

OECD SCIENCE, TECHNOLOGY AND INDUSTRY OUTLOOK 2004 COUNTRY RESPONSE TO POLICY QUESTIONNAIRE

JAPAN

1. General framework and trends in science, technology, and innovation policy

Science and Technology Policies in Japan

In Japan, based on the Science and Technology Basic Law that was enforced in 1995, the first Science and Technology Basic Plan was adopted in 1996, and the Second Science and Technology Basic Plan (adopted by the Cabinet) in 2001 targeting FY2001 to FY2005.¹

In the Second Science and Technology Basic Plan, the following policies are considered necessary for the establishment of a nation based on the creativity of science and technology:

- Priority setting for strategic promotion of S&T
- S&T system reforms to achieve excellent results and utilize them.

Furthermore, due to the need to keep the percentage of the governmental R&D expenditure as a portion of the GDP at least in the same level as the ones in leading European countries and the United States, the total amount of approximately 24 trillion yen for the governmental R&D expenditure from FY 2001 to FY2005 was defined as the goal under certain conditions. (Note that this estimation is based on an assumption that the percentage of the governmental R&D investment should be one percentage of the GDP, of which nominal growth rate is 3.5 percent, during the period of the Second Basic Plan.)

Currently, the Science and Technology Basic Plan (almost three years have passed since the adoption) is steadily advancing. At the same time, structural reforms including incorporation of National Universities into Corporations and transformation of R&D-related Public Corporations into Incorporated Administrative Agencies, etc., are proceeding.

Also, the Science and Technology Basic Plan states that the Council for Science and Technology Policy (CSTP) should follow-up on the Basic Plan at the end of every financial year, and for the policies implemented in FY 2002, “The Current Situation of Science and Technology Policies Based on the Science and Technology Basic Plan” was compiled.

The achievements of the major science and technology policies are described below.

¹ See <http://www8.cao.go.jp/cstp/english/basicplan01-05.pdf>

Governmental R&D Expenditure.

The accumulated amount of the governmental R&D expenditure by the FY 2004 government budget draft is 17 trillion yen, and efforts have been continuously put into securing the total amount of 24 trillion yen for the R&D expenditure.

System Reforms.

The former National Guideline (1997) was progressively reviewed and “National Guideline for the Evaluating Government Funded R&D” (decided by the prime minister in November, 2001) was developed. The new National Guideline was reinforced by adding R&D measures to evaluation strengthening link with resource allocation and so on.

Based on the new National Guideline, specific guidelines were developed by each Ministry, defining evaluation methods, etc., and evaluations are being conducted strictly by R&D agencies, according to the National Guidelines and the guidelines of each Ministry.

- As the competitive fund system is reformed, responsible systems are being constructed, including setting program officers with researching background who perform the actual works, such as evaluations and follow-up of issues.
- In April, 2004, each national university was transformed into a national university corporation, which will expand the independence of university management, and also will enable flexible human resource management as a result of transformation to the non-civil servants dominated system.
- The “Incorporated Administrative Agencies” were first established in FY2001 to increase flexibilities of those agencies’ operations and upgrade qualities of governmental services. Among agencies conducting research and development projects under MEXT’s (Ministry of Education, Culture, Sports, Science and Technology) jurisdiction, four institutions made starts as Incorporated Administrative Agencies in April 2001, another four in October 2003, and one more will in April 2004. Under this system, agencies are expected to raise transparency of their activities through ex-ante evaluations of pre-submitted plans, ex-post evaluations of accomplishments and disclosure of pay standards and financial statements. In addition, agencies are able to promote research and development more flexibly through newly adopted financial and personnel system.

Achievements of Other Policies

- Regarding the reforms and increase of competitive funds that contribute to the establishment of a competitive R&D environment, the total amount is being increased while increasing indirect expenses (296.8 billion yen in 2000 →360.6 billion yen in the government budget bill for 2004).
- To promote the achievement of excellent research results from universities and returning them to society, many efforts have been put into such activities as reinforcing matching funds that encourage industry-academia-government sector joint research activities and supporting university based startups. At the same time, it is ensured that university intellectual property centers are reinforced and strengthened, and universities are assisted in acquiring patents for research outcomes.
 - The number of research activities jointly conducted by national universities and companies:

4,029 (2000)→6,767 (2002)

- University based Starts-up: 128 (2000) →614 (2003)
- University intellectual property headquarters at universities: 43 (2003)
- Approved TLOs: 16 organizations (2000) →36 organizations (2003)
- The number of patents applied by approved TLOs: 691 (2000) →4,088 (2003)
- The number of licenses issued by approved TLOs: 98 (2000) →920 (2003)
- Science and technology in regional areas is being promoted, with universities and public research institutes, etc. as the core, by developing “Intellectual Cluster” (being implemented in 15 regions in 2003), and also by performing “Cooperation of Innovative Technology and Advanced Research in Evolutional Area” (19 regions and 9 regions were selected in 2002 and 2003 respectively) that encourages local industry-academia-government sector cooperation to focus on city areas.
- Additionally, METI (The Ministry of Economy, Trade and Industry) promotes “Industrial Cluster Projects” in order to encourage the development of new businesses, by making use of networks of people in the business, academic, and public sectors (19 projects were implemented in 2002 and 2003.)
- In order to secure the world-class educational research results, “Five-Year Program for Emergent Improvement of the Facilities of National Universities, etc.” (planned improvement area: approximately 600 million square meters, target project cost: approximately 1,600 billion yen) was adopted in April, 2001 including facilities at universities, etc. to be improved urgently within the next 5 years. By the FY 2004 initial budget, 1258.6 billion yen is planned to be provided and approximately 373 million square meters will be improved.

Strategic Priority Setting in R&D

In the process of investigation of the Second Science and Technology Basic Plan, in order to clarify the prioritized R&D fields to be worked on, fields that can significantly contribute to the following perspectives were evaluated:

- Creating knowledge that will be the source of new developments (intellectual assets enhancement)
- Promoting sustainable growth in the world markets, improving industrial technologies, and creating new industries and employment (economic effects)
- Improving people’s health and quality of life, enhancing the national security or disaster prevention. (societal benefits)

As a result, the Science and Technology Plan denotes that R&D resources should be allocated preferentially and intensively in the following four fields:

- 1) *Life sciences field* that contributes to preventing/treating diseases in aging society with a falling number of new born babies and to solving the food problem;

- 2) *Information and telecommunications field* that is advancing rapidly, and leads directly to the construction of advanced information and telecommunications society and expansion of the information and communications industry and high-tech industry;
- 3) *Environment field* that is indispensable to maintaining human health and conserving the living environment as well as sustaining the foundations of human existence;
- 4) *Nanotechnology and materials field* that makes spin-off effects to a broad range of fields, and with which Japan is at advantage.

Based on the Basic Plan, the Council develops promotion strategies for each field with a focus on the prioritized four fields, and also annually develops “Policies for allocation of budget and personnel and other resources” to show ministries prioritized areas while making requests for the next year.

Based on the promotion strategies for each field developed by the Council, MEXT has just developed R&D promotion strategies for each field in May, 2002 that clarify R&D issues, promotion strategies and so on for approximately next five years, with foresight into the decade ahead, and is promoting the strategies to enable related-institutions, etc. to work effectively and efficiently.

According to the guidelines of the Council, the resources are efficiently allocated at the MEXT and other ministries that conduct research and development.

(100 million yen)

	2002		2003		2004	
Life sciences	3,934	19.4%	4,270	20.9%	4,362	20.9%
Information and Telecommunications	1,758	8.7%	1,696	8.3%	1,758	8.4%
Environment	1,006	5.0%	1,099	5.4%	1,175	5.6%
Nanotechnology and Materials	856	4.2%	912	4.5%	940	4.5%
Energy	7,050	34.8%	6,714	32.8%	6,826	32.6%
Manufacturing Technology	164	0.8%	198	1.0%	203	1.0%
Infrastructure	2,554	12.6%	2,561	12.5%	2,836	13.6%
Frontier	2,953	14.6%	3,029	14.8%	2,814	13.5%

2. Public sector research and public research organisations

Reform of the organization and governance of public research organisations

The National Institute of Advanced Industrial Science and Technology (AIST) was inaugurated as an “Incorporated Administrative Agency” in April 2001, unifying 16 existing research institutions under the Ministry of International Trade and Industry (MITI). An “Incorporated Administrative Agency” refers to a governmental institution that has been turned into a legal entity which does not have governmental status. This reform aims to replace advance interventions and controls from government to the entity with after-the-fact checks as far as possible, and to assure flexible, effective and highly transparent administration, in order to supply effective and prompt public services that meet citizens’ needs.

From 2002 to 2003, the AIST continued to urge organisational reform internally in line with its purpose as an Incorporated Administrative Agency. As a result, consciousness that their research results should be commercialized and practically applied to social needs has been raised among individual researchers. In addition, quantitative indicators regarding research performance such as external research funding, the number of papers published, the Impact Factor, the number of patent applications, and income

from patents are rising, compared to the situation before the inauguration of the AIST as an Incorporated Administrative Agency. For these reasons, the AIST has been highly evaluated by the Incorporated Administrative Agency Evaluation Committee.

In the IT area, CRL (Communications Research Laboratory), the public R&D organization for IT, will be unified with TAO (Telecommunications Advancement Organization of Japan), which has supported private R&D, and the new organization for IT R&D will be established in April 2004. The new organization, NICT (National Institute of IT) is an incorporated administrative agency under the Ministry of Public Management, Home Affairs, Posts and Telecommunications (MPHPT) which implements R&D by itself and supports R&D in the private sector comprehensively.

Policies and government-sponsored programmes to foster international collaboration among researchers in universities and public research organisations.

TAO (Telecommunications Advancement Organization of Japan) had operated JGN (Japan Gigabit Network) from FY 1999 to FY 2003 as a research infrastructure for both of public, academic and business researchers. JGN was a nationwide network which consisted of ultra high-speed fibre-optic circuits and institutes for R&D. It had contributed to R&D of more than 600 organizations. This research infrastructure has resulted in the developments of various applications and the creation of new industries and new markets and the fosterage of human resources, etc. are expected to be achieved.

3. Government support for private-sector R&D and innovation

Vitalizing business R&D is significant challenge for the future of our economy. In Japan, the rate of tax subsidies of R&D is extremely low in international comparison. Recently, Japanese government has amended its R&D tax incentive system to overcome the depressed economic situation in Japan. The previous tax incentive system was designed for incremental R&D expenditure. The highest 3 yearly expenditures in past 5 years were averaged, and the increased amount from the average could be available for deduction. This plan was successful when the Japanese economy was growing continuously with high rate. However, after the economic downturn it lost its effectiveness; the total value of the tax deduction in Japan decreased from more than 100 billion yen to 20 or 30 billion yen. Therefore, Japanese government modified this tax incentive system in 2003 to allow 10-12% of total R&D expenditure to be deducted. In order to keep an incentive to companies for increasing their R&D expenditure, it is prescribed in the new tax incentive system that the deduction rate is raised from 10% to 12% with the rate of R&D expenditure in total sales volume of the company.

While Japanese technology and R&D levels are high, Japanese society lacks technology managers. It is urgently needed to establish Management of Technology (MOT) courses in Universities etc. METI (Ministry of Economy, Trade and Industry) establishes “Entrepreneurship Promotion Program” to solicit MOT development program proposals (course offerings, teaching materials and case study materials) from universities, graduate schools, and other educational institutions, to develop, test, and evaluate the programs in cooperation with industry. MEXT promotes support programs for MOT and/or intellectual property experts at universities.

4. Enhancing collaboration and networking among innovating organisations

Major initiatives to promote collaboration and networking among private firms

According to the Law for Promoting University-Industry Technology Transfer in 1998, METI and MEXT have approved 36 TLOs (Technology Licensing Organizations) for national and private universities as of December 2003.

METI and MEXT establish various policies to support approved TLOs. For Example:

- Grants for the technology transfer activities.
- Technology transfer-related information services.
- Alleviation of annual patent fee, etc. for approved TLOs (reduction by half).
- Measures to offer free use of national universities' facilities to approved TLOs: 22 organizations (as of August 2003)

As for an innovative cluster base, there is YRP (Yokosuka Research Park) as a R&D cluster base supported by MPHPT specialized for radio communications technologies. More than 60 organizations site their laboratories there. The next-generation radio communications systems such as "4th Generation Mobile Phones" are being developed in YRP through joint R&D among publics, academics and private firms.

Major policy initiatives to promote stronger industry/science

- Establish and develop venture capital funds and/or second-stage financing for the support of new technology-based firms or spin-offs from public research organisations.

In May 2001, the Minister of Economy, Trade and Industry launched an initiative "the Plan for the Creation of New Market and New Jobs". MEXT also promotes partnership between industry-academia-government

Japanese government aspires to establish 1000 venture companies derived from universities within three years.

METI and MEXT establish various policies to achieve the aim of the plan. For example:

- Support program for technology development on the basis of academic findings.
- Program to support management of university-based venture businesses.

5. Human resources for S&T

Efforts to increase numbers of university graduates with science and engineering degrees

Some recent international and domestic surveys find Japanese young people and public have low interest in S&T. However, the Japanese government considers that public understanding of science & technology plays a key role to build an advanced science and technology - oriented nation and to secure innovative technology and to boost industrial competitiveness. Therefore, the Government is now working with various projects to promote public understanding on science and technology.

"Science literacy enhancement initiative" has been implemented. The initiative supports activities in various way such as collaborating studies with science volunteers, science centers and research institutes in order to help children have concern about science.

The major activities are:

- Designating “super science high schools”
- Model schools for promotion of science education ‘Rika Daisuki School’ (for elementary and Junior High School”)
- Start of “science Partnership program”
- Developing advanced digital study materials for science and technology education.

In the second Science and Technology Basic Plan, aiming at improving self-reliance of young researchers, it is conceived that “In the future, the post-doctoral fellowship should be developed substantially in which research advisors using funds of their own responsibility could secure post-doctoral fellowships, post-doctoral fellows could be treated according to their ability, post-doctoral fellows could be dispatched to ministries or companies, and excellent doctoral students could get sufficient support, and the system should be evaluated”.

The MEXT, while increasing competitive funds, is expanding opportunities for post-doctoral fellows and others to participate in research projects supported with competitive funds, as well as promoting various support programs for bright doctoral students and post-doctoral fellows, such as fellowship programs (Japan Society for the Promotion of Science) that support young researchers including post-doctoral fellows, enabling them to focus on their research activities proactively.

Policy initiatives taken to address perceived shortages of scientists and engineers in particular fields

Based on the policy established by the Council for Science and Technology Policy and under the “Fostering Human Resource for Emerging Areas” program using the special coordination funds for promoting science and technology, the MEXT is fully aware of the situation in which there is a lack of necessary human resources in some fields that are important for the development of science and technology. With this caveat in mind, the MEXT sets up actively a human resource unit which fosters professionals in the newly emerging fields of science and technology at the earliest stage possible, in order to assure the nation’s position in the world by developing human resources strategically. The MEXT will also support the new construction of a re-educational system for corporate researchers and engineers to learn cutting-edge science and technology from FY 2004.

Policy changes related to the international migration and mobility of scientific and high-skilled personnel

In the Second Science and Technology Basic Plan of Japan, promoting the internationalization of scientific and technological activities is considered as one of the most important national policies. The Second Basic Plan states that it is necessary to increase opportunities for bright foreign researchers to take active part in research organizations in Japan, and to increase opportunities for Japanese researchers to take active part in excellent research organization abroad.

Based on the ideas of the Basic Plan, the MEXT is promoting international exchanges among researchers, being fully aware of deepening exchanges mainly with Asian countries, and the importance of improving the imbalance which exists in Japan’s exchanges with European countries; the imbalance is about a gap between the number of Japanese researchers who are dispatched to foreign countries and the number of foreign researchers who come to Japan. In such a context as this, international exchanges and collaboration related to the development of human resources for science and technology have been worked on.

Some of the specific programs to achieve these goals include the “Postdoctoral Fellowships for Foreign Researchers” program that invites bright young researchers to Japan, and the “Postdoctoral

Fellowships for Research Abroad” program that dispatches young bright researchers abroad, both of which are organized by the Japan Society for the Promotion of Science (JSPS).

6. Policies to boost innovation in the service sector

Policies to foster increased innovation and productivity growth in the service sector

In order to ensure developed competitiveness not only of software industry but also of the whole of industry in Japan and credibility of economic society system, METI will support intensively personnel and private enterprises to develop high quality software, improve quality and credibility of software, and productivity of these software, and promote actively human resource development and R&D through closed partnership among industry, academic and government for sharing resources used to develop software. Details of each measure are listed as follows:

- Supports for IT SMEs. METI will provide financial supports for R&D on software made by IT SMEs that has excellent technology seeds.
- Original software creation. METI will provide financial supports for software developments by excellent IT experts with high originality, who will be found by the program managers with high IT skills and related accomplishments.
- Next-generation software developments. METI will publicly invite development projects of next-generation software technology from private companies by specified sectors, and provide subsidies for certain projects adopted by the program manager.
- Promotion of open source software utilization. In order to promote development and utilization of open source software, METI will establish a pilot project in which selected institutions will introduce open source software for their desk-top systems. In addition, METI will provide financial supports for these institutions.

Efforts to improve human capital and develop highly-skilled workers through new educational curricula support for on-the-job training, etc.

METI will take several measures necessary to improve infrastructure of IT human resources that support sustainable development of advanced information society. Details of these measures are listed as follows:

- Supports for educational trainings responsive to IT Skill Standards
- METI will evaluate validity of practical educational trainings responsive to IT Skill Standards and training roadmap.
- Promotion of digitized education
- METI will establish standard specifications for both hardware and software to support effective trainings and educations utilizing IT products on primary and medium education levels.
- Development of IT human resources in Asian countries
- METI will promote standardization of e-Learning in Asian countries and support development of IT human resources to make effective contents.
- In addition, METI will take necessary measures for Japanese IT engineer examination to be introduced in Asian countries.

- Furthermore, METI will provide practical trainings for key IT technicians in Asian countries, so that these countries could become more highly IT nations and that private companies in these countries could make more closed business partnership with those of Japan.

Deregulation, labour market reforms, support for standards (e.g. technical standards, interoperability standards), or other policies to enhance competitiveness in the service sector.

Council for Regulatory Reform

In April 2001, The Council for Regulatory Reform was established within the cabinet office as an organization to comprehensively investigate and deliberate basic issue on necessary reform from the perspective of promoting economic (including the service sector) and social structural reforms at the request of the prime minister.

The Council for Regulatory Reform published “Third Report Regarding Promotion of Regulatory Reform” on December 22, 2003.

In this report, heavy focus placed on discussion of Action Plan for 17 high-priority issues* and comments made on some 340 issues. A cabinet decision was made on the report with greatest possible adherence being given to the report’s recommendations. Recommendations will also be reflected in new Three-Year Plan for Promotion of Regulatory Reform.

17 high-priority issues*: 12 high-priority issues contained in July 2003 *Action Plan for the Promotion of Regulatory Reform* report and 5 other issues added in October. Ex) Sale of Pharmaceutical products in regular retail; Promotion of opening for public properties and service to the private sector, etc.

Special zone for Structural Reform

To stimulate the Japanese economy (including the service sector), it is necessary to elicit private-sector vitality to the maximum extent, and to expand private-sector business by implementing regulatory reform.

By setting up specified zones where regulatory exception are established in accordance with the zone’s specific circumstances, based on voluntary plans proposed by municipal bodies, private-sector enterprises, etc., we promote structural reform in the area.

Since 57 Special Zones for Structural Reform were decided based on the Law on Special Zone for Structural Reform (promulgated on December 18, 2002) as the first one in April 2003, 236 Special Zones for Structural Reform have been decided in 2003FY.

One stop service centers for youth (labour market reform)

In order to promote the matching of jobs and young workers, we support one stop service centers which are set up by prefectures as a place of cooperation among industry, educational institutes, the community and local government, where young people can receive comprehensive employment-related services.

METI will commission enterprises the business to offer employment-related services such as job counseling and job training.