The nation should implement necessary policy measures to use R&D funds effectively corresponding to the progress of R&D in order to promote R&D smoothly.

(Making public the results of R&D)
Article 16

The nation should implement necessary policy measures to diffuse the results of R&D, such as the publication of the results of R&D and the provision of the information on R&D and measures to promote appropriate practical applications of them.

(Support of efforts by private enterprises)
Article 17

In consideration of the importance of the role played by the private sector in S&T activities in Japan, the nation should implement necessary policy measures to promote private sector R&D by encouraging initiatives in the private sector.

Chapter 4　Promotion of International Exchange
Article 18

The nation should implement necessary policy measures to promote international exchange such as international exchange of Researchers, international joint R&D and international distribution of information on S&T, in order to play an active role in international society, as well as to contribute to further progress in S&T in Japan, by intensely promoting international S&T activities.

Chapter 5　Promotion of Learning on S&T
Article 19

The nation should implement necessary policy measures to promote the learning of S&T in school and social education, to enlighten the people in S&T and to disseminate knowledge on S&T, so that all Japanese people including the young can deepen their understanding of and interest in S&T with every opportunity.

Supplementary Provision

This law shall enter into force on the day of its promulgation.

This English language version of this law is a translation of an original document produced in Japanese. Any questions that may arise about the interpretation of the law shall be resolved with regard to the original Japanese document.

Source:　Council for Science and Technology Policy, Cabinet Office's Web site
(accessed and cited November 1, 2001) <http://www8.cao.go.jp/cstp/english/law.html>

2. The Science and Technology Basic Plan (2006-2010) (unofficial version)

(decided by the Government of Japan on March 28, 2006)

(v) Promoting the activities of female researchers
(vi) Promoting the activities of foreign researchers
(vii) Utilizing the abilities of talented senior researchers
(2) Enhancing the human resource development function in universities
(i) Human resource development in universities
(ii) Drastic enhancement of graduate education
(iii) Formulating action plan on the reform of graduate school education
(iv) Improving financial aid for doctorate course students
(3) Developing human resources that meet the needs of society
(i) Human resource development by industry-university partnership
(ii) Promoting the activities of doctorals in industry
(iii) Development of diverse human resources utilizing and returning knowledge to society
(4) Expanding the scope of human resources who will bear the S&T in future
(i) Developing children with exuberant intellectual curiosity
(ii) Developing the individuality and abilities of gifted children
2. Creating scientific development and persistent innovation
(1) Developing a competitive environment
(i) Increasing competitive funds and indirect costs
(ii) Developing a competitive environment in organizations
(iii) Promoting the systemic reforms on competitive funds
(2) Enhancing the competitive edge of universities
(i) Creating universities that lead the world's S&T
(ii) Revitalizing universities that utilize uniqueness and characteristics
(3) Enhancing systems for creating innovation
(i) Maintaining the various research fund systems according to the development stage of R&D
(ii) Building a sustainable and progressive industry-university-government collaboration system
(iii) Promoting the utilization of new technologies in the public sector
(iv) Promoting the entrepreneurial activities of R&D ventures
(v) Promoting R&D by private enterprises
(4) Building regional innovation systems and creating vital regions
(i) Forming regional clusters
(ii) Developing smooth S&T policies in regions
(5) Effective and efficient promotion of R&D
(i) Effective utilization of research funds
(ii) Emphasizing the development and utilization of human resources in research funds
(iii) Reforming the evaluation system
(6) Resolving the institutional and operational bottleneck that acts against S&T activities and returning benefits from R&D to society
3. Reinforcing the foundation for promoting S&T
(1) Intentional and selective improvements of facilities
(i) Improvements of facilities such as national universities and public research institutions
(ii) Development of facilities of national universities and public research institutions
(iii) Developing the facilities of public universities
(iv) Developing the facilities of private universities
(v) Promoting the development and shared use of advanced large-scale public research facilities

(2) Improving the intellectual infrastructure
(i) Strategic and selective development of intellectual infrastructure
(ii) Building a framework for promoting efficient development and use
(3) Creating, protecting and utilizing intellectual property
(4) Actively responding to standardization
(5) Improving the research information infrastructure
(6) Promoting the activities of academic societies
(7) Promoting R&D in public research institutions

4. Strategically promoting international activities
(1) Systematic efforts of international activities
(2) Cooperating with Asian nations
(3) Promoting general development for reinforcing international activities, and acceptance of talented foreign researchers

Chapter 4 S&T to Be Supported by Society and the Public

1. Responsible measures to resolve ethical, legal, or social problems caused by S&T
2. Accountability relating to S&T and the improvement of information transmission
3. Improving the public awareness of S&T
4. Promoting proactive participation of the public in S&T

Chapter 5 Role of the Council for Science and Technology Policy

1. Basic operation
2. Specific measures
(1) Effective, efficient promotion of governmental R&D
(2) Promotion of S&T system reforms
(3) S&T to be supported by the public and to benefit society
(4) Strategic promotion of international activities
(5) Removal of structural or operational obstacles for smooth S&T activities and the return of the results to society
(6) Appropriate follow-up of the S&T basic plan and the promotion of the progress

Introduction

It is never easy for Japan, a resource-poor country, to occupy an honorable position in human society. In fact, the country's future prosperity depends on the development of unique, outstanding S&T. With this understanding, Japan set the goal of "becoming an advanced science-and technology-oriented nation" as a national strategy. The Science and Technology Basic Law has been enacted, under which a comprehensive range of measures has been taken intensively based on the Science and Technology Basic Plan (hereinafter "Basic Plan"), including the "First Basic Plan" for FY1996-2000, and the "Second Basic Plan" decided by the Cabinet in March 2001 and scheduled for implementation during FY2001-2005.

The first and second basic plans were formulated and carried out during the period of prolonged economic stagnation in Japan following the collapse of the bubble economy. Even in the deteriorating financial circumstances, governmental R&D expenditure increased, and a broad range of structural reforms were conducted such as: strategic priority setting in S&T through promotion of basic research and prioritization of R&D on national/social issues; development of a competitive R&D environment by increasing competitive funds and reforming existing systems; and reorganization of national research institutes and national universities into corporations.

At this time of formulation of the third basic plan, the Japanese economy has finally recovered from the prolonged stagnation and started to show signs of shifting to a sustainable growth path. In S&T, also, policy efforts have been made persistently based on the first and second basic plans. As a result of these efforts, world-leading research papers and findings emerged, and some of the advanced findings have been turned into innovative industrialization. The competitiveness of the private sector is based on national S&T capability. In light of this, both effective increase of R&D expenditure and thorough execution of R&T system reforms during the period of the third basic plan (FY2006-2010) will be indispensable for the long-term development of the Japanese economy.

Of course, people expect much more than economic contributions from Japan's S&T in the third basic plan. They also expect: contribution to society, which is changing remarkably due to rapidly aging population and declining birth rate; resolution of safety issues relating to public concerns about large-scale natural disasters and accidents, as well as complicated global security issues including terrorist attacks; and resolution of deteriorating global-scale problems concerning population and the environment, etc. Thus, the society expects S&T to play more extensive and profound roles. Moreover, the world never stops in making progress in S&T. China, South Korea, and other Asian countries, as well as the U.S. and European countries are rapidly coming to enhance S&T as a basis of national strength.

In order to use investments accumulated during the period of the previous two plans and also to meet increasing social and economic needs in various fields, the third basic plan should further enhance accountability and strategies, aiming at S&T to be supported by the public and to benefit society. The core strategies of the third plan are: development of human resources who can produce excellent research findings, creation of a competitive environment, promotion of science, and creation of persistent innovations through strategic investment; and removal of systematic or operational obstacles to return the R&D benefits to society. S&T has a mission to address a broad range of these policy issues for the next five years. With this basic understanding, the third basic plan intends to indicate primary measures to be executed steadily by the government as a whole with the leadership of the Council for Science and Technology Policy.

Chapter 1 Basic Ideas

1. Circumstances relating to S&T

(1) Progress in S&T measures

The first basic plan had as its primary principle aggressive promotion of both R&D to meet social and economic needs and basic research to create intellectual assets, and provided measures to be taken. In the plan, the total amount of governmental R&D expenditure was estimated to be around 17 trillion yen, and the final budget exceeded the estimation despite the severe financial conditions.

The second basic plan provided three basic concepts as the vision that this country should aim for in S&T policies: i.e. a nation contributing to the world by creation and utilization of scientific knowledge; a nation with international competitiveness and ability of sustainable development; and a nation securing safety and quality of life.

Based on these Ideas, the second basic plan budgeted about 24 trillion yen, more than the amount in the first basic plan, as governmental R&D expenditure for the five years from FY2001 to FY2005, aiming at S&T system reforms and strategic priority setting in S&T through promotion of basic research and prioritization of R&D on national/social issues. The measures planned in the second basic plan have been implemented steadily as a whole. The progress in primary measures is as follows:

(i) Total amount of governmental R&D expenditure

Due to economic stagnation over rather long periods of time and severe financial conditions, the total amount of governmental R&D expenditure did not reach 24 trillion yen, the amount planned in the second basic plan, but achieved higher growth compared to other general expenditures.

Note: The above expenditure of 24 trillion yen is based on an assumption that the governmental R&D investment should be 1% of GDP, of which nominal growth rate is 3.5%, during the period of the second basic plan.

(ii) Strategic priority setting in S&T

Strategic priority setting in S&T, aiming at effective, efficient promotion of governmental R&D investments, made steady progress in resource allocation. More specifically, the significance of basic research steadily increased in governmental R&D as a whole, while the country's S&T had a stronger basis. Competitive funds, in particular, increased remarkably. As for R&D on national/social issues, resources were allotted preferentially and primarily to four areas: life sciences; information and telecommunications; environmental sciences; and nanotechnology/materials. These areas are considered to greatly contribute to the vision for which the country should aim (the three Ideas). In the other four areas, i.e. energy, manufacturing technology, infrastructure, and frontier, R&D on indispensable fields for the nation’s existence in these areas were primarily promoted. As a result, in the S&T budgets for these eight areas, the percentage of budgets for the prioritized four areas increased from 38% in FY2001 to 46% in FY2005.

(iii) Development of a competitive R&D environment and other R&D system reforms

The amount of competitive funds (R&D funds distributed to researchers; the entities of resource allocation

are diverse, and a team including experts selects appropriate projects to be funded, from research projects gathered and proposed, mainly based on scientific or technical evaluation) did not double but increased, and the percentage of funds to the S&T budget increased from 8% to 13% in the period of the plan. In addition, certain progress has been made in system reforms such as increase of indirect expenses, improvement of systems to cultivate young researchers, and strengthening of the managerial/evaluation system by program officers and directors (POs/PDs). However, other reforms such as securing 30% of the budget for indirect expenses remain unfinished. In the course of budgetary increase in prioritized areas, a broader range of government agencies have been adopting the competitive fund system, and various types of expenses have been budgeted for competitive funds.

The numbers of universities and public research institutions adopting fixed-term appointment increased, while the percentage of fixed-term researchers to total researchers remained low.

Moreover, 68 national research institutes were reorganized into independent administrative institutions in April 2001 and national universities into corporations in April 2004, and research institutions became able to conduct more flexible research management. Under the National Guideline on the Method of Evaluation for Government R&D (Decided by Prime Minister in November 2001; amended in March 2005; hereinafter "National Guideline"), other R&D system reforms were promoted, resulting in the steady recognition and execution of R&D evaluation by relevant ministries, agencies, and research institutions, and the improvement of their awareness.

(iv) Industry-academia-government collaboration and other S&T system reforms

S&T system reforms enabled steadily progress in industry-academia-government collaboration such as: increase in the numbers of industry-academia joint research, technology transfers by technology licensing organizations (TLOs), and university-derived ventures (the total number of such ventures has reached 1,000). Regional S&T promotion has also advanced (18 regions for knowledge clusters; 19 projects for industrial clusters).

In accordance with the “5-Year Plan for Urgent Improvement of National Universities and Other Research Institutions,” graduate schools and research institutions were developed and improved, and the congestion problem of facilities, the priority issue, was resolved on a planned basis. However, the improvement of deteriorated facilities was delayed, while the number of deteriorated facilities increased mainly due to the elapse of time.

(2) Results of S&T policies

Looking into the promotion of basic research and the results of investment strategies including the effects of accumulated investments, Japan has improved its international status steadily in the quality and quantity of research papers, resulting in world-class achievements. According to the survey on extensive technical areas for S&T experts, in comparison with the U.S. and EU, Japan improved its international status in almost all fields compared to five years ago. Japanese researchers have been acknowledged for their unique findings, and Nobel Prizes have been awarded to three researchers in chemistry and one in physics since 2000.

As far as judging from the numbers of university-derived ventures and joint research conducted by universities and private companies, technology transfer from universities and public research institutions worked well during the period of the second basic plan. Also Japan's unique research findings have created a new market generating hundreds of billions of yen while contributing to defeating intractable diseases.

Comparing R&D levels in the aforementioned survey, the gap has narrowed between Asian countries and

Japan. International competition has been growing fiercer in the numbers of international patent applications and U.S.-registered patents, and Japan is less likely to improve its market share. The country's balance of trade in technology improved as a whole but remained in deficit in many leading-edge industries such as information and telecommunications.

Reviewing the results of R&D investments, the research level has steadily improved, and industry-university-government collaboration has been promoted. In addition, research findings have been returned to the economy and society. More specifically, a new cancer therapy (heavy ion medical accelerator) was developed, materials for regenerative medicine (artificial bone using apatite) were applied practically, and other contributions were made to improve people's health. In solar power generation, Japan achieved the world's highest power conversion efficiency and developed the technology for mass production. The amount of solar power generated in Japan accounts for 50% of the world's total, and thus S&T results have been contributing to the viability of Japan as an environmentally developed country. In industries supporting economic recovery such as the home information appliance and advanced materials industries, it is considered that governmental R&D results especially relating to information and telecommunications, nanotechnology/materials, and environmental sciences (the development of state-of-the-art semiconductor manufacturing technology, magnetic micro disks with the world-highest bit density, and photo catalytic materials with diverse effects), coupled with the country's industrial strength, have improved competitiveness steadily. These results have also been contributing to domestic and global security, such as clarifying the cause of the tanker accident that caused great damage to the Japan Sea coast due to an oil leakage, performing safety analysis, and incorporating new safety standards into international treaties in an appropriate manner.

These results, initially beginning with innovative findings and inventories, were developed by overcoming a lot of difficulties such as the "Valley of Death." In the course of the development, public R&D investments were made appropriately at suitable times from the initial research phase to the practical application phase, and leading industry-university collaborations were made in the final phase. We must accelerate further development based on these results.

It will take many years to turn the increase of intellectual assets into the creation of value. Therefore, future efforts should be made to use the country's potential S&T capability that improved by investments in the period of the previous two plans, to create innovation in a broad range of social and economic areas(the innovation generating new social and economic values with advanced scientific findings and technical inventions combined with human insights), enhance industrial competitiveness, resolve a wide range of social issues such as safety and health, and ensure the sustainable prosperity of the Japanese economy and public life.

(3) Changes that may have impact on S&T both at home and abroad and the roles of S&T

During the period of the third basic plan, the environment relating to S&T is expected to change remarkably at home and abroad, and people's expectations for S&T are also expected to grow.

It is obvious that demographic changes will have a greater impact on society. In order to achieve a stable economic growth despite the aging and decreasing population as well as the declining birth rate, Japan should tenaciously improve productivity. In addition, competitive companies are indispensable for Japan to achieve remarkable economic growth. Especially as other Asian countries have been rapidly improving their technological capabilities, some competitive Japanese manufacturers are facing fierce competition with companies in these countries. Therefore, it is required to produce more value-added products based on our

national strength. S&T are a basis for improving competitiveness and productivity, and it is necessary to ensure economic recovery and sustainable growth by promoting S&T and turning the results into persistent innovation.

The aging population and declining birth rate create a variety of new social issues, such as social security burdens on people, and national health, as well as economic issues. Meanwhile, social and national safety has been threatened by large-scale natural disasters, grave accidents, and complicated global security issues such as terrorist attacks, and there are growing concerns among people about safety and security. Since S&T are indispensable in resolving these issues, people's expectations for S&T will increase and thus S&T will assume responsibility for society.

Despite growing expectations, there remains a gap in different people's awareness of S&T. More specifically, many people are aware of S&T's contribution to society, while few people feel close to them. In particular, interest in S&T has been decreasing among young people. People are eager to obtain comfortable, safe, and spiritually affluent lives, while many feel anxiety about the rapid progress in S&T. Since the country's financial condition is getting worse, the development of advanced research facilities and other governmental R&D investments should be made more selectively and efficiently.

Fiercer international competition in S&T is one of the notable environmental changes that occurred in the world during the period of the previous two plans. Especially China, South Korea and other Asian countries achieved a remarkable economic growth, and their national policies for S&T promotion are considered to be playing a major role in this growth. In the U.S. and European countries, as well as China, South Korea, and other rapidly-growing Asian countries, the development of capable human resources is deemed as a basis for S&T capability, and competition for procuring human resources has been taking place on a global basis. Japan had once abundant human resources based on its high educational level, but now faces a deteriorating situation relating to human resources due to declining academic standards in recent years and demographic changes in line with the aging of the population and declining birth rate.

Many efforts have been made to resolve global-scale problems concerning population, the environment, food, energy, and resources, but difficult challenges still remain such as: sustainable development of human society; and S&T achievements so as not to pass negative assets to the next generation. Japan, a country possessing excellent S&T, is expected, more than ever before, to contribute to human society through the resolution of the challenges by using its national S&T capability. Expectations for Japanese technology relating to earthquakes and other disasters are also high. S&T relating to natural, human, and social sciences are essential to ensure that Japan stays valuable in human society across centuries.

2. Basic stances in the third basic plan

As outlined above, people strongly expect much from S&T in resolving fiercer S&T competition on a global basis, the aging of the population and declining birth rate, safety and security, and other global challenges. Meanwhile, there remains a gap in different people's awareness of S&T. In light of these circumstances, the third basic plan should be executed based on the following two stances.

(1) S&T to be supported by public and to benefit society

The effective implementation of S&T policies is possible only when they are understood and supported by the people. People’s support and understanding should be achieved by: making R&D investments more effectively and strategically; promoting the sciences persistently, thereby creating intellectual and cultural values; making further efforts to return R&D results to society and the public through the creation of

innovation; and clearly explaining S&T policies and their results to people, thereby enhancing accountability. These efforts will increase people's interest in S&T and ensure that S&T are developed with their support.

(2) Emphasis on fostering human resources and competitive research environments–Shift of emphasis from "hard" to "soft" such as human resources; greater significance of individuals at institutions

Human resources are the basis for S&T capability. The future of creative S&T in Japan depends on the capability of human resources who developed and play an active role in Japan. The country's policies for investments have shifted emphasis from "hard" to "soft" in general. For example, infrastructure building is included in "hard," while human resources, a basis of competitiveness in S&T and education, are included in "soft." Therefore, in S&T policies, also, investment emphasis will be shifted from infrastructure building to development of excellent human resources. The third basic plan intends to promote the development of creative human resources by discovering and training promising people, making personnel systems more flexible, securing a diversity of human resources, and promoting their creativity and willingness to take on challenges. The plan also aims to promote S&T system reforms to encourage each person to exert their willingness and enthusiasm thereby maximizing their creativity. The reforms should be made thoroughly so that young, female, or foreign researchers can exert their willingness and ability. In addition, efforts should be made to attract capable human resources at home and abroad and develop world-class human resources. These efforts will improve Japan's S&T in the long run and contribute to building trust with other countries.

For the development of a competitive environment in S&T, it is important for people engaged in S&T to generate creative ideas, have an opportunity to compete, and receive fair judgment. In order to promote advanced S&T activities in the modern society, it is also considered essential for researchers and promising young people to belong to research or educational institutions with suitable facilities and equipment. In order to develop a competitive R&D environment, research or educational institutions should not be operated based on sectionalism but should develop researchers by encouraging them to generate creative ideas, to compete with others, and to exert their ability to the maximum. Taking into consideration that research and educational institutions are a basis of individual S&T activities, S&T policies will shift to "greater significance of individuals at institutions" from the viewpoint of creating a more competitive environment.

3. Ideas and goals of S&T policies

(1) Ideas and policy goals of the third basic plan

The vision that Japan should aim for in the second basic plan (three Ideas) is universal and can be shared by everyone. The three Ideas cover entire S&T policies, and are useful in developing future S&T policies.

Meanwhile, these general Ideas are not sufficient to clearly explain a variety of governmental R&D expenditure to the public and to develop practical, individual policies. Moreover, from viewpoints of thorough accountability to people and the return of S&T results to society, it is desirable to set practical policy goals for the realization of these Ideas, develop measures based on the respective roles of the public and private sectors, and evaluate the effects of these measures.

Therefore, the third basic plan, in principle, will inherit three Ideas in the second basic plan and set more practical policy goals to realize these Ideas in consideration of domestic or global changes and future prospects regarding S&T, economy, and society. More specifically, the third basic plan will set the following six goals consisting of 12 sub-goals. These Ideas and goals are not placed in any order of priority, and are

valuable equally as national goals. S&T policies are surely important for the goals to be achieved, but some of the goals will not be achieved without the results of R&D activities conducted by private companies and other non-governmental entities.

<Concept 1> Create human wisdom – to realize a nation contributing to the world by creation and utilization of scientific knowledge -

* Goal 1: Quantum jump in knowledge, discovery, and creation – accumulation and creation of diverse knowledge to ensure a bright future -
    (1) Discover and clarify new principles and phenomenon
    (2) Create knowledge as a basis of discontinuous technical innovation
* Goal 2: Breakthroughs in advanced S&T – efforts for human dreams to be come true -
    (3) Bolster S&T by conducting the world's most advanced projects

In order to be a nation creating human wisdom and contributing to the world, Japan, firstly, should accumulate profound and diverse intellectual achievements that constantly generate remarkable knowledge. The accumulation of intellectual achievements, mainly from basic research to discover and clarify new principles and phenomenon, is expected to generate the knowledge that is a basis of discontinuous technical innovation and is pursued in life/material sciences where development has been made in an atomic/molecular size. Japan stays behind the U.S. or European countries in accumulating intellectual achievements to make a leap in knowledge.

Another goal for S&T policies is to contribute to human society by making breakthroughs in S&T with the world's most advanced projects. Japan is expected to lead the world in the creation of international knowledge such as obtaining information in the unknown and discovering phenomenon occurring only in extreme conditions.

In order to achieve these goals, it is essential to develop capable researchers who enthusiastically pursue the creation of scientific knowledge and to promote their activities. If Japan produces world-class, capable researchers, they will be a good target for young human resources, and enthusiasm for new creation will be elevated. Therefore, the second basic plan set a goal of producing as many as 30 Novel laureates in 50 years, aiming to increase the number of Japanese who win international prizes in science to the level of major European countries. For this purpose, S&T policies in the third basic plan are expected to promote basic research with emphasis on human resources.

<Concept 2> Maximize national potential – to create a competitive nation achieving sustainable growth -

* Goal 3: Economic growth & environmental protection – achieving sustainable economic growth based on environmental protection
    (4) Overcome global-warming and energy problems
    (5) Realize an environmentally harmonized, recycling-oriented society
* Goal 4: Innovator Japan – realizing a strong economy and industries creating innovation constantly -
    (6) Realize a ubiquitous Internet society attracting global interest
    (7) Become the world's top manufacturing nation
    (8) Enhance industrial competitiveness to win in global S&T competition

Japan must develop S&T as a basis of national strength to overcome the aging and decreasing of the population and declining birth rate, as well as global-warming/energy problems and to create a country that ensures sustainable growth in the fierce international competition. To achieve this goal, S&T policies should

focus on: how to decrease green house gas emission by 6% in 2012 from 1990 under the international agreement, and ensure the prosperity of the Japanese economy; and creation of an environmentally harmonizing, recycling-oriented society in the environmental sciences where people expect much from S&T.

Japanese industries are facing fierce competition with emergent Asian countries, such as China and South Korea. In order to ensure our industrial competitiveness under such circumstances, the development of S&T should be made to generate highly-value added innovation on a constant basis. For this purpose, policy goals should be set to build a ubiquitous Internet society that attracts the global society, lead the world in manufacturing as national strength, and establish an industrial capability to win in international S&T competition.

The creation of competitive new industries is expected to generate high-quality employment and increase people's income. The minimization of environmental burdens such as green house gasses is an essential challenge to be addressed by S&T for both economic growth and environmental protection.

<Concept 3> Protect nation's health and security - to become a nation that secures safety and quality of life -

* Goal 5: Nation's good health over lifetime – making Japan a country where people ranging from children to the elderly can stay healthy -

(9) Overcome diseases afflicting the public

(10) Realize a society where everyone can stay healthy

* Goal 6: The world's safest country – making Japan the world's safest country -

(11) Secure national, social safety

(12) Ensure safety in life

During the period of the second basic plan, the public has felt anxiety and strong expectations for S&T primarily in health and safety issues. Safety and security, which are the basis of the country's sustainable growth, have been threatened by successive events such as: the outbreak of SARS, BSE, bird flu, and other international infectious diseases; growing mistrust in food safety; deteriorating immune diseases such as hay fever; occurrence of grave rail accidents, etc. and large-scale natural disasters mainly due to earthquakes, tsunami, and typhoons; international security that has become more complicated since the terrorist attacks of September 11, 2001; growing threats to information security; and still severe situation of the peace. Meanwhile, there are growing expectations for S&T to protect health and safety such as: development of innovative therapies for diseases by life sciences where notable progress has been made on a cellular or molecular basis; realization of healthy life by preventive medicine and food functionality; and optimal utilization of advanced S&T for accidents, crimes, and natural disasters such as earthquakes.

Under these circumstances, S&T policies aim to combat diseases afflicting the public from children to the elderly, create a society where everyone can stay healthy over their lifetimes, and realize the world's safest nation where safety is ensured at social, national, and personal levels.

In order to achieve policy goals under these three Ideas, more practical goals are required to be set for each governmental R&D project. The relevant ministries and agencies will set policy goals for each project to realize 12 sub-goals with the leadership of the Council for Science and Technology Policy, and the Council will review these goals. Also, necessary modifications will be made to policy goals for each project in order to meet changing political needs in an appropriate manner.

By clarifying Ideas and policy goals for governmental R&D investments and creating a R&D system to realize these Ideas and goals, (i) accountability to the public will be promoted to clarify the goals or progress of R&D investments, and (ii) detailed guidelines and evaluation standards will be provided for each measure

and project, contributing to the effective return of the results to society and the public.

(2) S&T's contribution to the world, society, and public

Through the implementation of investments and measures to achieve new practical policy goals, S&T will also make a greater contribution to resolving a variety of deteriorating global-scale problems concerning population, the environment, food, energy, and resource, as well as the domestic issue of the rapid aging of the population and declining birth rate. More specifically, the six policy goals mentioned above should be achieved in order to address the following:

(Contribution to the world)

* Resolve problems common to all human beings
* Realize global peace and prosperity

(Contribution to the society)

* Bolster growth in the Japanese economy
* Lead global rule-setting

(Contribution to the public)

* Provide security and energy for people's lives
* Ensure employment and lives of high quality

The Science Council of Japan, an organization representing the Japanese research community, announced the results of the discussion on S&T policies in the formulation of the third basic plan. These expectations are considered to be fulfilled by implementing the following policies based on the aforementioned basic stances, Ideas, and policy goals.

4. Governmental R&D expenditure

R&D expenditure by the government and the private sector has increased during the period of the previous two plans, and the percentage of the total R&D expenditure to GDP in Japan exceeds that in major developed countries. Despite the reduction of expenditure for other policies in the recent severe financial condition, governmental R&D expenditure in Japan has increased considerably, reaching almost the same level of the U.S. and major European countries. These countries have been increasing R&D expenditure in recent years, and the public and private sectors should make continuous efforts to increase the expenditure in order to win in international competition in the era of large-scale intellectual competition.

It is further required that Japan makes R&D investments steadily in consideration of respective roles of public and private sectors, strengthening international competitiveness based on the investments through stronger public-private cooperation, and returning the results to the society and public.

In the period of the second basic plan, financial conditions in Japan were becoming worse than they were in the period of the first basic plan, and the worst among major developed countries. Therefore, it is essential to promote fiscal restructuring of both expenditure and revenues in order to create an active society and vital economy and achieve sustainable growth.

Under these circumstances, from the viewpoint of continuing the effort of S&T promotion made during the period of the previous basic plans, the percentage of governmental R&D expenditure to GDP in the period of the third basic plan also should be raised up to at least the same level as in the U.S. and major European countries. The total amount of the governmental R&D expenditure is estimated about 25 trillion yen in FY2006 to FY2010

Note: This estimation is based on the assumption that governmental R&D investment should be 1% of the GDP, of which the nominal growth rate is 3.1%, during the period of the third basic plan.

In light of these circumstances, annual budgets will be fixed in order to provide the expenditure necessary to promote measures in the basic plan. In budgeting, the trends of social and economic matters and needs of S&T promotion will be taken into account in the course of governmental fiscal restructuring, and the effects of governmental R&D investments will be maximized by implementing S&T system reforms steadily in financial conditions that are becoming worse than they were in the period of the second basic plan.

The quality of R&D activities will be upgraded by setting goals for the results to benefit the public and evaluating the effects of investments based on a solid evaluation system. S&T system reforms will be promoted thoroughly by: increasing funds selectively to develop human resources and create innovation; resolving the unreasonable allocation of research funds and improving the examination system; reforming the evaluation system; removing systematic or operational obstacles to ensure smooth S&T activities and return the results to society; and understanding S&T activities in research or educational institutions. In addition, other financial resources should be obtained by, for example, introducing private funds and setting off properties by sale.

Chapter 2 Strategic Priority Setting in S&T

Looking into the current progress and results of priority setting, as well as domestic social and economic circumstances and global trends for the future, priority setting in investments will continue to be essential from a viewpoint of effective, efficient promotion of S&T policies, and strategic priority setting in governmental R&D investments will be further promoted. The third basic plan intends to enhance its strategy through selection and concentration. The second basic plan addressed the prioritization of research areas, while the third basic plan intends to include inter-sectoral prioritization as well. The basic plan also intends to clarify the relationship between strategic priority setting in S&T and the six policy goals newly created under the basic Ideas.

1. Promotion of basic research

Basic research producing diverse wisdom and innovation will be steadily promoted with a certain amount of investments.

Basic research bringing human wisdom and serving as a source of knowledge is the most uncertain among all types of R&D activities. Generally, basic research does not produce desired outcomes on a planned basis but realizes them in the steady, serious pursuit of truth and after much trial and error. The findings and inventions, which do not fall into the existing knowledge framework, will make a leap in knowledge, and thus it is important to develop an innovation-oriented environment.

Basic research consists of two types: Type-1 basic research that is conducted based on the free ideas of researchers in S&T, including human and social sciences; and Type-2 basic research that aims at future application based on policies. They will be promoted according to their respective significances. More specifically, Type-1 basic research will promote a variety of research activities from the very early stages in the pursuit of universal knowledge from a long-term perspective, aiming to accumulate intellectual achievements to generate new knowledge constantly. Meanwhile, Type-2 basic research is considered a part of the R&D for policy-oriented subjects that will be covered in the following sections, aiming to create knowledge, a source of discontinuous innovations that can reform economy and society, in order to achieve

policy goals through prioritization based on Section 2 below.

Prioritization based on Section 2 below is not done for all types of basic research. For example, it must be clarified and thoroughly understood that research that derives from free ideas of researchers and are supported by Grants-in-Aid for Scientific Research will be promoted independently from R&D for policy-oriented subjects.

Out of all research activities that derive from the free ideas of researchers, those requiring huge amounts of funds, in particular, will be promoted through thorough evaluation on researchers' ideas and through governmental prioritization of projects.

2. Priority setting in R&D for policy-oriented subjects

(1) “Four priority fields to be promoted” and “four fields to be promoted”

The second basic plan emphasized R&D on national/social issues, especially those relating to life sciences, information and telecommunications, environmental sciences, and nanotechnology/materials, and funds were preferentially allocated to those four areas. The third basic plan deems those four areas as areas in which R&D activities should be promoted primarily (hereinafter “four priority fields to be promoted”), and intends to allocate resources preferentially to those areas based on the following requirements of inter-sectoral prioritization.

(i) The level of contribution to the three Ideas (relating to S&T, economy, and society) is generally high.

(ii) People’s expectations and interest are high according to the results of awareness surveys.

(iii) The trends of S&T strategies in other countries are taken into account.

(iv) Appropriate from practical perspectives, such as strategic viability and adoption by research sites.

In addition to the above, the third basic plan also deems the other four areas including energy, manufacturing technology, social infrastructure, and frontier as areas in which R&D activities are conducted with an emphasis on issues that are fundamentals for the nation's existence and need to be addressed by the government (hereinafter “four fields to be promoted”), and resource allocation will be made in an appropriate manner based on the principles of inter-sectoral prioritization mentioned in the following sections.

(2) Formulation of Promotion Strategies

Prioritized resource allocation should not be made, without close examination, to R&D projects, even to those relating to four priority fields to be promoted. Also, it is not appropriate to remove R&D projects relating to four fields to be promoted, without such examination, from subjects for strategic resource allocation. Therefore, as for the four priority fields to be promoted and the four fields to be promoted, the Council for Science and Technology Policy will formulate strategies for promotion of each of the eight areas in order to achieve policy goals. These strategies will be formulated based on the following Ideas of inter-sectoral prioritization, and essential R&D issues will be selected in each area. These R&D issues must not be exhaustive or comprehensive.

(i) Evaluate the future impact objectively on science, economy, and society by utilizing approaches such as a Delphi survey.

(ii) Clearly recognize Japan’s position and level in global S&T by using a benchmark, and clarify the necessity of investments. (e.g.: Is it an R&D issue to ensure Japan's competitive advantage by using national strength, an R&D issue to be resolved in response to strong social needs, or a R&D issue to

lead paradigm shift?)

(iii) Identify the necessity of investments in R&D processes ranging from the creation of knowledge to the return of the results to society and the public, from the viewpoints of contribution to achieving policy goals laid down in the plan and a path to the goals.

(iv) Understand the respective roles of the public and private sectors, and clarify the necessity of investments from the viewpoints of R&D risk, complementarity of the public and private sectors, and publicness.

(3) Selection of "Strategic Prioritized S&T"

There are a variety of investment patterns for essential R&D issues. One example is where the amount of budget for the R&D does not increase because an emphasis is placed on the utilization of previously accumulated investments. Another example is where the R&D needs to be conducted in the long run within a certain amount of budget. Therefore, in order to formulate the Promotion Strategies for Prioritized Areas, R&D issues for which funds are to be budgeted preferentially in the period of the basic plan should be narrowed down based on a certain criteria. In light of this, from the viewpoints below, the Council for Science and Technology Policy intends to select, within each area, the subject to which funds are to be allocated preferentially in the period of the basic plan, and to incorporate the subject as "strategically focused R&D" into Promotion Strategies for Prioritized Areas.

(i) Concentrated investments in the subject during the period of the basic plan are required for S&T to clearly indicate the method of meeting social and public concerns or needs that have been rapidly growing in recent years (e.g.: anxiety about safety and security).

(ii) Taking into account the status of international competition and the development of innovations, concentrated investments and the production of results during the period of the basic plan are indispensable for Japan to win in the global competition. If such investments are not made in the subject, it will be extremely difficult for Japan to catch up on what should have been done for the subject for the five years of the basic plan.

(iii) In a long-term, large-scale project that is conducted under a government-supervised consistent framework to develop world-leading human resources, concentrated investments in the subject during the period of the basic plan are required to maximize social, economic effects and ensure overall national security.

3. Matters to be considered in the formulation and implementation of Promotion Strategies

(1) Emerging and interdisciplinary fields

The intellectual combination or merging of different fields through friendly competition played a major role in producing great inventions and findings in the 20th century. In the 21st century, global-scale competition relating to knowledge is becoming fiercer. Under these circumstances, in order to create new knowledge, it is necessary to develop an environment that encourages the intellectual combination and merging of different fields. For example, R&D should be promoted to ensure that the knowledge of researchers in different fields is gathered easily in a cross-sectoral manner to revolve issues. The strategies for promotion of each of the eight areas will be formulated, giving due consideration to creating innovation through flexible combination or merging of different fields.

The creation of innovation by using S&T capability is highly likely to improve international competitiveness in the services industry, where the country's productivity is worse than other countries. Excellent outcomes in human or social sciences are expected to make manufacturers more high-value added. Therefore, in order to accelerate the creation of innovation, due consideration will be given to the promotion of human and social sciences and the intellectual integration of these sciences and natural sciences.

(2) Clarifying the relationship with policy goals and establishing R&D goals

Essential R&D issues selected based on the Promotion Strategies for Prioritized Areas should clarify S&T outcomes to be achieved (R&D goals), in order to achieve policy goals that each R&D issue set in the basic plan and practical policy goals for each project. More specifically, it is fundamental to clarity the R&D goals to be achieved in the period of the basic plan, as well as those to be achieved finally. The government's accountability for the return of S&T outcomes to society and the public will be enhanced by clarifying the respective the roles of the public and private sectors, the roles of public research institutions, and the path to achieving policy goals through the accomplishment of R&D goals.

(3) Horizontal matters to be considered relating to "Strategic Prioritized S&T"

(i) S&T selected to resolve social issues immediately

This type of S&T provides an immediate, exact solution to socially essential issues such as: international terrorist attacks that have been threatening global safety and security in recent years; proliferation of weapons of mass destruction; large-scale accidents and natural disasters such as earthquakes and typhoons; threats to information security; and emerging or reemerging infectious diseases such as SARS and bird flu. R&D relating to this type of S&T should be conducted by the government with clear goals, integrating specialized or segmentalized knowledge in S&T, and human and social sciences. The Council for Science and Technology Policy intends to promote R&D activities relating to this type of S&T for the interdisciplinary resolution of issues.

(ii) S&T selected to win in international competition

This type of S&T is selected in consideration of selection and concentration for R&D projects to establish stable international competitiveness, based on a competition strategy that is in compliance with the appropriate international benchmark. Examples are: S&T facing fiercer competition to reform the current structure of knowledge fundamentally and to make a leap in knowledge; S&T to which unsurpassed value should be added by using unique national advantages as soon as possible; and S&T that have a good opportunity to win in international competition in making breakthroughs that ensure the acquisition of huge added value.

(iii) S&T selected as a key technology of national importance

This type of S&T is deemed as essential technology to be invested intensively in a large-scale national project during the period of the basic plan ("Key Technology of National Importance"), and is addressed based on definite national goals and long-term strategies. For example, next-generation super computing technology and space transportation system technology are considered to fall into this category. The Council

for Science and Technology Policy intends to select key technology of national importance in the course of selecting strategic prioritized S&T, based on national long-term strategies. R&D activities aiming to realize a key technology of national importance will be conducted after the Council for Science and Technology Policy closely examines and evaluates them.

(4) Effective implementation of Promotion Strategies - Realization of "practical strategies"–

Even during the period of the basic plan, when necessary, strategies for promotion of each of the eight areas will be amended or revised flexibly to make changes to essential R&D issues or strategic prioritized S&T. These changes will be made in consideration of updated S&T knowledge and trends of emerging or interdisciplinary fields. The Council for Science and Technology Policy will realize "practical strategies," as a basis for promoting networks or collaborations involving relevant ministries, agencies, and research institutions, by establishing an annual policy cycle including: gathering of updated information to propose a policy of resource allocation; provision of the policy of resource allocation before the receipt of budgetary requests; prioritization of the budgetary requests; and preparation for proposing the next year's policy of resource allocation.

Also it is useful that, in order to implement the "practical strategies" in a cross-sectoral manner, relevant ministries, agencies, and organizations review broad R&D processes ranging from basic research to application and exchange opinions or relevant information, on a regular basis, regarding the trends of advanced R&D, technology maps, and road maps for the accomplishment of policy goals. The Council for Science and Technology Policy intends to strive to promote the smooth exchange of opinions and information sharing.

Chapter 3 Reforming the S&T System

1. Developing, securing and activating of human resources

Maintaining and strengthening the future of Japan's S&T and global competitiveness ride on the abilities of actively working people developed by our country. As well as creating an environment in organizations that accurately responds to the new era in which diverse and versatile individuals from young researchers to female researchers, foreign researchers and brilliant senior researchers can exhibit their motivation and talent, the government will strive to secure quality and quantity of human resources in the midst of the accelerating aging of the population and declining birthrate by implementing consistent comprehensive human resource development measures from elementary and secondary education to development of researchers.

(1) Creating an environment where individuals thrive

(i) Ensuring fair and highly transparent personnel systems

Since creating new value through unconventional creative ingenuity requires the promotion of sound competition and the security of fairness in personnel affairs, as a leading rule, extensively ensure a fair and highly transparent personnel system based on a merit system by boosting the competitiveness, mobility and diversity of human resources in our country's S&T activities.

Specifically, in recruiting researchers, the government will promote each organization carry out a competitive screening regardless of gender, age or nationality by extensively seeking candidates. As for the treatment of researchers, it will actively reward outstanding efforts by evaluating the abilities and achievements fairly.

Universities and public research institutions are required to implement reforms and improvements by appropriately positioning the personnel system in self-inspection and evaluation while keeping in mind their respective characteristics. Responding adequately to ensure the reform and improvement of personnel systems is also desired in third-party evaluation implemented on universities and public research institutions. Furthermore, the government promotes the activities of universities and public research institutions by using the status of personnel system reform as an indicator of examination for the competitive support system for organizations.

(ii) Supporting the independence of young researchers

In aspiring to create a vibrant research environment by providing young researchers with independence and the opportunity to be active in a competitive environment based on a fair and transparent personnel evaluation, the government will promote the introduction of a mechanism of providing young researchers with independence and the opportunity to be active through measures including the tenure track system (a mechanism of allowing young researchers to gain experience as an independent researcher in fixed-term employment before obtaining a steadier job through stringent screening), while taking into consideration the improvement of personnel mobility and the conditions of the fields particularly in universities that are aiming to become global research and education centers. Moreover, universities need to secure “jo-kyo” (could be translated to assistant professor or research associates) and prepare the playing field for them to further promote the activities of young researchers.

The government will support universities that systematically engage in environmental improvement for this purpose (providing startup funds, improving the research support system, and securing research space), and use the status of activities of universities as an indicator for examining the competitive support system for the organizations. The government will also promote management of facilities of universities so that young researchers can secure their research space.

Furthermore, the government will encourage young researchers to actively apply for competitive funds in general, as well as selectively improve the support for young researchers in striving to improve competitive funding. In so doing, the government will pay attention to setting up a program that takes into account the startup timing, and improving the program in which sufficient funds are paid to the young researcher to allow him/her to carry out the research at the head of a research organization. Through these undertakings, it will aim to raise the research funding to young researchers to a respectable degree.

Concerning the eligibility for competitive funding for young researchers, the government will take into consideration the diverse careers including child birth/rearing, and experience as a full member of society, and promote system improvement according to the respective purport of the system by establishing a system that evaluates the applicant on their research background rather than uniform age discrimination.

In addition, since the achievement of the plan to support 10,000 young researchers, especially post-doctorals, post-doctoral fellows are contributing greatly to the active development of Japan’s research activities now, but there has been criticism about the uncertainty of the career path after reaching the post-doctoral stage. As such, the government will support post-doctorals who are aspiring to become researchers while positioning them as the preliminary step to young researchers who can carry out research independently, and promoting the transparency of the recruitment process and supporting the independence

of young researchers. Moreover, as well as promoting the activities of universities and public research institutions to advance career support for post-doctorals including career paths other than academic research positions, the government will expand the opportunity for post-doctorals to come in contact with private enterprises.

Moreover, so that young researchers and post-doctorals can accumulate international experience and be in friendly competition with foreign researchers, the government will continue to improve measures to increase the opportunities for carrying out research in foreign research organizations and the opportunity of interacting with foreign researchers.

(iii) Improving the mobility of human resources

From the perspective of improving the mobility of human resources and creating a vibrant research environment, universities and public research institutions are to continue to strive for the extensive establishment of the fixed-term system. Moreover, if a young researcher finds a steady job through a fixed-term position, he/she is expected to devote him/herself to research activities. To sustain the vigor of those activities, the government will promote employment through a fixed-term system that allows for reappointment, and a review system in which the aptitude, qualifications and ability are regularly examined. In improving the fixed-term system, although the conditions differ by fields, as it is necessary for mobility to improve as researchers in general including private researchers, a simultaneous transition to a fixed-term system by several universities and the improvement of mobility in private research organizations are required.

In placing a researcher in a steadier job, it is desirable to choose those who have changed organizations, i.e., university, or major at least once after graduating from a faculty under a fair and transparent personnel system (promotion of “General One-transfer Rule for Young Researchers”).

(iv) Suppressing the rate of inbreeding and faculties

Creating a research environment where diverse human resources can exhibit creativity and work hard together while being intellectually stimulated is essential in creating new research areas and sustaining the dynamism of research organizations. Given this fact, although the percentage of teachers working for their old schools and faculties may rise as a result of recruiting truly brilliant human resources fairly and with transparency, its excessively high percentage is undesirable. As such, each university is to pay due caution to the percentage of teachers from the same schools, and universities with an excessively high percentage are expected to work on reducing that percentage. The government is to disclose the percentage of teachers from the same schools in each school by positions.

(v) Promoting the activities of female researchers

So that female researchers can fully exhibit their abilities, the government will expand the measures that take into account the balancing of research and child birth/rearing by acknowledging a fixed period of respite or postponement following child birth/rearing in receiving competitive funds based on the perspective of gender equality.

Universities and public research institutions are expected to not only implement general improvements, but are also required to steadily implement activities including consciousness reform by providing support for the balancing of research and child birth/rearing in the action plan to be formulated and implemented

based on the Law for Measures to Support the Development of the Next Generation.

The government will provide support for research institutions that are implementing efforts that others should follow. From the perspective of promoting the activities of diverse and talented researchers, universities and public research institutions are required to actively recruit through fair screening after openly seeking female researchers and candidates. Moreover, it is also desirable to actively promote female researchers for advancement and participation in policy-making bodies as well as for recruitment.

Concerning the percentage of female researchers, the objectives, philosophy, and realities of female researchers differ by organization, including in terms of institutions and specialties. However, there is hope that efforts will be made to promote the active recruitment of female researchers by each organization by setting a numerical target for the recruitment of women, making efforts to achieving that target, and disclosing the status of achievement, while taking into account the percentage of women in the doctorate courses of the relevant fields. Judging from the percentage of women in doctorate courses now, the prospective recruitment target of female researchers for natural science as a whole is 25 percent (physics 20 percent, optics 15 percent, agronomics 30 percent, healthcare 30 percent).

The government will grasp and disclose the status of efforts related to the promotion of activities of female researchers in universities and public research institutions, and the percentage of female researchers by job classification.

Furthermore, in the efforts to expand the horizons of children who like science and mathematics, the government will promote the provision of information such as familiar examples that could be useful for women to go into the S&T field or become role models, and reinforce the efforts that contribute to arousing the interest of girls.

(vi) Promoting the activities of foreign researchers

In S&T activities, there is a need to prepare the conditions to enable many brilliant human resources including world class researchers regardless of nationality to gather and be active in the research community of Japan.

In order to promote the appointment or recruitment of talented foreign researchers in universities and public research institutions, the government will support the building of organizational preparations of acceptance that take into account the living conditions such as securing of housing and children's education, as well as the research environment. Universities and public research institutions that are aiming to become global research and education centers are expected to formulate an action plan for promoting the activities of foreign researchers, and the government will grasp and disclose the status of their activities.

Furthermore, in order to facilitate the acceptance of foreign researchers, the reviews and improved administration required on the role of immigration control system and visa issuance are to be promoted further. The securing of housing for foreign researchers is expected to be improved by universities and public research institutions working in partnership with local authorities to sponsor foreign researchers.

On the other hand, to help talented international students to establish themselves in Japan, the government will carry out improved administration to enable international students who have acquired a doctorate in Japan to apply smoothly to a foreign post-doctorate invitation program. Moreover, universities and public research institutions are expected to prepare the conditions to make it easy for foreign researchers to apply for positions by ensuring that announcements are published in English and by accepting applications in English when recruiting researchers.

(vii) Utilizing the abilities of talented senior researchers

Holding on to the seniority system and extending the term of employment easily without ensuring the merit system could deprive young researchers of a chance to be recruited and sap the vigor of the research scene. On the other hand, it is very important for the improvement of the standards of S&T in Japan for researchers who have been recognized as being truly excellent by international standards to continue to work and achieve results. The government will urge universities to facilitate such researchers in some way even after their retirement to continue their work by utilizing competitive funds and external funds. It will also promote activities in which retired researchers can fully utilize their abilities and knowledge so that they can work extensively for the promotion of S&T in a non-official capacity.

(2) Enhancing the human resource development function in universities

(i) Human resource development in universities

In order to develop human resources with a broad perspective and a flexible mindset who are highly creative and can exhibit leadership globally in the creation and utilization of knowledge, promote the enhancement of the human resource development function in universities, which is pivotal for that endeavor.

At the faculty stage of universities, the improvement of liberal arts education as well as the development of diverse and quality education that ensures the organic partnership of liberal arts education and specialized education by identifying the characteristics and attributes of each university is expected.

In so doing, such education is expected that develops a broad perspective and flexible intellect on a firm foundation such as the establishment of a unique curriculum that combines major and minor subjects of study, and the introduction of a teaching method that enables students to learn deeply through practice, which emphasizes developing the ability to research challenges.

Each university is expected to work on improving its staff's ability to educate and provide research guidance, and actively introduce evaluation on educational activities as well as on research activities.

(ii) Drastic enhancement of graduate education

Quantitative improvements have been made steadily, as indicated by the growth of the number of graduate school students, which more than doubled in the last ten years by the improvements that have been made by graduate schools to date. In the future, efforts will be made to dramatically improve the quality of graduate school education.

Universities are expected to provide an education that cultivates the ability to utilize and apply professional knowledge including the capacity to deal with interdisciplinary fields by striving to provide graduate school education that enables students to acquire a high degree of expertise and a broad perspective, and by developing rudimental education in relevant fields in addition to acquiring advanced professional knowledge.

Universities are expected to work on reforms that focus on enhancing the systematic development of educational courses, so that they can ensure the management of the process that leads students to receive degrees by organizing a systematic educational program that leads to degrees after clarifying the objectives of graduate courses, while taking the needs of society into consideration. The government will devote itself to the improvement of graduate school education by providing information on the examples of outstanding undertakings for society, as well as developing on a full scale a competitive and intensive support system for the organizational efforts of an appealing graduate school education.

(iii) Formulating action plan on the reform of graduate school education

In reforming graduate school education, there is a need for comprehensive efforts that include the creation of world's leading centers of excellence, the establishment of graduate school evaluation, and the improvement of the financial base. As such, the government will formulate a systematic and intensive action plan (platform for the promotion of graduate school education) for the next five years in graduate schools based on the feedback from the Central Council for Education, and develop policy initiatives based on this plan. This plan should be formulated as a part of the structural reform of graduate schools based on the systematic positioning of education. However, since graduate schools, which are the core organizations for advanced S&T related human resource development and the leaders of research activities, form an important basis for the promotion of S&T, the government will formulate the plan by paying due attention to the compatibility with the S&T basic plan.

(iv) Improving financial aid for doctorate course students

Making improvements to enable human resources with excellent qualities and abilities to proceed to higher education without unduly fearing the financial burden that accompanies the advance to doctorate courses is necessary from the perspective of ensuring talented researchers, and contributes to expanding the diversity of career paths for post-doctorals. For these reasons, financial aid for doctorate course (latter stage) students will be improved using as reference the United States, in which nearly 40 percent of graduate school students are reported to be receiving aid that is equivalent to their living expense. Specifically, we will strive to enable 20 percent of doctorate course students to receive an amount equivalent to their living expenses by increasing the fellowships and competitive funding which pays for research assistants while fully ensuring the competitiveness of selecting excellent human resources. Concerning the scholarship loan program that is expected to play an important part from the perspective of human resource development, while securing soundness of program, promote the effective operation of a system of exempting outstandingly performing students from repayment based on relevant nomination by each university. Furthermore, the government will take appropriate measures that enable individual students to determine their eligibility for financial aid at the earliest possible time before sitting the exams for the doctorate courses in selecting their course.

(3) Developing human resources that meet the needs of society

(i) Human resource development by industry-university partnership

As the improvement of the quality of education in universities and graduate schools brings direct benefits to the industry, and since there is a limit to the self-reliance of human resource development that emphasizes in-house training after recruitment rather than university education, industries and universities are expected to engage in the development of human resources by building cooperative ties more than ever. For this reason, industries and universities are to support the creation of a quality long-term internship system, focusing on engineering, premised on establishing credits at the graduate school stage, and it should be widely disseminated. In addition, proceed with improving the opportunities for graduate school students and post-doctorals to participate with a certain degree of responsibility in the development or implementation of university-based educational programs by industry-university partnership, or collaborative studies with the industrial world under the appropriate guidance and supervision of guiding instructors.

Through such activities and direct dialogue between industry and university, the business community is expected to specify its needs for universities and graduate schools, and universities and graduate schools are expected to make constant improvements of their educational programs properly based on such needs.

(ii) Promoting the activities of doctorals in industry

Based on the standpoint that doctorals are those who should play active roles in leading and supporting an advanced knowledge-based society in various areas of society, enhance the development of doctorals that would play active roles in various areas of society by promoting the reform of graduate school education and industry-university collaboration in the aspect of human resource development. The industrial world is required to actively provide flexible and varied conditions for talented doctorals.

Furthermore, students as well as universities and the industrial world are expected to have a common view that it is desirable for doctorals to play active roles not only in academic research professions, but also in various areas of society. Since it is extremely important for each university to know the information about the career paths of the doctorals and utilize it in improving the quality of its education, each university is required to work on continuing to get such information.

(iii) Development of diverse human resources that would be responsible for utilizing and returning knowledge to society

(Development of human resources that would be involved in managing intellectual properties and technology)

As there is a demand for both quality and quantity of human resources that could support Japan's creation of innovation such as those that could strategically obtain and utilize S&T results as intellectual properties, and those that could effectively give R&D a market value by understanding both technology and management, independent efforts of universities involved in intellectual property and technology management education are to be promoted. In particular, from the perspective of development human resources with advanced and specialized vocational skills that would lead Japan's economy and society, we will support the qualitative improvement of professional graduate schools.

(Development of S&T communicators)

The development and activities of human resources that have the role of promoting communication between researchers, engineers and society, i.e. conveying S&T to the general public in an easy to understand manner, or providing feedback on society's awareness of the issues, will be promoted on a local level as well. Specifically, the area of activities as profession will be created and expanded by development S&T communicators, promoting the outreach activities of researchers, promoting the activities of exhibition planners and commentators, securing research funds of national and public research institutions and spending for S&T communication activities in R&D projects.

(Development of human resources that respond to new needs)

Promote the development and securing of mobile human resources in information and telecommunications such as software security technology, S&T that contributes to social safety such as measures against emerging and reemerging infectious diseases and terrorism, the integrated fields of natural science, humanities and social science in which the social needs are evident, and the rapidly developing fields of bioinformatics and technology.

(Development of engineers)

Engineers with advanced professional skills who support Japan's technical bases play a crucial role in achieving a sustained progress built on Japan's manufacturing and technology that create high added value. However, there has been fear in recent years concerning the aging of skilled engineers and the disassociation of young people from manufacturing.

International competition is intensifying including the rise of Asian countries in the manufacturing field, and since the baby-boomers will be gradually reaching retirement after 2007, the development of engineers for sustaining and securing the core competency of manufacturing that has been developed by the knowledge and know-how of the baby boomers in the manufacturing and building scenes has become the urgent task. For this reason, private enterprises are expected to proceed with an active human resource development that utilizes systems such as the human resource investment-promoting taxes for securing the human resources for manufacturing required in the manufacturing scene, and human resources for manufacturing that create high added value, and the smooth succession and dissemination of skills through the utilization of near-retirement human resources with outstanding skills, by relevant industries unifying and coordinating with education at schools. The government will support the intellectual production activities of engineers by organizing and widely providing elemental technology related to design and manufacturing processes, and past examples as knowledge or data.

Universities, colleges of technology and specialized training collages are to proceed with practical education for the development of engineers including future human resources for manufacturing. Moreover, as well as disseminating and promoting the application of the engineer certification system of professional engineers, the government will promote the building of an ongoing skill development system for engineers by various entities, the development and provision of educational materials for online learning, and the entry and reentry into graduate schools by adults to further enhance the opportunities of reeducation to meet adults' desire to study.

As well as promoting learning related to manufacturing techniques such as the enhancement of hands-on learning on manufacturing in elementary, junior high and high schools, and social education facilities, the government will implement efforts in industrial high schools and colleges of technology in partnership with local businesses.

(4) Expanding the horizonscope of human resources who will bear the S&T in future

(i) Developing children with exuberant intellectual curiosity

In order to develop children with exuberant intellectual curiosity by expanding the horizons of children who love science and mathematics, it is necessary to have an environment where children can familiarize themselves with and study S&T from the stages of elementary and secondary education. For this reason, as well as expanding the chance for children to see the faces of the researchers by talented researchers visiting schools to talk to children and their parents, the government will improve the opportunities for hands-on and problem-solving learning such as observations and experiments by supporting the efforts of motivated teachers and volunteers, and the schools' partnership with universities, public research institutions, businesses, science museums and museums. Concerning the grossly insufficient and antiquated laboratory instruments and facilities of elementary, junior high and high schools, their improvement will be aimed at. In addition, as well as developing and providing child-friendly digital educational materials and programs, the

government will promote the holding of S&T competitions by various entities.

Moreover, for training and improving the quality of teachers who can plainly teach subjects such as science, mathematics and industrial arts with advanced content, and conduct interesting classes, the government will review and improve the educational contents and methods of teacher training courses especially in universities with a central focus on teacher-training universities. Furthermore, as well as promoting the activities of teachers for obtaining advanced certificates, it will consider the application and role of the professional graduate school system in the training teachers who can exhibit a high degree of professionalism and carried out their practical leadership. In addition, it will continuously promote practical activities to schools from kindergartens to high schools attached to teacher-training universities in collaboration with universities, such as providing science and mathematics education that incorporates the results of research in universities concerning the educational contents and methods.

(ii) Developing the individuality and abilities of talented children

There is a need to develop the individuality and abilities of children who are interested in science and mathematics through effective science and mathematics education, and to develop outstanding human resources in S&T. For these reasons, the government will promote the participation of talented children in various international S&T competitions, as well as improve the support system for high schools that emphasize science and mathematics education.

In addition, the government will proceed with the linking of high schools and universities; in other words, the improvement of the high school-university link so that the individuality and abilities of talented children can be developed regardless of the influence of university enrollee selection. Specifically, it will make it possible for students who achieved remarkable results in high school to obtain appropriate evaluation by methods such as Admission Office (AO) Entrance Exam, or have high schools organize a special curriculum for the development of S&T related human resources with the help of universities. Furthermore, it will promote initiatives and improvements by carrying out activities of providing high school students the opportunities to come in contact with university-level education and research by accepting high school students into universities as non-degree students or having university instructors teach in high schools.

2. Creating scientific development and persistent innovation

The government will strive for S&T that passes on the results to society and the nation by creating intellectual and cultural value through scientific development by making S&T related resources work effectively, and reinforcing the efforts for manifesting the results of R&D as social and economical value through innovation. In so doing, it is not only important to work on reforming the R&D system, but also on resolving the institutional and operational bottleneck for smooth S&T activities and the passing on of results.

(1) Developing a competitive environment

Although competitive funds did not reach the goal of doubling set in the second basic plan, their improvement has progressed to a respectable degree, and there was a steady progress in the efforts for the development of a competitive environment coupled with the progress of systemic reforms. There is a need to further the efforts to revitalize research activities by setting the principle of competition in motion in more aspects in the future.

(i) Increasing competitive funds and indirect costs

The government will continue to strive to increase the competitive funds such as Grants-in-Aid for Scientific Research, which contribute to creating a competitive R&D environment, by expanding the breadth and freedom of the selection of researchers' research grants.

Concerning indirect costs in which a fixed percentage of the research grant is allocated to institutions that employ the researchers who have won the competitive funds, the government will achieve a 30% allocation in all systems as early as possible.

Indirect costs will be devoted to the expenses required for the management of research institutions in implementing the research, and they will be used, in principle, based on the decision of the institution. Among them all, competitive funds are expected to be used for preparing a research environment such as the departments and agencies that employ the researchers awarded with competitive funds, providing financial benefits for such researchers, and enhancing the administrative system that supports smooth application by researchers.

(ii) Developing a competitive environment in organizations

(Revitalizing research activities through competition)

Competitive funds have the effect of promoting competition among organizations that employ researchers through the promotion of competition between researchers and measures for indirect costs. Accordingly, it is necessary to promote the competition involved in securing human resources such as in universities by increasing the competitiveness and mobility for human resources, while further revitalization of research activities is also expected.

Just as it has been carried out in the world's top class research institutions, universities in Japan are also required to create a virtuous cycle of attracting brilliant researchers by devoting themselves to improving the research environment such as the competitive funds and indirect costs acquired by such brilliant researchers, while securing brilliant researchers by working on building an appealing research environment and providing benefits to the researchers.

(Effective combination of fundamental funds and competitive funds in universities)

In universities in Japan, there is a research system in which fundamental funds (national university budget subsidy, facilities improvement grants, and financial aid to private educational institution) play an important part in supporting the existence of the organizations that form the foundation of education and research (securing human resources, preparing education and research environment), while competitive funds support varied and excellent research plans. Fundamental funds and competitive funds both have their own functions, and they both play important parts. As such, examine an effective combination of fundamental funds and competitive funds in improving the overall governmental R&D expenditure.

In addition, since the whole of the national university budget subsidy is not something to be allocated according to the number of teachers in each university, and as it is important for allocated costs to be applied most effectively and efficiently coupled with competitive funds or external funds, from the perspective of developing a competitive environment including the president's discretionary allocation, while respecting the independent and autonomous in-school allocation. The government will promote such endeavors.

(iii) Promoting the systemic reforms on competitive funds

In order to fully exhibit the effects of each competitive fund system, carry out systemic reforms by clarifying the purport and objectives of the respective systems, so that the scale of the research funds, the research duration, the research system, the evaluation method, and the promotion measures can be optimized according to the purport of the system.

(Establishing a fair and highly transparent screening system)

As for the allocation of competitive funds, since the screening for a fair and highly transparent research subject that emphasizes the contents of the research and the capacity for implementation irrespective of the position or the title of the researcher is essential, the government will work to dramatically improve the screening system.

Concerning each system, the government will proceed with the reforms, i.e., increase of the number of judges, improvement of the research plan, and review of the screening standards, while streamlining the operation of screening. Particularly with increasing the number of judges, the research community is expected to actively cooperate on its own responsibility. In addition, concerning each system, the government will make an effort to recruit young researchers and foreign researchers as judges to secure fairness in screening from various perspectives.

(Feedback on the screening results)

Since communicating the details of the screening results and the views expressed at screening in as much detail as possible is believed to secure the transparency of screening, the government will improve the quality of research, and contribute to improving the quality of researchers including young researchers, and promote detailed disclosure so that the screening results will be fed back appropriately to the researchers in each system that relates to competitive funds.

(Enhancing the functions of the distributing agencies)

On the basis of transferring the allocation functions of competitive funds to independent distributing agencies, the systems with established policies will proceed with a steady transferal, and those with no established policies will respond appropriately by drawing a conclusion promptly while taking the reality into account.

As for the program officer (PO) and program director (PD) that support each system, the government will give consideration to the benefits so that those with qualities appropriate for these professions can be secured in a quantity that corresponds to the scale of the system. In addition, it will turn PO and PD into full-time positions as early as possible, mainly with large systems. Furthermore, the research community as a whole is expected to adequately evaluate the job experience of POs and PDs so that they can be positioned as part of the career paths of researchers.

As the improvement and enhancement of POs and PDs, as well as the research analysis functions for supporting their activities, and the operational functions related to screening, granting and managing are essential in the distributing agencies, the government will steadily carry out their system improvements by securing a percentage of the competitive funds. In addition, distribution agencies will strive for the training of competent POs and PDs by improving overseas training and seminars in Japan.

Moreover, in allocating competitive funds, it is necessary to take budgetary measures appropriately while taking the purport and objectives of the competitive funds into account to enable an efficient and flexible management of the competitive funds such as carrying over the funds of the year, and multiple applications per year.

(2) Enhancing the competitive edge of universities

In an age when the creation and application of new knowledge is dramatically increasing its importance, the enhancement of the global competitiveness of universities is extremely important. Therefore universities that will lead the world's S&T should be established. We are also in an age when it is essential for each university, be it national, public or private, including local universities, to enhance its competitive edge by utilizing its uniqueness and characteristics. With this understanding, fundamental funds that support the foundation of education and research will be provided responsibly.

(i) Creating universities that lead the world's S&T

Universities with global competitiveness cannot be created without sound competition between universities. For this reason, the government will further promote the development of a competitive environment, and the improvement of the mobility of human resources in universities, be it national, public or private. Furthermore, in order to actively develop the creation of universities that rival other universities in the world, and lead the world's S&T, it will promote the further enhancement of intensive investment under the principle of competition for organizations aiming to become the world's top class research and education centers.

The 21st Century COE Program is currently being developed as a part of structural reforms of universities through national, public and private universities. It is fitting to plan for further development in a more full and evolved way by implementing a stricter selection of focus based on the evaluation and validation of the program. In so doing, it is important to secure perspectives that universities play roles in further developing talented researchers and improving the basic research, as their primary missions. As such, it is appropriate to establish a wide range of disciplines as the scope and maintain the basic concept from the perspective of securing the diversity of fundamental research, and creating new areas, rather than placing a disproportionate emphasis on specific research areas.

While developing measures for securing the diversity of such fundamental research, in creating innovation, concretize the intensive investment for creating research and education centers by focusing on specific advanced research areas, while obtaining the cooperation of the business world from the perspective of creating research areas that may lead the world, as doing so will be extremely effective.

It is expected that these initiatives would lead to create about 30 research centers that will be positioned as the world's top class centers according to various evaluation indexes on research activities, i.e., centers of world's top 20 in field thesis citation index.

(ii) Vitalizing universities that utilize uniqueness and characteristics

(Developing universities open to the community)

Local universities are important intellectual and human resources for the local community, be it national, public or private, and they, as an entity open to the local community, should contribute further to the progress of the overall community. With the understanding that it is indispensable for local authorities to perceive and utilize such universities as partners in community regeneration, active support is anticipated.

For instance, it would be desirable to create a virtuous cycle of creation of knowledge and human resources, and community vitality through local universities by the community working together with the universities with the support of the government, such as a community contribution type industry-academia cooperation undertaken by universities in the creation of technological opportunities and new technologies of

indigenous industries or traditional industries, and the promotion of human resource development in partnership with those industries.

As a part of community regeneration through the revitalization and utilization of local universities, the Ministry of Education, Culture, Sports, Science and Technology, the Regional Generation Center and the Council for Science and Technology Policy will promote the “Regeneration Program for Local Knowledge Centers”, which incorporates support measures and general improvements for the independent efforts of the community in partnership with universities.

(Utilizing the research and education functions of private universities)

Private universities have been developing diverse and unique education and research activities based on the unique spirit on which their schools were founded, and it is indispensable for the government to utilize the human resource development functions and research functions of private universities from the perspective of securing the improvement and diversity of the S&T standards of Japan as a whole. On the other hand, even private universities, which are aiming to become global research and education centers, are suffered from shortcomings in their research environment in terms of human resources and facilities comparing to national universities. Therefore, there is a need to improve on those aspects.

For this reason, various measures should be undertaken. to enhance private universities. Public subsidies should be provided for private universities in order to strengthen research function of such private universities. In addition, 30% application of indirect costs in all systems should be achieved in managing the competitive funds, and then preferential indirect costs should be provided. Necessary condition ordering will also be carried out for promoting the introduction of various private funds.

(3) Enhancing systems for creating innovation

In order to effectively link the innovative R&D results, including the results of outstanding fundamental research created by universities and public research institutions, to innovation continuously, industries, universities and government will unite to enhance the system that creates innovation to fully exhibit Japan’s potential.

(i) Maintaining the various research fund systems according to the development stage of R&D

The government will further define the purport of the research fund systems, the anticipated outcome, the evaluation method, and the promotion measures according to the development stage and the characteristics of the R&D, and adequately maintain and operate the various systems from fundamental research to innovation creation.

(Efforts towards high-risk research in fundamental research)

The system that supports fundamental research is improving in quality and in quantity by the past reforms of the competitive fund system and the research standards are improving steadily. As the competitive fund system that supports fundamental research is based on what is called pure review screening, ensure its improvement.

On the other hand, just operating pure review screening uniformly may make it difficult to spot high-risk research (research that may create highly innovative results based on the fresh ideas of the researcher). For this reason, the government will take high-risk research into account by establishing a mechanism that

flexibly selects the challenges by assessing the originality and possibility of the ideas of the researcher in the part of the system that supports fundamental research.

(Enhancing competitive research for innovation creation)

From the perspective of promoting the passing on of results to society and the nation, there is a need to enhance R&D that takes on the challenge of creating innovative technology so that scientific and technological discoveries created in fundamental research are linked to creating social and economical value without ending as mere articles. For this, an appropriate management of research is required so that the research does not end as a mere extension of the researcher's intellectual curiosity. For this reason, the government will enhance the management system for competitive funds that promote the target fundamental research and applied research for innovative technology that leads to creating new value by establishing innovation-oriented goal setting or putting in place a program officer (program manager) with responsibility and discretion in carrying out research progress management.

(Creating bases for advanced interdisciplinary research)

Innovation is frequently created from new interdisciplinary research areas, and such areas are effectively created by active involvement for business solutions based on socioeconomic needs. For this reason, the government will selectively create research education centers in universities that focus on advanced interdisciplinary research areas that will enable Japan lead to the world by getting the active participation of the business world. The following points must be respected in creating these centers (bases for advanced interdisciplinary research for innovation)

(i) They are research and human resource development centers genuinely created by industry/academia collaboration,
(ii) They carry out research from a fundamental stage with commercial viability in mind.
(iii) They are centers that are open nationally and internationally.
(iv) They have the clear commitment of the business world such as the provision of research resources.
(v) They carry out innovative organizational operation and system reforms that facilitate the abovementioned points.

(Reforming the research fund system beyond office and ministries)

-Enhancing the appropriate management that correspond to various systems-

By carrying out appropriate management according to various research fund systems results visible to the nation are produced.

For this reason, the government will promote the enhancement of management for producing results by checking to see if appropriate institutional design and operation are implemented based on the anticipated results, according to the developmental stage and characteristics of the subject R&D on the various research fund systems such as competitive funds and project research funds.

-Building a mechanism that link outstanding research results to practical application beyond office and ministries-

As the research fund system of each office and ministry, and R&D in industry-university-government research institutions range widely from the stages of fundamentals to practical application, the government will strive to build a mechanism for advancing R&D without interruption beyond systems and institutions, and link it to practical application for research that is about to produce outstanding results, and those that have the potential to develop to create innovation. The Council for Science and Technology Policy will

promote such undertakings by each office and ministry.

As for research fund systems, which are expected to lead research to the next level, the government will introduce a mechanism that enables for the research of outstanding projects to be continued without interruption by implementing an evaluation at an appropriate time before the completion of the research. In addition, it will incorporate it into the research fund system or the collaboration between industry-university-government research institutions beyond office and ministries. Specifically, it will promote the efforts such as the prompt transmission of interim assessments and ex-post assessment results in various research fund systems and their utilization in other systems and institutions, the information sharing of advanced research trends and results, and R&D strategy and roadmaps through workshops between distributing agencies and research institutions, the building of a database that extracted and collected the information on the potential for the application of the results, and the enhancement of the functions of extensively studying other research results in planning R&D in distributing agencies and public research institutions.

(ii) Building a sustainable and progressive industry-university-government collaboration system

As a country that must create persistent innovation from its own unique research results amidst global competition, industry-university-government collaboration is an important means for realizing such a creation, and Japan will build a sustained and progressive industry-university-government collaboration system.

(Expanding into a full scale industry-university-government collaboration)

With the view that efforts must be made to expand into a more full-scaled industry-university-government collaboration, in addition to the technological transfer of traditional collaborative research that utilizes brilliant seeds of universities, the government will promote a strategic and systematic collaboration that could boost the effects of the collaboration by getting the industries, universities and government to hold a dialogue from the stage of establishing the research project, and working on collaborative research that sees through all aspects from fundamentals to application from a long-term perspective. The government will aim to create research centers that carry out world-class research and human resource development under industry-university-government collaboration, as a part of such a collaboration.

In addition, from the standpoint of promoting improvement of competitiveness of regions, and the regional contribution of universities and public research institutions, the government will promote regional-contribution type collaborative research undertaken by universities on the technological opportunities and new technology creation of local industries including small businesses. Through these efforts, the government will aim to substantially increase the amount of research funds from private businesses for universities.

(Sustainable development of industry-university-government collaboration)

-Developing industry-university-government trust-

Mutual understanding between businesses and universities is essential for sustainable industry-university-government collaboration. For instance, there is a need to develop trust by solving problems through thorough discussions after both parties have understood the differences regarding the considerations towards the characteristics of the collaborative research results, flexible and prompt response to corporate needs, thoroughness of awareness towards confidentiality, and characteristics of the university,

which is a non-responsible organization involved in the joint invention. As well as providing opportunities for both parties to communicate, and information on best practice, the government will promote the independent formulation of rules by presenting guidelines where required.

As for the indirect costs that will be required for the collaborative research or sponsored research with businesses in universities and public research institutions, the government will promote appropriate provisions, as it is important to secure the costs in the relevant research funds based on thorough discussions by both parties.

-Promoting the autonomous efforts of universities-

Universities are required to appropriately position the activities of industry-university-government collaboration in their respective operation policies, and engage proactively in collaborative activities by perceiving social contributions including industry-university-government collaboration, as well as education and research, as important missions. Universities are also expected to appropriately evaluate the achievements of researchers who are actively engaged in industry-university-government collaboration. In addition, they are also required to improve the mechanism that properly manages the conditions of conflicting interest that occur with the progress of collaborative research. The government will strive to give incentives to universities that are actively engaging in the activities of industry-university-government collaboration.

-Revitalizing and enhancing the collaboration of university intellectual property centers and technology licensing organizations (TLOs)-

In order for the activities of industry-university-government collaboration to achieve sufficient results, it is necessary to further revitalize the activities of university intellectual property centers and TLOs and make them more effective.

Intellectual property centers in universities that carry out strategic creation, management and utilization of intellectual property are a vital presence for universities to achieve their mission of passing on their research results to society, and the government will support their efforts while seeking the initiative of universities and management collaboration. As for TLOs that carry out technological licensing projects for the private sector, the government will strive to enhance the technological licensing system of other TLOs and universities by disseminating the success factors of TLOs that are achieving great results and support their launch.

Universities will further enhance collaboration between their intellectual property centers and TLOs from the perspective of fully utilizing the knowledge and know-how on technological licensing accumulated by TLOs and clarify their external contact by defining the relationship between their intellectual property centers and the TLOs.

-Developing smooth intellectual property activities-

The government will promote the efforts of organizations to properly secure the costs for intellectual property activities such as the costs of patent application in universities within organizations. In doing so, active utilization of indirect costs in competitive funds is expected. The government will also adequately aid the costs of overseas patent applications from the perspective of enhancing Japan’s global competitiveness and improve the support for competitive R&D for promoting the passing on of research results produced in universities to society.

(iii) Promoting the utilization of new technologies in the public sector

Promoting the utilization of new technologies through public procurement is important not only from the standpoint of improving the functions of the activities of the public sector and increasing efficiency, but also from the standpoint of promoting the passing on research results to society. For these reasons, the government will promote the coordination and collaboration of the public sector's needs, and the R&D seeds in R&D such as for S&T and advanced equipment research that contribute to safety. With S&T that contributes to safety, the government will strive to build a network of research information.

Furthermore, the public sector's creation of advance initial demand for new technologies for which demand is high or market scale is still small has major significance not only in contributing to the policy goals of each sector but also for forming new markets and stimulating private-sector innovation. The public sector is expected to actively consider the introduction of new technologies to the business scene by actively utilizing bidding systems that emphasize technical capabilities such as the integrated evaluation bidding system.

In addition, as it is important for R&D type ventures to have their products procured by the public sector to boost the creditworthiness of their companies and secure income at the inception stage, the government will take procurement from R&D type ventures into consideration in the introduction of new technologies by the public sector.

(iv) Promoting the entrepreneurial activities of R&D ventures

R&D type ventures including ventures initiated by universities are a presence that ought to play an active part in creating new industries, reforming the industry structure, and passing on the research results of universities to society, as the engine for innovation. For these reasons, the government will enhance the comprehensive support measures for R&D type ventures in the aspects of technology, funding, human resources, and demand creation, and promote general improvements on entrepreneurial activities. Particularly with regards to ventures initiated by universities, the government will competitively provide support to create ventures that grow and develop, and continue to support the creation of such activities.

In addition, since R&D type ventures can actively respond to the demands of the client due to their high motivation for taking on new businesses, the government will actively consider the utilization of capable R&D type ventures in R&D carried out by competitive funds for creating innovation, and R&D carried out by national and public research institutions on commission. Furthermore, the government will support the creation of a network between venture supporters, and strive to work on the facilitation of risk money supply to the ventures through developing entrepreneurial support type venture capital that utilizes fund contributions, promoting the investment activities of private investors such as the expansion of the utilization of the fax system for Angel, and promoting efficiency in government organizations' system of lending.

In addition, as there is criticism of the weakness of entrepreneurship in Japan by international standards, it is essential to create a thick layer of human resources, i.e., potential entrepreneurs that are motivated to take on challenges that may lead to commercialization in promoting essential entrepreneurial activities. For this reason, the government will encourage the efforts of promoting such entrepreneurial activities as the support of such activities by students, the creation of entrepreneurial opportunities through human interaction, and the improvement of quality such as business promotion related courses in universities.

(v) Promoting R&D by private enterprises

Since it is private enterprises that create market values in the form of new products from the results of

R&D and industry-university-government collaboration, leading them to ultimately achieve innovation, it is important to revitalize private sector R&D. As a nation, Japan will strive to utilize tax measures that contribute to the promotion of R&D activities, and improve the technological development programs that reduce the risks of R&D up to commercialization to boost their motivation on the basis of the self-supporting efforts of the private sector. In addition, with regards to small businesses that support the foundation of Japan's industrial competitiveness, the government will support efforts towards the enhancement and development of manufacturing technologies after taking the vulnerabilities of the financial base and managerial resources into account.

Moreover, amidst the increasing tendency towards the manufacturing of in-house products by the utilization of external R&D capacity and results, there is a need to build a cooperative relationship that mutually develops in a sustainable way in the private sector by positioning universities and public research institutions as their partners for innovation from a long term perspective to accelerate the creation of innovation by the nation as a whole.

(4) Building regional innovation systems and creating vital regions

As the promotion of S&T in regions contributes to building regional innovation systems and creating vital regions, thus enhancing the sophistication and diversification of the S&T of Japan as a whole, and the competitive edge of the innovation systems, the government will actively encourage such promotion. Moreover, the government will promote broad-ranging activities as something that will contribute to achieving safe, secure and quality lives for local residents, and producing creative and appealing regions and culture.

(i) Forming regional clusters

Formation of regional clusters not only needs R&D by industry-academia-government collaboration, but also requires various activities such as facilitation of finance, support of new business creation, development of the market environment and building of cooperative networks. As such, the government will proceed with long term efforts based on the strategic initiative of regions and the collaboration of relevant organizations.

The government will continue to provide competitive support for cluster forming activities carried out under local initiatives. In so doing, the government will provide selective support to regions that have the potential to develop as world-class clusters, by assessing the global competitive edge of each region according to the progress of cluster formation and develop clusters across Japan with strengths that utilize regional characteristics, however small in scale.

(ii) Developing smooth S&T policies in regions

In promoting regional S&T policies, the government will expect local authorities to fulfill an active role and enhance inter-ministerial coordination by eliminating vertical divisions between ministries.

Since the enhancement of the functions of coordinators is crucial to promoting industry-academia-government collaboration in regions, the government will develop the support system for them and support the building of coordinator networks. The government will promote the development of human resources through collaboration of local universities and industries by methods such as internships.

Moreover, national public research institutions in the regions are expected to meet the needs of local industries while collaborating with local universities, and create and disseminate the seeds themselves.

Although public research institutions of local authorities are carrying out technological developments and technical guidance that meets the needs of local industries and scenes, they are expected to play an effective role for regional industry-academia-government collaboration, while choosing and converging in operations that utilize the respective characteristics and strengths, and planning extensive collaboration between regions by taking the effectiveness of past results into account.

(5) Effective and efficient promotion of R&D

(i) Effective utilization of research funds

(Thoroughly eliminating waste in research fund allocation)

Illogical overlap of research fund allocation and excessive concentration of research funds that exceed the relevant efforts of individual researchers (allocation of time that an individual engaged in various operations such as research, education and administration) must be thoroughly eliminated.

For this reason, the government must build a cross-ministerial "R & D management system" for implementing inspections on overlap etc by sharing information between the competitive fund systems among all ministries as early as possible based on the e-Government Building Program. The cross-ministerial "R & D management system" will have an application receptionist function which enables researchers to input data and applies for whole research fund systems that include competitive research funds as a core.

Meanwhile, the Council for Science and Technology Policy will also proceed with preparing the database on research funds besides competitive funds such as project research funds by building a government R&D database to contribute to effective and efficient allocation of resources such as eliminating overlap by grasping the complete picture of the status of allocation of research funds as a whole including funds other than competitive funds. The government will promote cross-ministerial "R & D management system" utilization after making sufficient adjustments with the R&D management system and the government R&D database. Through its utilization, ministries will appropriately fulfill the responsibility of providing explanations on allocation decisions by implementing inspections on overlap etc.

In addition, the government will rigorously respond by imposing limitations on the application eligibility for researchers for dishonest receipt or wrongful use of research funds.

(Managing the efforts of researchers by universities and public research institutions)

Universities and public research institutions should secure the time for implementing R&D through research funds researchers obtain externally by managing the efforts of researchers. In particular, universities aiming to become global research and education centers will work on early establishment of proper effort management. Moreover, they will ensure the description of efforts of researchers in the application form under the acknowledgement of the organization in applying for a research fund system such as competitive funds and project research funds.

(ii) Emphasizing the development and utilization of human resources in research funds

In view of the importance of the development of human resources in engaging in R&D, and stricter selection of focus on human resources that comes with the prioritization of R&D, developing and utilizing human resources should be further emphasized in research funds such as competitive funds.

Therefore, the government will carry out necessary system improvements by working on putting research funds into the development and utilization of human resources in each research fund system. Through this, the government will promote the independent formation of research institutions by young researchers by

developing young researchers through providing funds equivalent to the living expenses of doctorate course students, and providing staff costs for post-doctorals, research supporters, and external research human resources.

At the same time, through ensuring application premised on the shared use of general purpose research equipment, and promoting the use of common spaces, the government will do its utmost for the effective utilization of the facilities as a whole.

(iii) Reforming the evaluation system

R&D evaluation is extremely important in planning the creation of a flexible, competitive and open R&D environment, the selective and efficient promotion of R&D and improvement of quality, the improvement of the motivation of researchers, and the formulation of better policies by fulfilling the responsibility of providing explanation to the nation. The government will implement such evaluations according to specific policies that set out the evaluation methods by office and ministries in line with general guidelines.

Furthermore, from the perspective of further developing Japan's evaluation systems, the government will review the general guidelines where required based on the implementation of R&D evaluations.

(Direction of reforms)

The government will make efforts to ensure that evaluations do not become unnecessarily bureaucratic from the perspective of evaluation, to boost motivation by taking the difficulty of the task taken on by the researchers into consideration, and train and secure assessment personnel with a talent for spotting and cultivating unique and outstanding researchers and R&D, so that the evaluations encourage a spirit of creation and questioning of results.

The government will work on choosing appropriate survey analysis methods and evaluation methods according to the subject, timing and objectives of evaluation in implementing evaluations, developing and reforming evaluation methods, training evaluation personnel, including young personnel, and improving their evaluation ability (experts of respective fields skilled in evaluation, staff of ministerial organizations, researchers specializing in evaluation), so that evaluations will be reliable and of global standard. The government will work on clearly and specifically establishing the evaluation objectives after fully recognizing that evaluations are important means of aiding strategic decision-making, and clarifying how and by whom the evaluation results will be utilized beforehand, so that they can be utilized and promote reform.

Furthermore, concerning evaluations of R&D measures from the perspective of the evaluation subject, the government will further establish and improve follow-up evaluations from the standpoint of implementation timing by taking its implementation into account.

(Operating an effective and efficient evaluation system)

From the perspective of avoiding unnecessary duplication of evaluations, maintaining the continuity and uniformity of evaluations, and operating effective and efficient evaluation systems as a whole, the office, ministries and organizations that implement R&D will improve the evaluation systems by appointing personnel responsible for the operation of the evaluation systems, and implementing improvements of the system and foundation for the mutual coordination and utilization of the evaluations, and assessment. In so doing, they will secure the budget for evaluation, train and secure evaluation personnel, and build and manage the database.

(Promoting evaluations based on policy targets)

Evaluations are implemented by establishing appropriate items of evaluation and evaluation standards according to the characteristics of R&D. However, in so doing, the government will work on establishing the items of evaluation and evaluation standards based on the policy targets related to the relevant R&D so that the results can be passed on to society and the nation effectively.

(6) Resolving the institutional and operational bottleneck that acts against S&T activities and returning benefits from R&D to society

In promoting S&T, an active interaction of human resources, a smooth implementation of research activities, the promotion of industry-university-government collaboration, and the improvement of institutional environment that supports the smooth passing of research results to society are important matters for increasing the effects of human and material investments for S&T. Although there has been remarkable progress in such areas as the research exchange system, the fixed-term system of researchers, the independent organization system, the national university system, and the intellectual property system, there is much criticism that various institutional bottlenecks still remain, including, for example, immigration controls on foreign researchers, working environment of female researchers in relation to child birth/rearing, treatment of pensions and retirement benefits associated with personnel change, promotion of utilization of contract authorization for research funds, the clinical study environment, the employment environment for research supporters, and the financing environment for research institutions.

For this reason, the Council for Science and Technology Policy will actively deepen its involvement in the boundary area of S&T policy and other policies, and work together with relevant ministries, agencies and councils for resolving the institutional bottlenecks that hinder the promotion of S&T, and for resolving the various obvious issues in operating the systems in the research scenes. In addition, they will provide their opinions where required and carry out follow-ups on their implementations.

3. Reinforcing the foundation for promoting S&T

(1) Systematic and prioritized improvements of facilities

Promoting the improvements of such facilities as universities and public research institutions is essential for promoting the development of talented world-class human resources, creative and advanced R&D, and becoming a creative S&T nation, and such improvements need to be implemented by order of priority in public facilities as well.

In so doing, as universities are particularly required to turn out such outstanding human resources as researchers that will lead the next generation, they are required to develop an environment and atmosphere fitting for a place of creative learning and research.

(i) Improvements of facilities such as national universities and public research institutions

Although the restrictedness of facilities that have been worked on by priority through the “Five-Year Program for Emergent Renovation and Building of Facilities of National Universities, etc.” have been improved as planned, improvements on deteriorated facilities have been gotten behind, and as a result they have increased in correlation with the demands for improvements because of deterioration by aging. Moreover, there have been new education and research needs such as responses to graduate schools newly established after 2001, responses to securing space for education and research activities of young researchers,

and responses to the training and practice associated with the development of new diagnostic and treatment techniques.

The deterioration of such facilities as national universities built in large numbers from the 1960s to 1970s is continuing, and as they are not only unable to respond to the new educational and research needs in terms of function, but as there are also safety issues such as earthquake resistance and the aging of key facilities, the government will take particular budgetary steps for systematic improvements from a long-term perspective by positioning the regeneration of the aging facilities as a high-priority issue.

The dimensions of improvements required in national universities have reached approximately 10 million square meters. The government will support systematic improvements by formulating a facilities improvement plan that incorporates facilities that require urgent improvements during the five years of the third basic plan from the perspective of carrying out the regeneration of deteriorated facilities as a high-priority for outstanding research centers, and basic facilities that emphasize human resource development functions.

Moreover, for university hospitals and nationally-run specialist medical centers that are implementing improvements through long-term borrowings, the government will support steady systematic improvements so that they can continue to fulfill their pioneering roles in advance medical care.

National universities are required to promote facilities improvements through new methods based on self-help efforts such as enhancing the collaboration with the business world and local governments, to utilize long-term loans and the private finance initiative (PFI), further enhance facilities management systems such as facilities operation and maintenance, and secure flexible and mobile space from an all-campus perspective. In order to promote efforts for such reforms by national universities, the government will carry out necessary review of the systems, and carry out prioritized distribution of resources after actively assessing the efforts of national universities.

The government will also improve facilities to meet the needs of the times to produce outstanding R&D results, and develop talented human resources in public research institutions such as independent administrative agencies. In particular, the government will carry out the regeneration and refurbishment of facilities preferentially and systematical for public research institutions established before mid 1950’s, as there are many remarkably deteriorated facilities.

Furthermore, the government will consider a long term improvements plan per organization for public research institutions, such as Tsukuba Science City, that have facilities with a risk of a simultaneous occurrence of deterioration issues in the future.

(ii) Development of facilities of national universities and public research institutions

The importance of laboratory facilities and advanced research facilities has dramatically increased with the advances in basic research. As the use of those facilities in abstract research has an important role to play, the government will support national universities to enable them to intentionally develop their research facilities including large scale facilities from a long-term perspective.

National universities and public research institutions will promote effective and efficient use of research facilities, such as shared use beyond the framework of organizations, reuse of facilities after completion of competitive fund supported research, as well as effective use of existing facilities by actively making efforts to share the use of the facilities within organizations.

(iii) Developing the facilities of public universities

With regards to education and research facilities of public universities that are playing a major role as centers of education and research in regions, it would be best for the government to strive to improve the financial measures based on the decision of local authorities, which are the establishers.

(iv) Developing the facilities of private universities

Selective development of private university facilities are important in boosting Japan's research capability and promoting the sophistication of education and research. However, given that the development of private university facilities are not exactly sufficient, the government will improve financial aid to private educational institutions so that development of research facilities in private universities can be actively carried out .

(v) Promoting the development and shared use of advanced large-scale public research facilities

As advanced large-scale public research facilities such as next-generation super computers and next-generation radiation sources require vast expenses for development and operation, and sharing them extensively would lead to producing results of the world's best standard, rather than treating them as projects of specific research institutions, the government should take the responsibility for promoting their development and shared use by choosing the best organization from the various industry-university-government organizations to implement the development and shared use fairly and efficiently.

For this reason, the government will build a mechanism for integral promotion of development and operation of these facilities including the development of laws for promoting shared use. Moreover, the government will carry out intentional and continuous development by giving priority to large-scale research facilities such as Inter-University Research Institute Corporation after carrying out rigorous evaluations in selecting the specific advanced large-scale shared facilities.

(2) Improving the intellectual infrastructure

(i) Strategic and selective development of intellectual infrastructure

Amidst rising dependency on knowledge of socioeconomic activities as a whole by the advances in research and development activities, the government will proceed with the selective development of the intellectual infrastructure(materials for research such as biological resource, measurement standards, methods of measurement, analysis, testing and evaluation, relevant advanced equipment, and related database) that supports these activities at large, aiming for the highest global standards by 2010, while proceeding with selection and concentration by reviewing the intellectual infrastructure developments plan so that developments that use the qualitative perspective, i.e., the level of response to user needs and usage frequency, as a guideline, as well as the quantitative perspective can be carried out.

In addition, with regards to advanced equipment, given that equipment development in itself has the nature of leading advanced research, the government will carry out selective development of key elemental technology and system integration technology for equipment that are essential in research of important areas, and those that are being caught up by other countries despite Japan having a comparative advantage.

(ii) Building a framework for promoting efficient development and use

Aiming for development of user-friendliness and the integral operation of various intellectual infrastructures, the government will plan to turn public research institutions into centers by designating and developing them as core centers for various areas of intellectual infrastructure. Core centers are required to grasp the needs of the users, and reflect them in the development and operation of their intellectual infrastructure. Their common functions are: collaboration with relevant organizations, accumulation and transmission of the location of the intellectual infrastructure and technical information, and considerations on intellectual property.

Public research institutions and universities are required to build the framework that is required by securing full time personnel that will play a part in the development of the intellectual infrastructure, and position the required framework aptly in their respective operation policies so that the level of contributions to the development on the intellectual infrastructure of the researchers and engineers can be evaluated. The government will strive to improve the social visibility of this area by commending researchers and engineers that have contributed to the development of the intellectual infrastructure.

Moreover, public research institutions and universities are expected to clarify the importance of digital archiving for accumulating R&D results, and the storage of materials for research in their respective operation policies, and work on their intentional accumulation by formulating a research plan including the costs required in obtaining such research funds as competitive funds.

As it is believed that giving and receiving materials for research will be carried out frequently in the future, the government will continue to work on development of regulations on intellectual property with public research institutions and universities. In so doing, the abovementioned core centers are expected to contribute to the improvement of Japan's response capability towards issues related to intellectual property through sharing the results of considerations with other organizations.

In addition, they will actively participate in measurement standards development and biological resource development particularly in Asia by continuing to rigorously participate in international endeavors related to the development of measurement standards.

(3) Creating, protecting and utilizing intellectual property

In order to produce creative and innovative R&D results, and pass them onto society and the nation, it is essential to revitalize the intellect creation cycle that effectively uses the results of intellect creating activities by adequately protecting them as intellectual property by stimulating and activating the intellect creating activities. The government will promote measures on the creation, protection and utilization of intellectual property for the promotion of Japan's S&T and the enhancement of global competitiveness.

(Improving the intellectual property systems in universities)

Development of systems of intellectual property and formulation of rules including the institutional consolidated management of inventions are being implemented in universities. The government will support the system development of university intellectual property centers and TLO for the development of future full-scale intellectual property activities, and promote the efforts for carrying out a prompt and flexible business operation by responding to various problems associated with intellectual property management and contract.

In addition, since conflicts on intellectual property that universities are involved in are coming to the surface, the government will support system development in universities so that they can respond properly to

resolve such conflicts.

(Promoting intellectual property activities)

It is important to utilize outstanding R&D results that become the source of global competitiveness by effectively obtaining the rights particularly as basic patents in Japan and abroad.

The government will encourage businesses to switch the emphasis of their patent strategies from quantity to quality so that they lead to obtaining high-quality basic patents. As it is important for universities to utilize great intellectual property by obtaining the rights properly regardless of nation, the government will support the strategic efforts of universities. The government will also carry out the development of search systems for patent information so that outstanding quality research results can be obtained.

In addition, with regards to the various issues of intellectual property advanced technology areas such as life science have, i.e., smooth usage of other's patents in testing and research in universities, the government will make considerations that take into account the appropriate balance with the level of freedom of research in universities, and develop the intellectual property system and its operation as needed.

(Developing regions through intellectual property)

Universities, which are the creation centers of intellectual property are expected to produce new intellectual property that leads to the development of regions as the core of regions. The government will support the efforts of promoting the creation and utilization of intellectual properties that match the needs of regions by reinforcing collaborations of universities with local businesses, local authorities and local research institutions, and encouraging the security and utilization of advisors on intellectual property in regions.

(4) Actively responding to standardization

It is important to actively respond to standardization to disseminate R&D results, and as such, relevant organizations including the government will provide effective support while the business world proactively takes on the activities of standardization.

The government and public research institutions will engage in the activities of standardization by positioning intellectual property strategy as well as standardization strategy clearly in the R&D plan in implementing R&D projects. Moreover, in order to strategically gain global standards produced in Japan, the government will promptly and effectively participate with consistency by exhibiting leadership through producing an international standardization proposal in areas with technical advantage, and further reinforce collaborations between relevant office and ministries, and industry-university-government collaborations for the activities of international standardization organizations such as the International Organization for Standardization (ISO), the International Electro technical Commission (IEC) and the International Telecommunication Union (ITU). Furthermore, in striving for international standardization, the government will speed up the deliberations of domestic standards so that they can be utilized strategically as a step towards international standards.

In addition, the importance of human resources that can accurately respond to the activities of standardization, i.e., take on the role of international secretary in the activities of international standardization, has increased. As such, the government will reinforce the framework of training standardization experts through improving the training and educational programs including the production of teaching materials on standardization, utilizing the experts of public research institutions, and improving support for participation in the activities of international standardization.

(5) Improving the research information infrastructure

Research information infrastructure has a quality as a sort of lifeline essential in research activities, and the government will always go ahead of advanced information and telecommunications technology and global trends to particularly improve host computers and high-speed networks.

In addition, the government will carry out effective and efficient operation of research information infrastructure by promoting the systematic collection, storage and effective transmission of research information such as essential research paper journals in research institutions, and the collaboration and efforts between researchers and research institutions.

Specifically, as well as achieving a flexible and efficient research information network through the introduction of the latest technologies, and a user-friendly computing environment, the government will reinforce global collaboration. In addition, the government will carry out comprehensive and strategic efforts for foundational software development that reinforce the hardware and their organic coordination including the building of a system that encompass them, and the securing of human resources.

Moreover, in order to advance the usage environment of research information, the government will improve the integrated search system of bibliographic information and patent information such as articles, enhance the system of collecting and storing research paper journals, and promote function reinforcement and coordination of university and national libraries, while introducing the latest information and telecommunications technologies.

Furthermore, the government will support digital archiving of research paper journals so that Japan's accumulated research information can be sent out at home and abroad as assets.

In addition, for the purpose of disclosing the results obtained by researchers in research under public financial support, we expect to be able to peruse research papers published in journals online without charge after a certain period of time.

(6) Promoting the activities of academic societies

(Role of academic societies)

Academic societies support Japan's research activities beyond research institutions such as universities, as places for presenting research results, exchanging knowledge, and communicating and coordinating with researchers and academic societies at home and abroad. In order to improve the international position Japan's S&T, there is a need to enhance their functions by promoting reforms through self-help efforts of such academic societies.

Moreover, academic societies are expected to carry out broad activities such as active communication with society on S&T, support for children's participation in international S&T competitions, and contribution for ongoing ability development of engineers, while being aware of their social role. As a country, the government will actively provide support sot that such activities can be carried out briskly.

(Enhancing the global competitiveness of academic societies)

Academic societies in Japan have seen a fall in their information transmission abilities compared to European and American academic societies that outpace capital strength by the rapid globalization of the transmission and distribution of research information through journals by the dissemination of the Internet, and there is concern that the presentation of research results is shifting away from academic societies at home and abroad.

For this reason, academic societies are expected to carry out infrastructure development for boosting the abilities of collecting, analyzing, transmitting and distributing research information using information and telecommunications, and enhancing information transmission by using active interaction of human resources such as bringing in foreign researchers to revitalize workshops. Furthermore, from the perspective of reinforcing the global competitiveness of research paper journals, academic societies are expected to promote globalization in the editing and referencing of research paper journals, and utilize information telecommunications technologies under their self-help efforts for independence and progress, including the integration with research paper journals of relevant areas. The government will provide competitive and selective support for strengthening their functions by promoting such reforms of academic societies.

(7) Promoting R&D in public research institutions

The mission of public research institutions is to achieve policy objectives, and they carry out selective R&D focusing on basic and pioneering research that lead to the improvement of Japan's S&T, and systematic and comprehensive research with specific targets that conform to policy needs. In so doing, they are required to strengthen their functions so that they can effectively disseminate the research results produced, put them to practical use, and pass them on to society by fully exhibiting their potential ability for creating innovation, while reinforcing their ties with universities and the business world.

Many public research institutions have evolved as independent organizations, but each organization is expected to engage in self-governing and self-active operation and reforms such as to introduce flexible operation of research funds, and fair and highly transparent competitive personnel and payroll systems through their own managerial efforts under the discretion of their director. In addition, from the perspective of improving the functions of organizations, they are encouraged to carry out R&D by obtaining competitive funds. However, it is important first to have the necessary expenses for achieving the organizations' mission to be provided without fail through operating expense subsidies.

Furthermore, in order to increase competitive funds and promote strategic and selective S&T, the government will take measures so that there will be no immediate budgetary restrictions for competitive fund distributing organizations, and those that are properly involved in strategic and selective S&T, just for being independent organizations.

Tsukuba Science City and Kansai Science City will work on R&D collaborations and integration that utilize their advantage of having a concentration of several public research institutions within the city.

4. Strategically promoting international activities

From now, Japan needs to not only stay with the perspective of merely globalizing the activities of S&T, but to implement them strategically. In so doing, the government will make efforts towards achieving the following objectives while using the approaches of competition and harmonization, cooperation and support according to the condition of the counterparts based on sufficient research and analysis of global trends.

- Utilize Japan's S&T abilities to respond to the solving of international challenges, and the international imperatives and expectations from other countries to raise the trust towards Japan.
- Contribute to formulating international standards and rules on S&T through Japan's initiatives.
- As well as cultivating Japan's researchers as world-class human resources, strengthen Japan's S&T abilities by improving the diversity of research and standards of research through accepting outstanding foreign researchers.

(1) Systematic efforts of international activities

With regards to the bilateral and multilateral frameworks in the international cooperative activities of S&T, the government will carry out systematic efforts for international activities of S&T, while keeping in mind the existence of mutual complementarities of S&T activities and common challenges between Japan and our counterparts

Among those undertakings are:

(i) Forming of a multilayered network (government, research institutions, academic societies, researchers), (ii) Extracting of common challenges that must be worked on jointly including Japan, and the implementation of R&D and technological development for solving such challenges (iii) Promotion of the creation of a seed bed of new international cooperation. In addition, the government will work on developing human resources that will lead in future international activities.

(2) Cooperating with Asian nations

As well as continuing to improve the prior international frameworks, and cooperation and collaborations with European nations and the United States of America, the government will strengthen the ties of S&T with Asian nations to fulfill the role that is expected of Japan from both inside and outside the country, in view of international situations, i.e., the geographical and environmental accessibility, the rapid improvement of the S&T standards, and the increasing closeness of economic relations. For this reason, the government will strengthen the collaboration of S&T. As such, the government will implement a policy dialogue called “Asian Region S&T Ministerial Summit” (tentative name) at a high level including ministers involved in S&T policies with Asian nations, based on the existing government-to-government dialogue and interaction by researchers.

In parallel with this dialogue, the government will strengthen the S&T community with Asian nations through network formation and responses for common challenges in the Asian region by promoting interaction with researchers from Asian nations.

(3) Promoting general development for reinforcing international activities, and acceptance of talented foreign researchers

In order to forcefully promote international activities, the government will strengthen the infrastructure that supports such activities, including the reinforcement of the administrative system that leads the international activities in universities and public research institutions, the effective promotion of overseas base activities of relevant organizations and the promotion of collaborations, and the development of the systems that systematically collect and analyze overseas S&T trends. In addition, in order to improve the international ratings and visibility of Japan’s S&T activities, the government will support the active transmitting of information on research results, researchers and research institutions overseas, mainly for overseas centers, and the forming of the network of officials including those with research experience in Japan. Moreover, the government will continue to develop and improve the Tsukuba Science City and the Kansai Science City as international R&T centers open to all.

In order to promote the acceptance of foreign researchers and expand their activities, the government will further promote necessary reviews and operational development on the future of immigration control systems and visa issuance. Specifically, the government will proceed with efforts for the extension of period of stay

for foreign researchers, the relaxation of restrictions on permission of permanent residence, the relaxation of restrictions on issuance of short term stay via with multiple-exit, and the simplification and acceleration of various procedures, and put forward suggestions on the issuance of APEC business travel cards (ABTC) to researchers at APEC related meetings.

Chapter 4 S&T to Be Supported by Society and the Public

S&T activities and systems do not exist independently from society and the public. It is no exaggeration to say that the development of S&T will be possible only when S&T activities and systems are extensively supported by society and the public. “S&T to be supported by the public and to benefit society” is a basic principle of the third basic plan. Therefore, entities at various levels, ranging from the Council for Science and Technology Policy, relevant ministries and agencies, municipal governments, the Science Council of Japan, academic societies, other research communities, research institutes, to individual researchers, will promote associated measures according to their respective roles and in an appropriate manner.

Human and social sciences are important to resolve the diverse problems of modern society. Therefore, we need to implement comprehensive measures combining these sciences and natural sciences.

1. Responsible measures to be taken to resolve ethical, legal, or social problems caused by S&T

Rapidly advancing S&T are coming to greatly influence social issues including legal and ethical issues such as: bioethical issues including human cloning technology; anxiety about genetically engineered foods; concerns about the misuse of personal information; and ethical issues for researchers including those who forge experimental data. In order to achieve social trust in S&T, the government and research communities will draw up, through open processes, a set of rules in consideration of global trends, while encouraging S&T researchers to conduct R&D activities in compliance with those rules. In particular, as well as promoting comprehensive and strategic review and study on the impact that nanotechnology has on society, they will enhance measures to resolve bioethical issues that have been growing rapidly in close relation with society.

In the formulation of those rules, the Council for Science and Technology Policy will be involved in the creation of the basic rules, with foresight and in cooperation with the relevant ministries and agencies. The Science Council of Japan, as an organization representing the Japanese research community, will also contribute to making the rules. In addition, in order to establish the ethics of researchers and engineers, we will encourage universities and other educational institutions to build education systems, and academic societies to develop training systems and formulate ethical guidelines.

S&T activities for risk assessment, such as safety assessment, the devisal of test methods, and the collection, arrangement, and analysis of data, are important to rationally implement the risk control required to return the S&T results to society.

The activities for creating social consensus based on the results of scientific risk assessment are essential for the public to feel security. The government will support these activities.

2. Accountability relating to S&T and the improvement of information provision

Returning S&T results to the public with clear explanations is fundamental in achieving people’s support

for S&T. Practical policy goals mentioned in Chapter 1 are the basis of strengthening of accountability for people for S&T. The Council for Science and Technology Policy will follow up the progress which each of the ministries and agencies makes for accomplishment of the goals, as well as provide society and the public with relevant information.

The basic responsibilities of research institutions and researchers are to disclose their research activities as much as possible and explain the details and results clearly to society. In the course of fulfilling their responsibilities, those research institutions and researchers are expected to use diverse media effectively and efficiently.

We will promote outreach activities that aim for the sharing of public needs among researchers through interactive communication between researchers and the public. Therefore, we will create and adopt a mechanism in the competitive fund system to ensure a certain amount of expenditure for outreach activities.

3. Improving the public awareness of S&T

In order to increase public interest in S&T, it is important to improve adults' knowledge and ability (S&T literacy) relating to S&T, as well as enrich science and mathematics education in elementary and secondary education. Therefore, we will formulate and widely spread the vision of S&T literacy (a document clearly explaining the knowledge, technology, and views relating to S&T). We also need to implement new methods for the merging of S&T, culture, and the arts, so that society and the public may gain a deeper understanding and awareness of S&T.

Furthermore, we will increase the opportunities for all the public from infants to the elderly to come into contact with, experience, and learn about S&T. More specifically, we will enhance the National Science Museum, the National Museum of Emerging Science and Innovation (Miraikan), and other museums, while promoting the development and securing of employees who support their activities, science volunteers, and NPO employees. In addition, we will promote the contributions of universities and public research institutions to the improvement of the people's awareness of S&T through social activities such as opening to the public of their facilities and equipment and lectures on demand. The government will also provide the public with an opportunity to experience the dream and excitement of S&T through a variety of competitions and events.

4. Promoting proactive participation of the public in S&T

The active participation of the public in S&T as well as the approaches of S&T toward the public are essential for increasing the people's understanding and support for S&T. Therefore, we will enhance measures to encourage the public to participate in S&T proactively. More specifically, measures will be taken to encourage ministries and agencies to actively disclose the basic plan, and research details and progress of the R&D project which may have a large impact on society and raise public interest extensively, as well as to encourage them to reflect the feedback obtained as a result of the disclosure to the public.

Chapter 5 Role of the Council for Science and Technology Policy

1. Basic operation

With the leadership of the Prime Minister, the Council for Science and Technology Policy will operate with foresight and flexibility and suggest a national strategy as the chief controller of the promotion of

policies so that essential policies mentioned in the S&T basic plan may be realized by the nation as a whole accurately and steadily.

In the operations, the Council will closely cooperate with the Science Council of Japan, Council on Economic and Fiscal Policy, Strategic Council on Intellectual Property, IT Strategic Headquarters, Council for Regulatory Reform, Council for Gender Equality, Headquarters for Regional Revitalization, and other entities.

Furthermore, the Council for Science and Technology Policy will pursue the vision for which human society in the 21st century should aim, always have a global view, and conduct proactive activities as "the meeting place of wisdom" that covers the natural, human, and social sciences. So that the Council may be well known to society and the public, it will also strive to develop interactive communication between S&T and society/the public and to improve public awareness of S&T, aiming at "S&T being supported by the public and benefiting the society."

2. Specific measures

(1) Effective, efficient promotion of governmental R&D

(Enhancing strategic R&D)

In order to enhance strategic R&D through selection and concentration, the Council will promote inter-sectoral prioritization, while formulating the Promotion Strategies for Prioritized Areas that indicate important R&D issues. The Council will also select strategic prioritized S&T to be incorporated in the Strategies. These Strategies will be amended flexibly in consideration of updated S&T knowledge and information, and an annual policy cycle will be established to reflect the amendments to the resource allocation policy and thereby realize "practical strategies." The policy goals of ministries and agencies for each project and related progress will be clarified to strengthen accountability.

(Improving prioritization in the resource allocation policy)

For more effective allocation of S&T-related resources and the removal of adverse effects of sectionalism, the Council will implement prioritization more strictly and provide relevant ministers with its opinions. The Council will strive to improve the method of prioritization and make other improvements including priority setting from viewpoints of policy goals in addition to S&T.

(Full-scale promotion of S&T collaboration measures)

The Council will enhance collaboration among ministries and agencies and remove adverse effects of sectionalism such as the unnecessary overlapping of measures. The Council will start taking S&T collaboration measures before the budget requests and thereby promote them on a full-scale basis, in order to exert the effects of synergy and merging to accomplish policy goals.

(Promoting the understanding of S&T activities conducted by independent administrative institutions and national universities, and the publication of opinions offered regarding the activities)

The Council will understand the current progress of S&T activities conducted by independent administrative institutions and national universities that play a major role in promoting national S&T policies, as well as the status of resource injections for these activities. Then the Council will analyze their consistency with the basic plan and offer its opinions. Giving sufficient consideration to the characteristics of

independent administrative institutions and national universities and their influence on research/educational activities, the Council will ensure more thorough understanding of the current progress and status, and, when necessary, ask relevant ministries and agencies to take measures for improvement. By releasing the offered opinions publicly, the Council will encourage these corporations to accelerate their reforms by improving the transparency of their S&T activities.

(Enhancing research and analysis functions and adjustment functions among ministries and agencies)

In conjunction with the functional improvements mentioned above, the Council will enhance research and analysis functions, as well as adjustment functions among ministries and agencies.

(2) Promotion of S&T system reforms

The Council for Science and Technology Policy will promote evaluation system reforms, evaluation of large-scale R&D projects and other nationally important R&D projects, improvement of systems related to industry-university-government collaborations, and reform of the competitive fund system. The Council will also improve governmental R&D database to avoid the unreasonable overlapping of research fund allocation and the concentrated fund allocation that exceeds the appropriate amount the individual should be granted for his/her efforts.

(3) S&T to be supported by the public and to benefit society

Taking adequate measures by ministries and agencies is essential for S&T to gain social understanding and public interest, and the Council for Science and Technology Policy will also promote these measures. In particular, the Council will promote understanding of the progress in the accomplishment of policy goals, provision of related information, strengthening of provision of information on S&T, expansion of functions of communicating with the public, and participation of the public in S&T.

(4) Strategic promotion of international activities

Due to the necessity for taking international measures strategically, the Council will promote high-level policy discussions with other Asian counties in the “Council of Ministries for Asian S&T (tentative name).”

(5) Removal of structural or operational obstacles for smooth S&T activities and the return of the results to society

The Council intends to be involved with S&T policies and border areas with other policies more proactively in cooperation with relevant ministries, agencies, and councils, in order to remove structural obstacles for S&T promotion and resolve operational problems that are appearing at research sites.

(6) Appropriate follow-up of the S&T basic plan and the promotion of the progress

In addition to promoting the above, the Council will follow up the status of implementation of measures in the basic plan in cooperation with relevant ministries and agencies, and provide the Prime Minister and

relevant ministers with the follow-up, and, when necessary, its opinions as well. The Council will conduct a follow-up at the end of each year and a more detailed one at the time three years have passed since the implementation of the measures. The Council will understand related progress and, when necessary, it will change the measures in the basic plan flexibly. The Council will take appropriate measures for S&T system reforms, when necessary, to promote the progress of the measures in the basic plan.

3. Statistics

(1) Trends in R&D expenditures, etc. in Japan

1. Japan

Item / FY	Gross domestic product Trillion yen	R&D expenditures 100 Million yen	Government financed R&D expenditures 100 Million yen	Defense-related R&D expenditures 100 Million yen	A (%)	B (%)	C (%)	D (%)	Number of researchers Persons	Population 10 thousand persons
1981	261.9143	59,823.56	16,124.28	325.73	2.28	27.0	26.6	0.62	394,619	11,790
82	274.5722	65,287.00	16,661.64	364.87	2.38	25.5	25.1	0.61	407,197	11,873
83	286.2782	71,807.82	17,214.33	394.52	2.51	24.0	23.6	0.60	421,468	11,954
84	306.8093	78,939.31	17,777.80	446.07	2.57	22.5	22.1	0.58	450,083	12,031
85	327.4332	88,902.99	18,672.53	586.77	2.72	21.0	20.5	0.57	462,891	12,105
86	341.9205	91,929.32	19,553.11	661.33	2.69	21.3	20.7	0.57	489,100	12,166
87	359.5089	98,366.40	21,118.40	741.35	2.74	21.5	20.9	0.59	504,008	12,224
88	386.7361	106,275.72	21,177.81	827.00	2.75	19.9	19.3	0.55	530,495	12,275
89	414.7429	118,154.82	22,024.20	930.68	2.85	18.6	18.0	0.53	553,336	12,321
90	449.9971	130,783.15	23,465.62	1,042.68	2.91	17.9	17.3	0.52	579,552	12,361
91	472.2614	137,715.24	25,044.63	1,150.45	2.92	18.2	17.5	0.53	603,548	12,410
92	483.8375	139,094.93	26,967.17	1,269.89	2.87	19.4	18.6	0.56	620,014	12,457
93	480.6615	137,091.39	29,658.49	1,371.75	2.85	21.6	20.8	0.62	644,977	12,494
94	486.9469	135,960.30	29,181.77	1,407.88	2.79	21.5	20.6	0.60	664,855	12,527
95	495.7357	144,082.36	32,924.00	1,544.99	2.91	22.9	22.0	0.66	682,590	12,557
96	506.4795	150,793.15	31,605.51	1,652.79	2.98	21.0	20.1	0.62	698,280	12,586
97	510.4658	157,414.99	32,038.52	1,753.40	3.08	20.4	19.5	0.63	720,560	12,616
98	501.3835	161,399.25	34,984.92	1,441.76	3.22	21.7	21.0	0.70	731,017	12,647
99	496.6058	160,105.88	35,037.49	1,465.29	3.22	21.9	21.2	0.71	757,244	12,667
2000	502.7831	162,893.36	35,407.64	1,360.81	3.24	21.7	21.1	0.70	761,857	12,693
2001	492.3467	165,279.98	34,769.43	1,489.88	3.36	21.0	20.3	0.71	750,739	12,731
2002	488.7244	166,750.53	34,526.81	1,434.78	3.41	20.7	20.0	0.71	756,336	12,748
2003	493.5532	168,041.55	33,942.87	1,608.12	3.40	20.2	19.4	0.69	757,339	12,769
2004	496.1970	169,375.84	33,887.63	1,855.22	3.41	20.0	19.1	0.68	787,264	12,778
2005		—	—	—	—	—	—	—	790,932	12,776

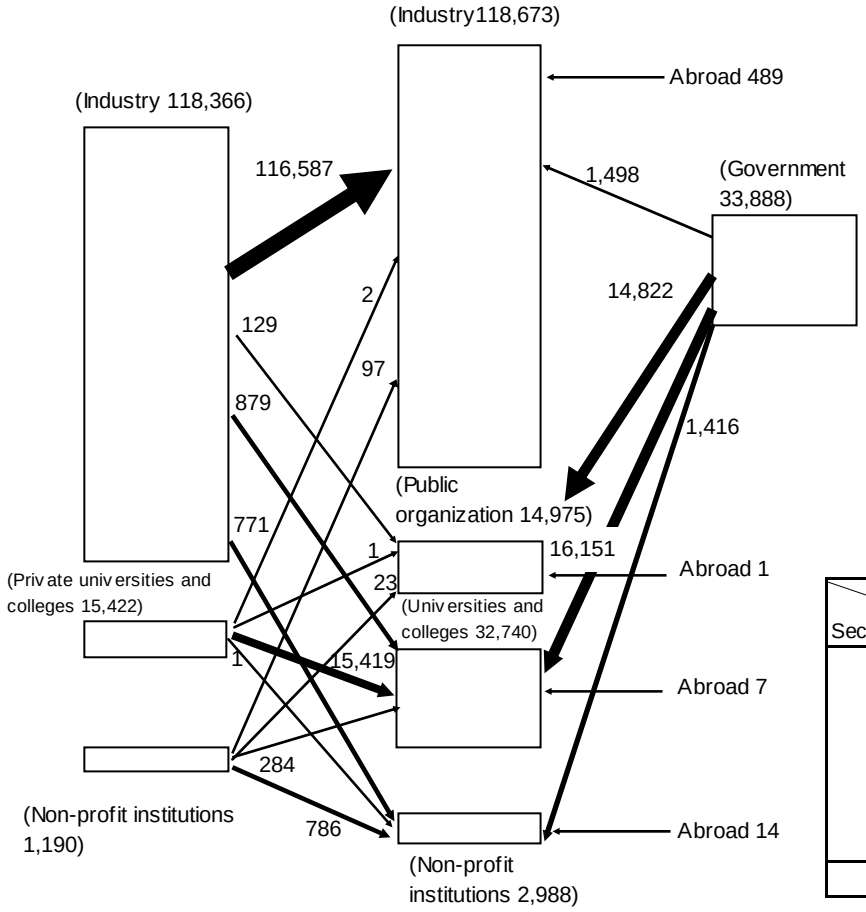
Notes: 1. A (b/a) =R&D expenditures as a percentage of gross domestic product, B (c/b) =the ratio of R&D expenditures financed by government, C ((c-d)/(b-d)) =the ratio of R&D expenditures financed by government excluding defense R&D expenditures and D (c/a) =government financed R&D expenditures as a percentage of gross domestic product.
2. R&D expenditures and the number of researchers are the total of natural sciences, social sciences and humanities.
3. The number of researchers is as of April 1 in each fiscal year, except for FY2002 and later, which are as of March 31.
4. Defense-related R&D expenditures are appropriations to the Defense Agency in the science and technology budget of the government.
5. The numbers of population are those of national censuses and estimations as of October 1.
6. Industries were added as new survey targets in FY1996 and FY2001.
7. Survey coverage categories were changed in 2001; the definition under which the number of researchers was counted up to 2001 differs from that under which it was counted in 2002.

Sources: 1. Gross domestic product: the Cabinet Office, Economic and Social Research Institute, "Annual Report on National Accounts", "Quarterly Estimates of GDP (Preliminary Report)"
2. R&D expenditures, government-financed R&D expenditures, and number of researchers: Ministry of Internal Affairs and Communications, Statistics Bureau, "Report on the Survey of Research and Development."
3. Population: "Population Census" and "Population Estimation (as of October 1 of each year)."

(2) Flow of R&D expenditures in Japan (in FY2004)

(Unit: 100 million yen)

(Financed by the private sector 134,978) (Total expenditures amount 169,376) (Financed from abroad 510) (Financed by the government 33,888)



Unit: %

Classification / Sector	Financing ratio	Performing ratio
Industry	69.9	70.1
Government	20.0	8.8
Universities and colleges	9.1	19.3
Non-profit institution	0.7	1.8
Abroad	0.3	-
Total	100	100

Notes: 1. R&D expenditures include social sciences and humanities.

2. R&D expenditures are the funds spent by research institutions themselves for research. There are two concepts of R&D expenditures on a performing basis: disbursement and cost. Japan considers R&D expenditures to be disbursements. Disbursement includes expenditures on labor, materials, tangible fixed assets, lease fee and so on. In case of cost, it computed by adding the depreciation of tangible fixed assets instead of expenditures on the tangible fixed assets.

3. Coverage of each sector is as follows:

(1) Financing sector

1) Industry: companies, public corporations and incorporated administrative agencies whose major purpose is not in research activities.

2) Government: national and local governments, national local government-owned research institutions, research-centered public corporations and incorporated administrative agencies, and national and public universities and colleges (including junior colleges)

3) Universities and colleges: private universities and colleges (including junior colleges)

4) Non-profit institutions: nonprofit private research institutions including incorporated foundations and associations, etc.

(2) Performing sector

1) Industry: coverage is the same as in the financing sector
2) Public organizations: national and local government-owned research institutions and research-centered public corporations and incorporated administrative agencies.
3) Universities and colleges: national, public and private universities and colleges.
4) Non-profit institutions: coverage is the same as in the financing sector

Source: Statistics Bureau, Ministry of Internal Affairs and Communications. "Report on the Survey of Research and Development"

(3) Trends in composition ratios of R&D expenditures by character of work in Japan

(Unit: %)

Classification / FY	Industry			Government research institutions			Universities and colleges			Private research institutions			Total		
	Basic research	Applied research	Develop-ment	Basic research	Applied research	Develop-ment	Basic research	Applied research	Develop-ment	Basic research	Applied research	Develop-ment	Basic research	Applied research	Develop-ment
1981	5.2	21.8	73.0	14.5	32.1	53.4	57.4	35.0	7.6	9.8	36.1	54.2	14.6	25.6	59.8
82	5.5	21.9	72.6	14.4	31.8	53.9	56.5	36.4	7.1	8.3	32.6	59.1	14.7	25.8	59.5
83	5.7	22.0	72.3	14.0	30.7	55.3	56.4	35.7	7.9	9.1	31.2	59.8	14.6	25.3	60.1
84	5.6	22.0	72.4	14.0	29.8	56.2	56.4	35.4	8.2	10.7	31.6	57.7	14.1	25.1	60.8
85	5.9	21.9	72.1	13.1	28.5	58.3	55.7	36.2	8.0	10.4	33.5	56.0	13.4	24.9	61.7
86	6.1	21.6	72.3	13.7	27.3	59.0	55.8	36.2	8.1	14.1	27.8	58.1	13.8	24.4	61.9
87	6.6	21.7	71.7	14.7	28.3	57.0	55.7	36.3	8.0	18.0	21.1	60.9	14.5	24.3	61.2
88	6.6	21.7	71.7	13.6	26.8	59.6	54.5	37.2	8.3	17.6	22.5	59.9	13.8	24.2	62.0
89	6.4	21.5	72.2	13.3	27.3	59.5	54.9	36.8	8.3	19.2	22.8	58.0	13.3	23.9	62.8
90	6.4	21.8	71.8	14.3	28.6	57.1	54.6	37.1	8.3	18.2	22.9	58.8	13.0	24.2	62.8
91	6.8	22.2	71.1	14.6	29.3	56.1	54.5	37.1	8.4	18.7	26.2	55.1	13.3	24.6	62.1
92	6.9	22.1	71.1	16.6	27.6	55.8	54.3	37.3	8.3	17.0	20.4	62.6	13.9	24.4	61.7
93	6.7	21.4	71.9	18.7	26.9	54.5	54.0	37.4	8.6	20.1	20.5	59.4	14.8	24.0	61.2
94	6.8	22.2	71.1	18.5	27.8	53.6	54.2	37.1	8.7	21.1	18.7	60.2	15.0	24.6	60.5
95	6.6	22.0	71.3	20.6	27.7	51.7	54.6	36.5	8.9	20.1	18.9	61.1	15.5	24.5	60.0
96	6.2	22.1	71.8	19.8	26.9	53.3	54.7	36.4	9.0	18.5	19.2	62.4	14.6	24.3	61.1
97	6.2	21.6	72.2	21.3	31.8	46.8	54.3	36.7	9.0	14.9	21.1	64.0	14.3	24.4	61.3
98	5.6	21.9	72.6	24.5	29.9	45.6	54.8	36.3	8.9	14.4	21.9	63.8	14.4	24.6	61.0
99	5.8	20.5	73.7	25.0	27.9	47.1	54.0	36.9	9.1	15.3	21.9	62.8	14.6	23.5	61.8
2000	5.8	21.3	73.0	27.6	26.8	45.7	53.6	37.3	9.1	15.7	20.5	63.8	14.7	23.9	61.4
01	5.8	20.4	73.9	30.5	24.1	45.3	53.5	37.5	9.0	19.6	37.1	43.2	14.6	23.4	62.0
02	5.9	19.5	74.6	31.0	26.9	42.1	54.0	36.4	9.6	20.1	38.9	41.1	15.0	22.8	62.2
03	6.0	19.4	74.7	30.9	30.5	38.6	55.0	36.5	8.5	18.7	39.3	42.0	15.0	23.0	62.0

Note: 1. The figures are for the composition of R&D expenditures by character of work in the natural sciences (physical science, engineering, agricultural science, and health science). Figures include institutions for the social sciences and humanities.
2. Survey coverage categories were changed in FY2001; figures for non-profit institutions up to FY2001 use the values for private research institutions.
3. Some Industries were added as new survey targets in FY1966 and FY2001

Source: Statistics Bureau, Ministry of Internal Affairs and Communications. "Report on the Survey of Research and Development"

(4) Trends in R&D expenditures by financing sector in Japan

(Unit: million yen)

Classification / FY	Total		National and local government		Private sector		Abroad	
	R&D expenditures (A)	Ratio (%)	Financing amount (B)	Ratio (%) (B/A)	Financing amount (C)	Ratio (%) (C/A)	Financing amount (D)	Ratio (%) (D/A)
1981	5,982,356	100	1,612,428	27.0	4,363,785	72.9	6,144	0.1
82	6,528,700	100	1,666,164	25.5	4,855,537	74.4	6,999	0.1
83	7,180,782	100	1,721,433	24.0	5,451,130	75.9	8,220	0.1
84	7,893,931	100	1,777,780	22.5	6,108,562	77.4	7,590	0.1
85	8,890,299	100	1,867,253	21.0	7,014,906	78.9	8,140	0.1
86	9,192,932	100	1,955,311	21.3	7,229,721	78.6	7,900	0.1
87	9,836,640	100	2,111,840	21.5	7,716,556	78.4	8,243	0.1
88	10,627,572	100	2,117,781	19.9	8,501,469	80.0	8,323	0.1
89	11,815,482	100	2,202,420	18.6	9,603,321	81.3	9,742	0.1
90	13,078,315	100	2,346,562	17.9	10,721,479	82.0	10,274	0.1
91	13,771,523	100	2,504,463	18.2	11,255,016	81.7	12,044	0.1
92	13,909,493	100	2,696,717	19.4	11,199,371	80.5	13,405	0.1
93	13,709,139	100	2,965,849	21.6	10,731,483	78.3	11,807	0.1
94	13,596,029	100	2,918,177	21.5	10,663,868	78.4	13,984	0.1
95	14,408,235	100	3,292,400	22.9	11,100,469	77.0	15,366	0.1
96	15,079,315	100	3,160,551	21.0	11,904,662	78.9	14,102	0.1
97	15,741,499	100	3,203,852	20.4	12,493,864	79.4	43,783	0.3
98	16,139,925	100	3,498,492	21.7	12,593,344	78.0	48,089	0.3
99	16,010,588	100	3,503,749	21.9	12,448,321	77.8	58,519	0.4
2000	16,289,336	100	3,540,764	21.7	12,684,198	77.9	64,374	0.4
01	16,527,998	100	3,476,943	21.0	12,986,146	78.6	64,909	0.4
02	16,675,053	100	3,452,681	20.7	13,162,679	78.9	59,694	0.4
03	16,804,155	100	3,394,287	20.2	13,363,302	79.5	46,566	0.3
04	16,937,584	100	3,388,763	20.0	13,497,794	79.7	51,028	0.3

Notes: 1. Including R&D in the social sciences and humanities.

2. Some Industries were added as new survey targets in FY1996 and FY2001.

Source: Statistics Bureau, Ministry of Internal Affairs and Communications. "Report on the Survey of Research

(5) Trends in R&D expenditures by performing sector in Japan

(Unit: million yen)

Classification / FY	Business enterprises				Non-profit institutions		Public organizations				
	Companies	Public corporations/ Incoporated administrative (a)	Total (A)	Ratio (%) (A/E)	(B)	Ratio (%) (B/E)	National	Local government owned	Public corporations/ Incorporated (b)	Total (C)	Ratio (%) (C/E)
1981	3,517,034	112,759	3,629,793	60.7	245,521	4.1	201,256	191,162	268,979	661,397	11.1
82	3,917,089	121,929	4,039,018	61.9	276,178	4.2	203,343	189,702	280,038	673,083	10.3
83	4,435,361	124,766	4,560,127	63.5	279,651	3.9	208,767	191,567	291,025	691,359	9.6
84	5,114,631	22,003	5,136,634	65.1	307,425	3.9	215,853	199,622	310,209	725,684	9.2
85	5,913,942	26,005	5,939,947	66.8	349,812	3.9	235,950	206,935	367,874	810,759	9.1
86	6,105,886	14,277	6,120,163	66.6	399,971	4.4	244,828	209,212	386,183	840,223	9.1
87	6,480,897	13,370	6,494,268	66.0	441,273	4.5	308,246	215,583	419,348	943,177	9.6
88	7,202,873	16,446	7,219,318	67.9	458,925	4.3	272,506	223,677	439,072	935,255	8.8
89	8,217,138	16,682	8,233,820	69.7	498,535	4.2	284,261	240,902	428,592	953,755	8.1
90	9,246,003	21,163	9,267,166	70.9	537,291	4.1	318,959	270,303	387,605	976,867	7.5
91	9,716,195	26,853	9,743,048	70.7	573,453	4.2	321,988	282,730	442,378	1,047,096	7.6
92	9,541,757	18,928	9,560,685	68.7	612,427	4.4	373,004	288,631	498,466	1,160,101	8.3
93	9,028,186	25,422	9,053,608	66.0	618,179	4.5	422,193	300,054	556,394	1,278,641	9.3
94	8,947,451	32,802	8,980,253	66.1	636,800	4.7	404,172	300,515	521,740	1,226,427	9.0
95	9,332,438	63,459	9,395,896	65.2	640,021	4.4	484,917	291,893	613,322	1,390,132	9.6
96	10,026,582	31,827	10,058,409	66.7	679,251	4.5	447,366	288,807	592,361	1,328,534	8.8
97	10,620,651	37,705	10,658,357	67.7	716,967	4.6	474,120	279,099	553,757	1,306,976	8.3
98	10,668,070	131,993	10,800,063	66.9	714,068	4.4	474,238	291,222	637,454	1,402,914	8.7
99	10,520,427	109,735	10,630,161	66.4	689,609	4.3	488,781	286,482	706,468	1,481,731	9.3
2000	10,766,366	93,848	10,860,215	66.7	707,069	4.3	499,508	273,139	740,986	1,513,633	9.3
01	11,364,628	86,383	11,451,011	69.3	361,570	2.2	214,302	260,076	1,007,645	1,482,024	9.0
02	11,496,855	79,985	11,576,840	69.4	332,664	2.0	202,161	249,788	1,031,261	1,483,211	8.9
03	11,704,668	54,271	11,758,939	70.0	321,968	1.9	225,382	239,553	995,205	1,460,140	8.7
04	11,847,859	19,417	11,867,276	70.1	298,796	1.8	246,374	230,978	1,020,195	1,497,546	8.8

(5) Trends in R&D expenditures by performing sector in Japan (continued)

Classification / FY	Universities and colleges					Total	
	National	Public	Private	Total (D)	Ratio (%) (D/E)	(E)	Ratio (%)
1981	643,472	72,582	729,591	1,445,645	24.2	5,982,356	100
82	675,850	75,986	788,586	1,540,422	23.6	6,528,700	100
83	711,364	78,097	860,184	1,649,646	23.0	7,180,782	100
84	749,826	81,964	892,398	1,724,187	21.8	7,893,931	100
85	756,686	88,645	944,449	1,789,780	20.1	8,890,299	100
86	786,462	90,608	955,505	1,832,575	19.9	9,192,932	100
87	843,900	96,756	1,017,264	1,957,921	19.9	9,836,640	100
88	860,678	97,888	1,055,508	2,014,073	19.0	10,627,572	100
89	899,221	114,331	1,115,819	2,129,372	18.0	11,815,482	100
90	961,724	126,936	1,208,331	2,296,992	17.6	13,078,315	100
91	1,001,800	124,153	1,281,974	2,407,927	17.5	13,771,524	100
92	1,077,675	138,430	1,360,176	2,576,281	18.5	13,909,493	100
93	1,191,676	144,959	1,422,077	2,758,712	20.1	13,709,139	100
94	1,163,036	160,477	1,429,038	2,752,551	20.2	13,596,030	100
95	1,311,399	177,474	1,493,313	2,982,187	20.7	14,408,236	100
96	1,296,359	173,288	1,543,474	3,013,120	20.0	15,079,315	100
97	1,300,615	182,796	1,575,788	3,059,199	19.4	15,741,499	100
98	1,406,556	184,576	1,631,747	3,222,879	20.0	16,139,925	100
99	1,395,167	184,088	1,629,831	3,209,086	20.0	16,010,588	100
2000	1,385,637	188,106	1,634,675	3,208,418	19.7	16,289,336	100
01	1,390,794	186,617	1,655,980	3,233,392	19.6	16,527,998	100
02	1,435,972	183,965	1,662,401	3,282,338	19.7	16,675,053	100
03	1,410,545	181,350	1,671,214	3,263,109	19.4	16,804,155	100
04	1,367,747	188,409	1,717,810	3,273,966	19.3	16,937,584	100

Notes: 1. Figures include the social sciences and humanities.
2. Survey coverage categories were changed in FY2001; figures for non-profit institutions up to FY2000 use the values for private research institutions.
3. Until FY2000, public corporations and independent administrative institutions (a) were those which were operated on a self-paying basis. Since FY2001, they indicate those whose main productive activities are classified into “Industries” in the input-output table.
4. Until FY2000, public corporations and independent administrative institutions (b) were those which were not expected to operate on a self-paying basis. Since FY2001, they indicate those whose purpose is to carry out examinations and research on scientific technologies.
5. Some Industries were added as new survey targets in FY1996 and FY2001.

Source: Statistics Bureau, Ministry of Internal Affairs and Communications. "Report on the Survey of Research and Development"

(6) Trends in composition ratios of R&D expenditures by constituent elements in Japan

(Unit: million yen)

FY/Organization \ Expense item		Total amount of R&D expenditures	Labor cost		Material cost		Expenditure on tangible fixed assets		Lease fee		Other expenses	
				Ratio (%)		Ratio (%)		Ratio (%)		Ratio (%)		Ratio (%)
1987	Total	9,836,640	4,408,202	44.8	1,649,009	16.8	1,699,734	17.3	…	…	2,079,695	21.1
88	Total	10,627,572	4,751,744	44.7	1,865,427	17.6	1,684,476	15.9	…	…	2,325,925	21.9
89	Total	11,815,482	5,157,612	43.7	2,122,497	18.0	1,898,230	16.1	…	…	2,637,144	22.3
90	Total	13,078,315	5,666,706	43.3	2,399,308	18.3	2,054,560	15.7	…	…	2,957,740	22.6
91	Total	13,771,524	5,956,397	43.3	2,403,971	17.5	2,149,488	15.6	…	…	3,261,668	23.7
92	Total	13,909,493	6,236,450	44.8	2,322,072	16.7	1,952,988	14.0	…	…	3,397,984	24.4
93	Total	13,709,139	6,357,527	46.4	2,147,058	15.7	1,910,782	13.9	…	…	3,293,772	24.0
94	Total	13,596,030	6,498,958	47.8	2,162,027	15.9	1,706,059	12.5	…	…	3,228,986	23.7
95	Total	14,408,236	6,719,897	44.0	2,304,175	17.3	1,970,607	14.2	…	…	3,413,557	24.5
96	Total	15,079,315	6,987,518	46.3	2,560,417	17.0	1,868,326	12.4	…	…	3,663,055	24.3
97	Total	15,741,499	7,209,396	45.8	2,694,767	17.1	1,897,202	12.1	…	…	3,940,134	25.0
98	Total	16,139,925	7,415,988	45.9	2,649,973	16.4	1,938,341	12.0	…	…	4,135,623	25.6
99	Total	16,010,588	7,371,720	46.0	2,680,753	16.7	1,864,370	11.6	…	…	4,093,745	25.6
	Business enterprises	10,630,161	4,627,391	43.5	2,088,392	19.6	987,000	9.3	…	…	2,927,379	27.5
	Government research institutions	1,481,731	439,590	29.7	199,779	13.5	408,900	27.6	…	…	433,462	29.3
	Universities and colleges	3,209,086	2,086,089	65.0	219,074	6.8	409,563	12.8	…	…	494,360	15.4
	Privateresearch institutions	689,609	218,649	31.7	173,508	25.2	58,907	8.5	…	…	238,545	34.6
2000	Total	16,289,336	7,312,424	44.9	2,758,692	16.9	1,885,601	11.6	…	…	4,332,619	26.6
	Business enterprises	10,860,216	4,532,255	41.7	2,153,595	19.8	1,051,243	9.7	…	…	3,123,123	28.8
	Government research institutions	1,513,633	447,804	29.6	200,780	13.3	398,020	26.3	…	…	467,029	30.9
	Universities and colleges	3,208,418	2,105,484	65.6	216,542	6.7	375,125	11.7	…	…	511,267	15.9
	Private research institutions	707,069	226,880	32.1	187,776	26.6	61,213	8.7	…	…	231,200	32.7
01	Total	16,527,998	7,407,835	44.8	2,861,584	17.3	1,806,677	10.9	166,882	1.0	4,285,019	25.9
	Business enterprises	11,451,011	4,731,473	41.3	2,379,628	20.8	1,035,594	9.0	105,165	0.9	3,199,151	27.9
	Public organizations	1,482,024	462,892	31.2	207,974	14.0	353,399	23.8	16,497	1.1	441,261	29.8
	Universities and colleges	3,233,392	2,109,802	65.3	217,515	6.7	371,196	11.5	40,449	1.3	494,430	15.3
	Non-profit institutions	361,570	103,667	28.7	56,468	15.6	46,488	12.9	4,771	1.3	150,176	41.5
02	Total	16,675,053	7,399,615	44.4	2,750,181	16.5	1,752,587	10.5	177,221	1.1	4,595,450	27.6
	Business enterprises	11,576,840	4,745,939	41.0	2,270,648	19.6	970,294	8.4	113,827	1.0	3,476,132	30.0
	Public organizations	1,483,211	452,855	30.5	204,258	13.8	355,305	24.0	17,248	1.2	453,515	30.6
	Universities and colleges	3,282,338	2,100,077	64.0	229,670	7.0	381,533	11.6	42,318	1.3	528,740	16.1
	Non-profit institutions	332,664	100,713	30.3	45,604	13.7	45,454	13.7	3,828	1.2	106,676	32.1
03	Total	16,804,155	7,631,443	45.4	2,785,558	16.6	1,737,555	10.3	180,797	1.1	4,468,803	26.6
	Business enterprises	11,758,939	4,990,754	42.4	2,249,712	19.1	1,005,455	8.6	118,282	1.0	3,394,736	28.9
	Public organizations	1,460,139	447,368	30.6	263,474	18.0	321,307	22.0	18,086	1.2	409,903	28.1
	Universities and colleges	3,263,109	2,094,863	64.2	231,849	7.1	361,709	11.1	41,354	1.3	533,334	16.3
	Non-profit institutions	321,968	98,458	30.6	40,523	12.6	49,084	15.2	3,074	1.0	130,829	40.6
04	Total	16,937,584	7,611,525	44.9	2,816,867	16.6	1,562,737	9.2	178,354	1.1	4,768,100	28.2
	Business enterprises	11,867,276	4,897,412	41.3	2,313,775	19.5	957,187	8.1	111,639	0.9	3,587,263	30.2
	Public organizations	1,497,546	463,874	31.0	261,638	17.5	244,865	16.4	18,368	1.2	508,802	34.0
	Universities and colleges	3,273,966	2,158,580	65.9	208,327	6.4	316,491	9.7	43,773	1.3	546,794	16.7
	Non-profit institutions	298,796	91,659	30.7	33,127	11.1	44,194	14.8	4,575	1.5	125,241	41.9

Notes: 1. Figures includes the social sciences and humanities.
2. Survey coverage categories were changed in FY2001; figures for non-profit institutions up to FY2000 use the values for private research institutions.
3. Lease fee was added as an expenditure in FY2001.

Source: Statistics Bureau, Ministry of Internal Affairs and Communications. "Report on the Survey of Research and Development"

(7) Trends in number of personnel engaged in R&D activities in Japan

(Unit: person)

Classification / Year	Number of R&D	Personnel engaged in R&D activities		Researchers		Assistant research workers		Technicians		Clerical and other supporting personnel	
1981	19,447	644,386	100	394,619	61.2	83,657	13.0	90,426	14.0	75,684	11.7
82	18,642	663,549	100	407,197	61.4	87,329	13.2	91,169	13.7	77,854	11.7
83	20,838	684,365	100	421,468	61.6	90,103	13.2	93,326	13.6	79,468	11.6
84	18,137	725,615	100	450,083	62.0	96,272	13.3	97,074	13.4	82,186	11.3
85	17,755	745,604	100	462,891	62.1	100,530	13.5	99,280	13.3	82,903	11.1
86	16,987	777,454	100	489,100	62.9	101,996	13.1	101,861	13.1	84,497	10.9
87	17,681	794,730	100	504,008	63.4	102,901	12.9	102,486	12.9	85,335	10.7
88	18,303	821,061	100	530,495	64.6	101,587	12.4	102,950	12.5	86,029	10.5
89	18,316	849,183	100	553,336	65.2	101,809	12.0	105,430	12.4	88,608	10.4
90	17,497	882,658	100	579,552	65.7	106,117	12.0	104,190	11.8	92,799	10.5
91	17,823	920,019	100	603,548	65.6	106,179	11.5	113,562	12.3	96,730	10.5
92	18,144	931,732	100	620,014	66.5	107,013	11.5	108,014	11.6	96,691	10.4
93	16,057	962,050	100	644,977	67.0	107,001	11.1	108,120	11.2	101,952	10.6
94	16,997	971,227	100	664,855	68.5	99,152	10.2	103,400	10.6	103,820	10.7
95	18,835	969,547	100	682,590	70.4	90,072	9.3	98,142	10.1	98,743	10.2
96	19,028	972,447	100	697,780	71.8	82,851	8.5	94,788	9.7	97,028	10.0
97	21,878	994,978	100	720,560	72.4	83,906	8.4	93,892	9.4	96,620	9.7
98	24,931	999,578	100	731,017	73.1	83,539	8.4	89,104	8.9	95,918	9.6
99	23,607	1,029,968	100	757,244	73.5	86,822	8.4	91,852	8.9	94,050	9.1
2000	27,061	1,022,079	100	761,857	74.5	84,527	8.3	84,441	8.3	91,254	8.9
01	22,056	1,000,014	100	750,739	75.1	78,951	7.9	81,157	8.1	89,167	8.9
02	18,468	972,495	100	756,336	77.8	68,754	7.1	67,138	6.9	80,267	8.3
03	29,663	968,092	100	757,339	78.2	67,040	6.9	65,143	6.7	78,570	8.1
04	28,608	994,348	100	787,264	79.2	67,389	6.8	62,450	6.3	77,245	7.8
05	—	1,009,937	100	790,932	78.3	73,106	7.2	67,582	6.7	78,317	7.8

Notes: 1. The number of researchers includes those in the social sciences and humanities, and is as of April 1 of each year, except for FY2002 and later, which are as of March 31.
2. The number of R&D performing institutions is the figure for each year in question.
3. Survey categories were changed in 2002; numbers up to 2001 are for researchers whose primary duty is research (except at universities and colleges, where the number includes those who conduct research as an additional post).
4. Industries were added as new survey targets in 1997 and 2002.

Source: Statistics Bureau, Ministry of Internal Affairs and Communications. "Report on the Survey of Research and Development"

(8) Trends in number of researchers by sector in Japan

(Unit: person)

Classification / Year	Business enterprises				Non-profit institutions		Public organizations				
	Companies	Public corporations/ Incorporated administrative agencies (a)	Total (A)	Ratio (%) (A/E)	(B)	Ratio (%) (B/E)	National	Local government owned	corporations/ Incorporated administrative agencies (b)	Total (C)	Ratio (%) (C/E)
1981	181,892	2,997	184,889	47.4	4,861.0	1.2	10,706	15,497	2,589	28,792	7.4
82	189,952	2,990	192,942	48.3	7,408.0	1.8	10,704	15,655	2,652	29,011	7.3
83	198,132	3,005	201,137	48.4	5,971.0	1.4	10,795	15,269	2,767	28,831	6.9
84	220,835	3,047	223,882	50.5	6,856.0	1.5	10,777	15,287	2,697	28,761	6.5
85	230,445	652	231,097	50.7	7,198.0	1.6	10,641	15,464	2,713	28,818	6.3
86	251,138	633	251,771	52.3	7,565.0	1.5	10,770	15,340	2,780	28,890	6.0
87	260,457	389	260,846	52.6	8,427.0	1.7	10,697	15,294	2,918	28,909	5.8
88	278,904	394	279,298	53.6	9,632.0	1.8	10,766	15,004	3,139	28,909	5.6
89	293,789	413	294,202	54.2	10,788.0	1.9	10,899	15,215	3,174	29,288	5.4
90	313,527	421	313,948	55.3	11,497.0	2.0	10,864	15,094	3,364	29,322	5.2
91	330,573	423	330,996	56.0	12,405.0	2.1	10,895	15,107	3,514	29,516	5.0
92	340,387	422	340,809	56.2	13,459.0	2.2	10,943	15,037	3,623	29,603	4.9
93	355,957	449	356,406	56.5	14,104.0	2.2	11,096	15,048	3,750	29,894	4.7
94	366,845	433	367,278	56.5	14,734.0	2.2	11,210	14,862	3,835	29,907	4.6
95	376,179	460	376,639	56.5	16,262.0	2.4	11,223	14,957	4,083	30,263	4.5
96	383,565	535	384,100	56.3	16,113.0	2.3	11,243	14,936	4,167	30,346	4.5
97	399,859	502	400,361	56.9	16,746.0	2.3	11,370	14,698	4,173	30,241	4.3
98	403,737	495	404,232	56.6	16,905.0	2.3	11,412	14,347	4,453	30,212	4.2
99	428,693	502	429,195	57.9	16,113.0	2.1	11,471	14,576	4,863	30,910	4.2
2000	433,256	502	433,758	58.1	15,747.0	2.1	11,373	14,678	4,936	30,987	4.2
01	420,881	482	421,363	57.3	15,865.0	2.1	11,463	14,661	5,104	31,228	4.2
02	429,981	707	430,688	57.8	11,188.0	1.5	3,473	14,853	15,424	33,750	4.5
03	430,493	697	431,190	57.8	10,954.0	1.4	3,264	14,492	16,135	33,891	4.5
04	458,271	574	458,845	58.3	10,378.0	1.3	3,235	13,989	16,487	33,711	4.3
05	455,365	503	455,868	57.6	10,023.0	1.3	3,373	13,630	16,891	33,894	4.3

(8) Trends in number of researchers by sector in Japan (continued)

Classification / Year	Universities and colleges					Total	
	National	Public	Rrivate	Total (D)	Ratio (%) (D/E)	(E)	Ratio (%)
1981	77,635	12,358	86,084	176,077	45.2	389,758	100
82	79,346	12,291	86,199	177,836	44.5	399,789	100
83	82,588	14,124	88,817	185,529	44.7	415,497	100
84	85,179	14,139	91,266	190,584	43.0	443,227	100
85	87,061	14,658	94,059	195,778	43.0	455,693	100
86	89,139	14,924	96,811	200,874	41.7	481,535	100
87	91,078	15,281	99,467	205,826	41.5	495,581	100
88	93,823	15,447	103,386	212,656	40.8	520,863	100
89	95,749	16,099	107,210	219,058	40.4	542,548	100
90	98,190	16,292	110,303	224,785	39.6	568,055	100
91	99,764	16,879	113,988	230,631	39.0	591,143	100
92	102,118	16,801	117,224	236,143	38.9	606,555	100
93	107,175	17,554	119,844	244,573	38.8	630,873	100
94	111,608	18,434	122,894	252,936	38.9	650,121	100
95	114,629	19,479	125,318	259,426	38.9	666,328	100
96	119,210	20,206	127,805	267,221	39.2	681,667	100
97	122,858	21,104	129,250	273,212	38.8	703,814	100
98	125,386	21,737	132,545	279,668	39.2	714,112	100
99	125,955	21,749	133,322	281,026	37.9	741,131	100
2000	125,796	22,090	133,479	281,365	37.7	746,110	100
01	126,749	21,974	133,560	282,283	38.4	734,874	100
02	126,673	21,978	132,059	280,710	37.7	745,148	100
03	128,159	22,217	130,928	281,304	37.7	746,385	100
04	131,081	21,963	131,286	284,330	36.1	787,264	100
05	133,989	22,266	134,892	291,147	36.8	790,932	100

Notes: 1. The number of researchers includes those in the social sciences and humanities, and is as of April 1 of each year, except for 2002 and later, which are as of March 31.
2. Survey coverage categories were changed in 2002; figures for nonprofit organizations up to 2001 use the values for private research institutions.
3. Numbers up to 2001 are for researchers whose primary duty is research (except at universities and colleges, where the number includes those who conduct research as an additional post).
4. Until FY2000, public corporations and independent administrative institutions (a) were those which were operated on a self-paying basis. Since FY2001, they indicate those whose main productive activities are classified into “Industries” in the input-output table.
5. Until FY2000, public corporations and independent administrative institutions (b) were those which were not expected to operate on a self-paying basis. Since FY2001, they indicate those whose purpose is to carry out examinations and research on scientific technologies.
6. Some Industries were added as new survey targets in 1997 and 2002.

Source: Statistics Bureau, Ministry of Internal Affairs and Communications. "Report on the Survey of Research and Development"

(9) R&D expenditures and number of researchers of companies, etc. by industry in Japan (FY2004)

Industry	Number of companies, etc. conducting research activities	Number of employees of companies, etc. conducting R&D activities	Number of researchers	R&D expenditures performed	R&D expenditures per researcher	Number of researchers per 10-thousand employees
	(companies)	(persons)	(persons)	(million yen)	(10 thousand yen)	(persons)
All industries	24,290	5,942,174	455,868	11,867,276	2,603	767
Agriculture, forestry and fisheries	17	8,111	190	4,900	2,579	234
Mining	17	8,011	437	14,150	3,238	545
Construction	1,820	369,588	5,403	123,288	2,282	146
Manufacturing	17,481	4,184,560	399,601	10,388,353	2,600	955
Food	1,332	427,232	12,706	281,784	2,218	297
Textile mill products	156	49,439	2,189	38,409	1,755	443
Pulp and paper	80	44,387	2,333	50,802	2,178	526
Printing	249	49,745	1,653	35,857	2,169	332
Drugs and medicines	670	195,646	20,836	906,749	4,352	1,065
Chemical products	1,440	278,605	35,188	831,287	2,362	1,263
Industrial chemicals and chemical fibers	495	141,236	17,183	479,917	2,793	1,217
Oils and paints	438	53,972	8,061	135,874	1,686	1,494
Other chemical products	507	83,396	9,945	215,497	2,167	1,193
Petroleum and coal	97	26,181	1,723	43,762	2,540	658
Plastic products	487	105,771	5,246	118,477	2,258	496
Rubber products	229	84,312	7,090	166,862	2,353	841
Ceramics	917	120,016	6,221	129,138	2,076	518
Iron and steel	216	123,242	4,607	135,087	2,932	374
Non-ferrous metals and products	132	72,645	5,476	139,773	2,552	754
Fabricated metal products	2,888	219,352	6,877	100,528	1,462	314
General machinery	2,388	478,534	42,907	991,033	2,310	897
Electrical machinery, equipment and supplies	1,966	401,962	45,578	1,009,382	2,215	1,134
Electronic and electric measuring instruments	853	89,624	15,053	265,532	1,764	1,680
Other electrical machinery equipment and supplies	1,113	312,338	30,525	743,850	2,437	977
Information and communication electronics equipment	1,242	380,263	85,756	2,099,408	2,448	2,255
Electronic parts and devices	1,205	285,438	33,624	679,007	2,019	1,178
Transportation	398	544,588	48,390	1,928,102	3,985	889
Motor vehicles	340	497,061	45,220	1,878,686	4,155	910
Other transportation equipment	58	47,527	3,170	49,416	1,559	667
Precision machinery	771	157,114	20,539	534,853	2,604	1,307
Other manufacturing	617	140,087	10,659	168,052	1,577	761
Electricity, gas, heat supply and water	44	167,771	1,947	67,871	3,486	116
Information and communications	2,756	661,485	28,872	613,722	2,126	436
Software and information processing	2,255	281,328	22,197	293,463	1,322	789
Communications	42	334,171	5,508	299,928	5,445	165
Broadcasting	14	19,627	317	13,603	4,291	162
Newspaper, publishers and other data processing	444	26,360	850	6,727	791	322
Transport	26	229,251	582	24,832	4,267	25
Wholesale trade	1,426	114,198	2,256	29,134	1,291	198
Finance and insurance	11	39,935	233	3,514	1,508	58
Services	693	159,264	16,347	597,513	3,655	1,026
Professional services	431	47,906	2,693	41,678	1,548	562
Scientific research institutes	224	24,888	13,292	550,533	4,142	5,341
Other business services	38	86,470	363	5,302	1,461	42

Notes: The number of companies conducting research activities is the number of companies that conducted research activities in FY2004. The number of researchers is as of March 31, 2005.

Source: Statistics Bureau, Ministry of Internal Affairs and Communications. "Report on the Survey of Research and Development"

(10) Trends in ratio of company R&D expenditures to sales figures in Japan

(Unit: %)

Industry \ FY	1997	98	99	2000	01
All industries	2.85	3.14	3.06	3.01	3.29
Agriculture, forestry and fisheries	0.53	0.63	0.59	0.58	0.54
Mining	1.15	1.58	1.20	0.99	1.24
Construction	0.39	0.43	0.58	0.48	0.42
Manufacturing	3.67	3.89	3.68	3.70	4.03
Food	1.00	1.05	0.93	1.01	0.96
Textiles	1.77	1.59	2.17	2.17	1.87
Pulp and paper products	0.92	1.12	1.06	0.98	1.09
Printing and publishing	1.06	1.13	1.24	1.14	1.07
Chemicals	5.24	5.49	5.37	5.36	5.73
Industrial chemicals and chemical fibers	3.87	4.25	3.99	3.64	4.07
Oils and paints	4.57	4.25	4.47	4.43	4.71
Drugs and medicines	8.06	8.07	8.07	8.60	8.52
Other chemicals	5.30	5.36	4.99	5.11	5.07
Petroleum and coal products	0.49	0.48	0.32	0.24	0.26
Plastic products	2.24	2.32	2.17	2.38	2.83
Rubber products	3.37	3.19	4.09	3.64	4.02
Ceramics	2.93	2.96	2.35	2.48	2.84
Iron and steel	1.92	2.01	1.88	1.64	1.67
Non-ferrous metals and products	2.44	2.45	2.43	2.37	2.49
Fabricated metal products	1.46	1.52	1.41	1.70	1.49
General machinery	3.41	3.76	3.96	3.93	4.16
Electrical machinery	6.05	6.32	5.75	5.65	6.83
Electrical machinery, equipment and supplies	6.13	6.08	5.90	5.64	6.21
Communication and electrical equipment	6.01	6.43	5.69	5.65	7.09
Transport equipment	3.97	4.12	3.95	3.90	4.25
Motor vehicles	4.20	4.35	4.12	4.09	4.44
Other transport equipment	2.90	3.03	3.09	2.86	3.15
Precision instruments	6.28	6.33	6.83	6.34	6.58
Other manufacturing	1.70	1.84	1.66	1.70	1.79
Transport communication and public utility	0.91	0.80	1.11	1.15	1.14
Wholesale trade	-	-	-	-	0.35
Software data processing	7.84	10.08	8.35	5.79	3.69
Professional services	-	-	-	-	1.29
Miscellaneous business services	-	-	-	-	0.77
Scientific research institutions	-	-	-	-	75.59

(Unit: %)

Industry \ FY	2002	03	04
All industries	3.06	2.98	3.11
Agriculture, forestry and fisheries	0.53	0.74	0.70
Mining	0.93	0.93	1.27
Construction	0.39	0.42	0.40
Manufacturing	3.99	3.71	3.87
Food	1.08	1.06	1.11
Textile mill products	2.25	1.70	1.88
Pulp and paper	1.16	1.16	1.28
Printing	1.35	1.26	1.23
Drugs and medicines	8.91	8.43	8.64
Chemical products	3.59	4.13	4.08
Industrial chemicals and chemical fibers	3.90	3.66	3.75
Oils and paints	4.13	4.34	4.16
Other chemical products	2.95	5.13	5.00
Petroleum and coal	0.23	0.23	0.24
Plastic products	2.44	2.47	2.27
Rubber products	4.20	4.34	4.33
Ceramics	2.52	2.30	2.28
Iron and steel	1.50	1.45	1.32
Non-ferrous metals and products	2.45	2.13	2.20
Fabricated metal products	1.39	1.25	1.45
General machinery	4.43	4.12	4.08
Electrical machinery, equipment and supplies	5.20	5.05	4.97
Electronic and electric measuring instruments	4.98	5.14	5.10
Other electrical machinery equipment and supplies	5.26	5.02	4.92
Information and communication electronics equipment	7.43	6.75	6.80
Electronic parts and devices	5.13	3.88	4.65
Transportation	4.35	4.40	4.56
Motor vehicles	4.56	4.63	4.80
Other transportation equipment	1.87	1.69	1.55
Precision machinery	7.77	6.26	7.44
Other manufacturing	1.82	2.14	2.58
Electricity, gas, heat supply and water	0.44	0.41	0.37
Information and communications	1.97	2.08	2.29
Software and information processing	2.41	3.13	4.09
Communications	1.97	1.85	1.82
Broadcasting	0.17	0.17	0.13
Newspaper, publishers and other data processing	1.07	0.79	0.59
Transport	0.29	0.24	0.27
Wholesale trade	0.19	0.29	0.12
Services	13.20	20.44	19.23
Professional services	0.81	1.05	3.25
Scientific research institutes	84.41	85.93	80.66
Other business services	0.80	0.89	0.46

Notes: 1. Figures are the ratios of individual company R&D expenditures to sales amounts.
2. Figures are for companies only, excluding public corporations, incorporated administrative agencies and finance and insurance.
3. Some industries were added as new survey targets in FY1996 and FY2001.
4. Information processing is not included in the "software and information processing" category up to FY2000.
5. Industrial classification has been changed since FY2002.

Source: Statistics Bureau, Ministry of Internal Affairs and Communications. "Report on the Survey of Research and Development"

(11) Trends in Japan's technology trade amounts

(Unit: 100 million yen)

Classification / Year	Export (A)	Import (B)	Ratio (A/B)
1981	1,063	3,775	0.28
82	1,392	4,369	0.32
83	1,351	4,707	0.29
84	1,651	5,401	0.31
85	1,724	5,631	0.31
86	1,527	5,454	0.28
87	1,870	5,515	0.34
88	2,099	6,429	0.33
89	2,782	7,347	0.38
90	3,590	8,744	0.41
91	3,860	8,135	0.47
92	3,875	9,106	0.43
93	4,296	7,998	0.54
94	5,294	8,476	0.62
95	5,668	8,881	0.64
96	7,257	10,684	0.68
97	8,839	11,634	0.76
98	9,659	11,706	0.83
99	9,310	11,213	0.83
2000	11,024	11,863	0.93
01	12,689	13,490	0.94
02	13,907	13,705	1.01
03	14,388	12,893	1.12
04	17,717	15,248	1.16

Notes: 1. Figures are values in each calendar year.
2. Method of figuring out has been changed since January 1996. Figures prior to 1991 have been revised based on the new method.

Source: The Bank of Japan. "Balance of Payments Monthly"

(12) Trends in technology trade amounts by industry in Japan

(1) Technology export amounts

(Unit: million yen)

Industry \ Fiscal year	1994	95	96	97	98	99	2000	01	02	03	04	Composition ratio (%)	Ratio to the previous year	Percentage of receipts to R&D expenditures (%)
All industries	462,128	562,077	703,033	831,563	916,098	960,800	1,057,853	1,246,814	1,386,769	1,512,189	1,769,428	100	1.17	23.1
Construction	7,820	3,063	13,251	3,274	2,398	434	3,779	667	719	1,424	1,035	0.1	0.73	8.7
Manufacturing	452,585	556,414	686,629	824,476	908,200	955,450	1,047,860	1,213,310	1,367,092	1,490,356	1,742,216	98.5	1.17	23.4
Food	9,096	10,564	8,924	8,830	8,851	10,519	10,579	12,649	17,694	15,338	16,381	0.9	1.07	15.5
Textile mill products	3,635	4,396	22,384	5,284	3,651	3,851	2,362	2,663	2,535	1,473	1,854	0.1	1.26	8.0
Drugs and medicines	–	–	–	–	–	–	–	–	142,212	135,912	182,803	10.3	1.35	29.5
Chemical products	64,113	72,064	95,089	106,755	122,769	144,992	130,517	156,263	56,524	54,573	60,269	3.4	1.10	11.1
Ceramics	10,495	11,658	11,836	13,717	13,129	11,604	11,550	11,974	14,079	11,398	14,292	0.8	1.25	20.0
Iron and steel	12,845	16,923	20,940	15,319	11,932	11,544	13,436	9,601	9,570	6,598	8,114	0.5	1.23	7.2
Non-ferrous metals and products	4,418	4,315	5,149	5,738	6,252	5,538	5,728	4,863	8,015	7,688	16,765	0.9	2.18	20.1
Fabricated metal products	3,154	3,690	20,035	3,295	6,715	3,053	2,286	4,035	2,304	2,221	3,366	0.2	1.52	12.1
General machinery	20,262	22,081	22,444	29,727	31,616	29,377	35,275	50,347	45,946	53,766	88,655	5.0	1.65	16.9
Electrical machinery	140,477	215,022	233,257	246,008	237,757	204,473	211,358	239,886	–	–	–	–	–	–
Electrical machinery, equipment and supplies	–	–	–	–	–	–	–	–	45,448	55,408	66,225	3.7	1.20	10.3
Information and communication electronics equipment	–	–	–	–	–	–	–	–	135,954	145,051	186,436	10.5	1.29	10.4
Electronic parts and devices	–	–	–	–	–	–	–	–	61,157	51,060	51,438	2.9	1.01	13.3
Transportation	164,234	163,975	211,049	350,947	435,717	500,018	588,961	675,545	771,384	893,159	967,314	54.7	1.08	54.8
Precision machinery	5,633	8,467	10,397	8,890	8,426	9,262	7,729	13,523	11,141	5,999	23,489	1.3	3.92	5.8
Other manufacturing	14,223	23,259	25,125	29,966	21,385	21,219	28,079	31,960	43,129	50,712	54,815	3.1	1.08	16.3
Other	1,723	2,600	3,153	3,813	5,500	4,916	6,214	32,837	18,958	20,409	26,177	1.5	1.28	12.3

(2) Technology import amounts

(Unit: million yen)

Industry \ Fiscal year	1994	95	96	97	98	99	2000	01	02	03	04	Composition ratio (%)	Ratio to the previous year	Percentage of receipts to R&D expenditures (%)
All industries	370,693	391,715	451,169	438,400	430,054	410,296	443,287	548,379	541,713	563,764	567,643	100	1.01	7.9
Construction	936	1,310	528	1,224	557	648	371	411	1,188	2,081	1,103	0.2	0.53	3.0
Manufacturing	367,843	388,257	439,097	430,420	406,251	388,068	423,002	488,708	473,294	486,439	496,869	87.5	1.02	7.0
Food	8,511	7,949	8,678	8,731	7,484	9,655	16,335	17,445	18,955	6,948	7,254	1.3	1.04	8.3
Textile mill products	7,829	8,087	10,561	6,889	4,849	4,050	4,450	3,585	2,045	1,931	1,878	0.3	0.97	17.7
Drugs and medicines	–	–	–	–	–	–	–	–	41,684	36,460	33,520	5.9	0.92	6.7
Chemical products	59,043	66,166	69,803	67,297	71,677	66,876	65,191	89,875	26,345	27,952	29,206	5.1	1.04	5.7
Ceramics	2,290	1,767	3,538	3,923	9,170	5,103	5,806	8,156	972	715	1,104	0.2	1.54	1.5
Iron and steel	2,342	4,187	3,020	5,210	4,880	2,419	2,269	2,242	2,013	804	1,009	0.2	1.25	1.0
Non-ferrous metals and products	2,707	4,084	4,629	15,701	3,694	3,227	5,823	44,132	41,158	54,403	26,544	4.7	0.49	31.6
Fabricated metal products	1,680	1,973	1,664	1,406	1,741	1,077	558	1,848	2,007	712	1,212	0.2	1.70	4.2
General machinery	23,270	21,066	23,295	21,932	23,581	28,775	38,841	30,615	49,485	53,669	67,989	12.0	1.27	13.7
Electrical machinery	177,382	199,746	222,324	218,942	204,999	202,274	216,367	223,006	–	–	–	–	–	–
Electrical machinery, equipment and supplies	–	–	–	–	–	–	–	–	33,761	31,357	40,751	7.2	1.30	6.2
Information and communication electronics equipment	–	–	–	–	–	–	–	–	151,645	151,130	189,146	33.3	1.25	9.9
Electronic parts and devices	–	–	–	–	–	–	–	–	45,626	50,726	33,680	5.9	0.66	7.8
Transportation	35,630	32,525	42,534	34,792	36,165	33,921	34,616	36,979	25,612	26,033	21,300	3.8	0.82	1.4
Precision machinery	10,618	11,911	12,836	15,085	9,742	6,759	7,731	14,354	12,749	18,846	23,798	4.2	1.26	6.0
Other manufacturing	36,541	28,796	36,215	30,512	28,269	23,932	25,015	16,471	19,237	24,753	18,478	3.3	0.75	6.6
Other	1,914	2,148	11,544	6,756	23,246	21,580	19,914	59,260	67,231	75,244	69,671	12.3	0.93	98.0

Notes: 1. "Other" is the value of total industry exports and imports minus the value of the manufacturing industry and construction industry exports and imports.
2. Some industries were added as new survey targets in FY1996 and FY2001.
3. Industrial classification has been changed since FY2002. The ratio to the previous year for chemicals is compared to the total for drugs and medicines and chemical products for FY2002 and to chemicals for 2001.

Source: Statistics Bureau, Ministry of Internal Affairs and Communications. "Report on the Survey of Research and Development"

(13) Trends in technology trade amounts of Japan by region and country

(1) Technology export amounts

(Unit: 100 million yen)

FY / Region and country	1994	95	96	97	98	99	2000	01	02	03	04	Composition ratio (%)	Ratio to the previous year
Asia (excluding West Asia)	2,140.68	2,807.44	3,435.06	2,851.09	2,513.26	2,490.57	2,931.15	3,366.85	3,612.85	4,085.99	4,820.59	27.2	1.18
West Asia	23.14	15.34	18.58	26.45	20.74	23.04	42.56	57.58	71.77	76.63	143.34	0.8	1.87
North America	1,500.41	1,728.97	2,354.61	3,945.27	4,803.59	5,500.41	5,844.82	7,215.29	7,981.95	8,589.94	9,684.26	54.7	1.13
South America	49.52	47.80	83.10	82.83	87.00	64.17	108.99	95.00	84.75	118.19	133.53	0.8	1.13
Europe	810.04	943.37	1,070.47	1,245.95	1,550.39	1,373.80	1,480.68	1,556.08	1,933.93	2,025.52	2,625.42	14.8	1.30
Africa and Oceania	97.48	77.85	68.51	164.06	186.01	156.01	170.33	177.33	182.43	225.63	287.14	1.6	1.27
Total	4,621.27	5,620.77	7,030.33	8,315.65	9,160.99	9,608.00	10,578.53	12,468.13	13,867.69	15,121.89	17,694.28	100.0	1.17
South Korea	531	646	696	460	385	331	399	350	370	359	450	2.5	1.25
China	173	178	469	436	434	469	525	687	858	1139	1307	7.4	1.15
Taiwan	300	441	402	508	503	549	529	483	648	630	720	4.1	1.14
Indonesia	152	216	232	205	159	138	182	228	314	380	380	2.1	1.00
Thailand	362	462	513	415	304	354	547	696	652	826	1033	5.8	1.25
Singapore	265	284	408	289	251	180	211	210	176	166	251	1.4	1.51
USA	1393	1606	2082	3653	4260	4691	4805	5856	6341	6785	7754	43.8	1.14
Brazil	35	37	61	52	46	32	71	53	51	82	90	0.5	1.10
UK	442	413	459	578	753	609	660	546	717	775	984	5.6	1.27
Italy	27	49	61	61	60	50	56	69	134	129	115	0.6	0.89
Russia	2	1	1	—	—	—	2	2	2	1	13	0.1	13.98
Germany	92	139	136	137	154	159	131	190	272	206	319	1.8	1.55
France	101	148	155	144	170	159	186	239	246	266	311	1.8	1.17
Australia	53	20	19	65	104	95	90	103	109	127	182	1.0	1.43

(2) Technology import amounts

(Unit: 100 million yen)

FY / Region and country	1994	95	96	97	98	99	2000	01	02	03	04	Composition ratio (%)	Ratio to the previous year
North America	2,618.70	2,793.09	3,305.47	3,135.17	3,061.49	2,915.56	3,314.45	3,743.35	3,679.45	3,818.16	4,117.45	72.5	1.08
Europe	1,077.08	1,097.44	1,160.94	1,198.38	1,185.42	1,135.90	1,051.06	1,691.61	1,672.70	1,711.33	1,402.11	24.7	0.82
Other	11.16	26.62	45.28	50.45	53.63	51.50	67.36	48.83	64.99	108.15	156.87	2.8	1.45
Total	3,706.94	3,917.15	4,511.69	4,384.00	4,300.54	4,102.96	4,432.87	5,483.79	5,417.13	5,637.64	5,676.43	100.0	1.01
USA	2,605	2,776	3,285	3,110	3,038	2,896	3,294	3,706	3,655	3,798	4,098	72.2	1.08
UK	125	121	134	116	130	153	134	321	243	264	241	4.2	0.91
Itary	17	25	18	16	16	14	16	24	27	69	42	0.7	0.61
Netherlands	218	234	242	237	268	219	184	170	327	118	150	2.6	1.27
Switzerland	204	205	173	179	185	164	194	196	185	169	98	1.7	0.58
Germany	211	194	248	271	229	211	199	226	213	204	228	4.0	1.12
France	174	189	201	202	166	163	149	551	557	691	440	7.7	0.64

Note: Some Industries were added as new survey targets in FY1996 and FY2001.
Source: Statistics Bureau, Ministry of Internal Affairs and Communications. "Report on the Survey of Research and Development"

(14) Japan's technology trade amounts by industry and region (FY 2004)

(Unit: million yen)

Item	Export amounts							Import amounts			
	Total	Asia (excluding West Asia)	West Asia	North America	South America	Europe	Other	Total	North America	Europe	Other
All industries	1,769,428	482,059	14,334	968,426	13,353	262,542	28,714	567,643	411,745	140,211	15,687
Construction	1,035	434	-	355	-	245	-	1,103	99	995	10
Manufacturing	1,742,216	462,515	14,299	963,404	12,874	260,444	28,680	496,869	353,521	129,947	13,401
Food	16,381	5,616	-	4,018	2,109	4,549	89	7,254	5,890	1,350	14
Textile mill products	1,854	1,155	-	656	-	43	-	1,878	4	1,874	-
Pulp and paper	1,817	600	-	325	134	758	-	77	60	17	-
Printing	5,965	5,790	-	129	-	46	-	806	255	543	8
Drugs and medicines	182,803	1,207	171	117,301	9	64,114	1	33,520	13,845	19,048	627
Chemical products	60,269	33,875	215	11,866	126	13,379	809	29,206	23,489	5,657	64
Petroleum and coal	580	318	3	95	7	152	5	1,604	779	815	9
Plastic products	9,420	7,280	30	963	-	1,013	136	1,677	1,184	451	42
Rubber products	32,011	7,871	649	13,316	1,099	7,686	1,390	3,651	2,813	676	162
Ceramics	14,292	10,252	19	1,862	249	1,605	306	1,104	138	955	11
Iron and steel	8,114	5,023	259	1,135	536	932	229	1,009	775	206	28
Non-ferrous metals and products	16,765	14,295	-	1,793	5	626	46	26,544	722	25,818	4
Fabricated etal products	3,366	2,245	-	948	13	134	27	1,212	754	391	67
General machinery	88,655	31,034	19	34,057	105	22,359	82	67,989	51,330	11,171	5,489
Electrical machinery, equipment and supplies	66,225	28,261	85	30,590	345	6,122	823	40,751	33,952	6,354	445
Information and communication electronics equipment	186,436	101,383	21	50,041	621	34,181	189	189,146	148,636	35,918	4,592
Electronic parts and devices	51,438	40,967	13	8,416	108	1,929	5	33,680	29,941	2,436	1,303
Transportation	967,314	161,366	12,815	681,081	7,405	80,308	24,339	21,300	10,495	10,728	77
Precision machinery	23,489	3,306	-	2,308	3	17,872	-	23,798	19,260	4,096	442
Other manufacturing	5,020	670	-	2,507	0	1,636	206	10,644	9,204	1,444	16
Other	26,177	19,110	35	4,667	479	1,853	34	69,671	58,125	9,269	2,277

Notes: 1. "-" indicates figure is not applicable.
2. "Other" is the value of total industry exports and imports minus the value of the manufacturing industry and construction industry exports and imports.
Source: Statistics Bureau, Ministry of Internal Affairs and Communications. "Report on the Survey of Research and Development"

(15) Deflators

Sector / Year	R&D expenditure deflators in Japan					GDP deflators								
	Overall (including social science and humanities)				Natural sciences	Japan	USA	Germany	France	UK	EU-15	EU-25	South Korea	China
	Business enterprises	Non-profit institutions and public organizations	Universities and colleges	Total										
1981	81.5	83.8	73.5	81.5	83.3	83.2	59.1	66.3	54.0	44.4			33.0	
82	84.2	86.1	76.2	84.2	85.8	85.0	62.7	69.4	60.3	47.7			35.2	
83	85.6	87.2	78.0	85.6	87.0	87.0	65.1	71.7	66.1	50.3			37.4	
84	88.1	89.5	80.6	88.1	89.5	89.8	67.6	73.1	70.8	52.6			39.6	
85	89.7	90.7	82.5	89.7	90.8	91.9	69.7	74.7	74.6	55.5			41.5	
86	87.9	89.1	82.6	87.9	88.7	93.4	71.2	77.2	78.3	57.4			43.8	
87	88.5	89.7	83.8	88.5	89.3	93.7	73.2	78.5	80.6	60.4			46.3	
88	90.7	91.8	86.7	90.7	91.4	94.4	75.7	79.7	83.2	64.2			49.8	
89	94.8	96.0	90.8	94.8	95.4	96.6	78.6	81.6	86.0	69.0			52.7	
90	97.8	99.3	94.2	97.8	98.3	98.9	81.6	84.2	87.8	74.2			58.2	54.3
91	99.5	100.9	96.7	99.5	99.9	101.8	84.5	87.2	89.9	79.1			64.4	57.9
92	100.0	101.3	97.8	100.0	100.3	103.4	86.4	91.5	91.6	82.3			69.3	62.5
93	99.7	100.9	98.3	99.7	99.9	104.0	88.4	94.9	93.2	84.5			73.7	71.6
94	100.3	101.3	99.6	100.3	100.5	104.1	90.3	97.2	94.6	85.8			79.5	85.9
95	100.7	101.6	100.4	100.7	100.8	103.5	92.1	99.0	95.6	88.1	88.7	88.1	85.4	97.2
96	101.9	102.5	102.0	101.9	102.0	102.7	93.8	99.5	97.2	91.1	91.5	91.1	89.8	102.9
97	102.9	103.4	102.8	102.9	102.9	103.1	95.4	99.8	98.0	93.6	93.8	93.5	93.9	103.8
98	100.9	101.5	100.9	100.9	100.9	102.9	96.5	100.3	98.8	96.4	95.3	95.1	99.4	101.3
99	99.7	100.2	99.8	99.7	99.7	101.5	97.9	100.7	98.7	98.6	97.3	97.0	99.3	99.1
2000	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
01	98.2	98.1	98.4	98.2	98.2	98.7	102.4	101.2	101.8	102.2	101.7	102.0	103.5	101.2
02	96.3	96.2	96.1	96.3	96.3	97.4	104.2	102.7	104.0	105.6	104.2	104.5	106.5	101.0
03	95.8	95.5	95.5	95.8	95.8	96.1	106.3	103.7	105.6	109.0	104.6	104.8	109.4	103.0
04	96.2	95.9	95.4	96.2	96.2	95.0	109.1	104.5	107.3	111.2	106.9	107.1	112.3	109.5

Notes: 1. Figures serves as the base year for deflator with a value of 100.
2. The R&D expenditures deflator in Japan uses a fiscal year value.
3. The deflator value for non-profit institutions and public organizations in Japan up to FY2000 is the figure for research institutions.

Sources: R&D expenditure deflators in Japan: Statistics Bureau data
GDP deflators in EU-15 and EU-25 -- Download from Database on Eurostat; Others -- OECD "Main Science and Technology Indicators 2005-2"