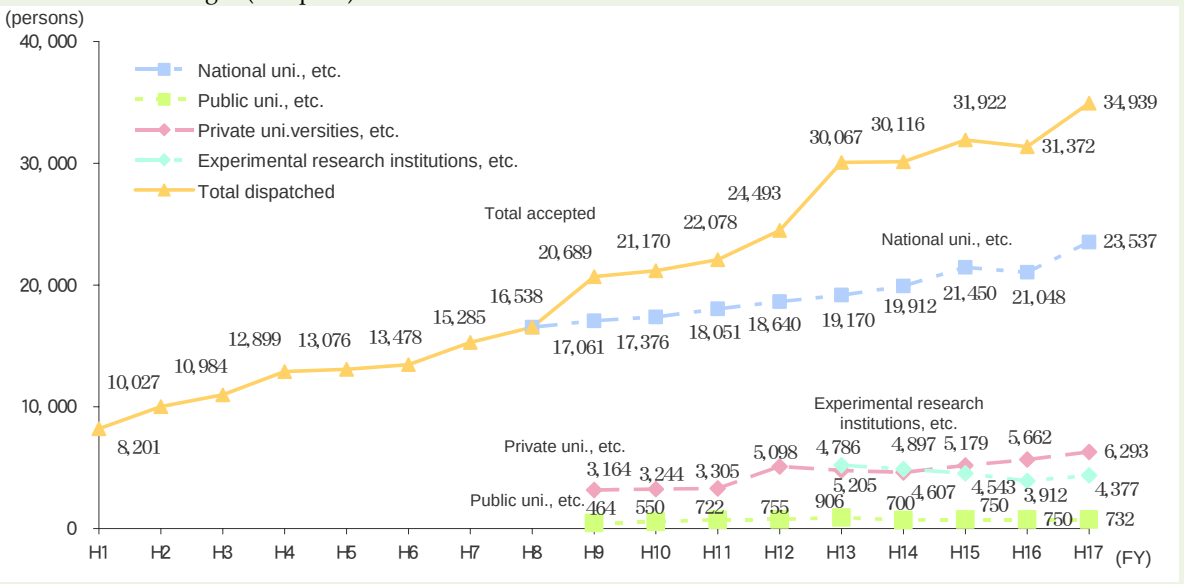
For the S&T development as well as academic research, it is essential that Japan attracts many excellent researchers in Japan and overseas and let Japanese researchers to compete at cutting-edge levels at the international standard. For this purpose, various researcher-exchange programs are being carried out.

JSPS, through its Postdoctoral Fellowship for Foreign Researchers, provides excellent young foreign researchers with opportunities to engage in research at Japanese universities. In addition, JSPS dispatches young Japanese researchers abroad through its Postdoctoral Fellowships for Research Abroad and International Training Program (ITP) for young researchers newly implemented in 2007 so as to enable them to engage in research at outstanding foreign research organizations and expand opportunities to mingle with foreign researchers. JSPS also promotes activities such as joint research, seminars and researcher exchanges through bilateral collaboration with funding agencies overseas.

As a result of these measures, the numbers of foreign researchers invited and Japanese researchers dispatched overseas have generally been increasing at private and national universities, and research institutions over the past years (Figure 2-3-26). In FY 2005, the numbers of both researchers dispatched and invited increased by about 10% from the level of FY 2004. By regions, there are active researcher exchanges with Asia, Europe, and North America (Figure 2-3-27).

Figure 2-3-26 Trends in Researcher Exchanges at Universities and Experimental Research Institutions

Researcher Exchanges (accepted)



Researcher Exchanges (dispatched)

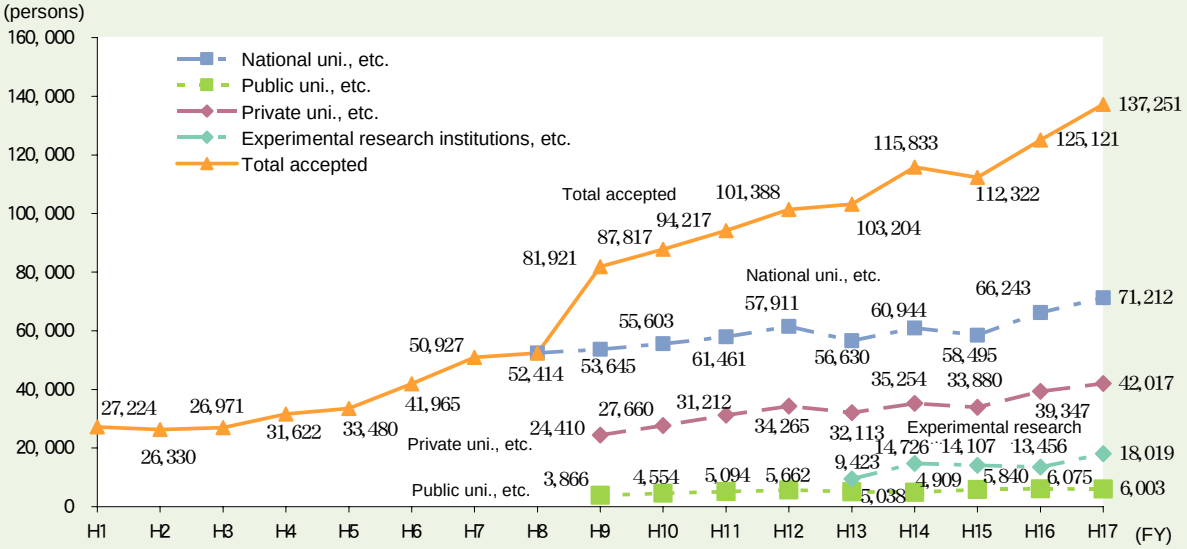
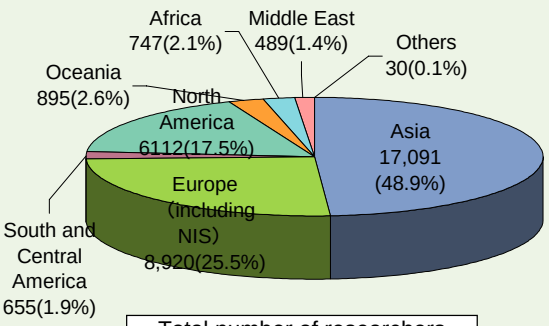
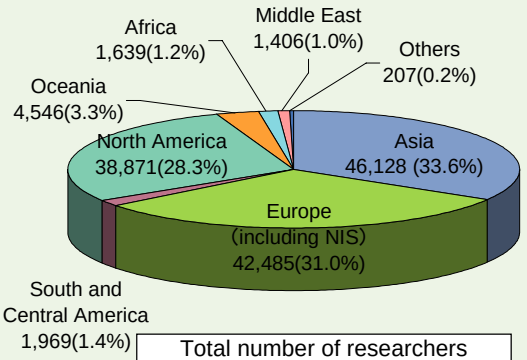


Figure 2-3-27 Number of Researcher Exchanges, by Region



Total number of researchers accepted into Japan in FY 2005
34,939



Total number of researchers dispatched from Japan in FY 2005
137,251