

## Chapter 7 Enhancing the Capacity to Promote Science, Technology and Innovation

Effective, flexible implementation of the policies and measures stipulated in the fifth Science and Technology Basic Plan is important. Efforts are being made to enhance the scientific and technological innovation functions of universities and national Research and Development (R&D) agencies, strengthen the leadership of the Council for Science, Technology and Innovation (CSTI) and secure R&D investment.

### Section 1 Reforming Universities and Enhancing their Function

Universities need to effectively and efficiently utilize their human resources, knowledge and funding to play a vital role in scientific and technological innovation.

Fundamental reforms are being planned to increase the contributions made by university education and research to society.

#### 1 University Reform

In order to address the demands of our age of dramatic change, it is absolutely vital to foster diverse and excellent human resources and to develop a rich foundation for the creation of diverse and outstanding knowledge, in order to enable flexible and appropriate responses to whatever changes in circumstances and new problems are encountered. In this effort, it is universities that play the key role. Furthermore, the role of universities is expanding, spanning from making new knowledge available to society through to engaging in industry–academia–government collaborations in order to widely deliver economic, social, and public benefits to society.

Universities, which have an extremely important role in generating science, technology and innovation, face a variety of challenges, such as reforming their management and personnel systems, ensuring stable posts for young professionals, participating in international initiatives to promote the circulation of talented researchers, engaging fully in industry–academia–government collaborations, and promoting diversification of funding sources. To appropriately address these challenges, it is necessary to ensure that personnel, knowledge, and funds within a university are utilized effectively and efficiently.

To this end, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) established a “designated national university cooperation system” where the national university cooperation designated by the minister set high-level goals toward the world’s best education and research activities. In June 2017, Tohoku University, the University of Tokyo and Kyoto University were designated, followed by the Tokyo Institute of Technology and Nagoya University in March 2018.

In addition, the “Basic Approach to TAKUETSUDAIGAKUIN PROGRAM (tentative)” was formulated at the “Experts Meeting on TAKUETSUDAIGAKUIN PROGRAM (tentative)” in April 2016. MEXT plans to expedite this discussion by a “commissioned project to promote the TAKUETSUDAIGAKUIN PROGRAM (tentative)” in which studies will be conducted in FY2017 to make general decisions regarding public invitation and screening processes (see Chapter 4, Section 1, 1(3)).

MEXT also formulated “Guidelines for Fortifying Joint Research Through Industry-Academia-Government Collaboration” in November 2016 to encourage collaboration between these sectors. The

guidelines promote adoption of cross-appointment systems to enable university faculty members to work full-time at multiple organizations by allocating their time to various duties (see Chapter 4, Section 1, 2(3)).

In addition, MEXT is implementing a “program for Excellent Young Researchers” to reward promising young researchers engaged in novel research with stable research environments in which to conduct independent research. The program also offers these researchers new career opportunities at industry, academia and national R&D agencies across Japan (see Chapter 4, Section 1, 1(1)).

## Section 2 Reforming National R&D Agencies and Enhancing their Function

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National R&D agencies are planning to implement structural reforms to enhance their functions in accordance with long-term plans formulated to meet the requests of the national government and the international community. The reforms will enable these agencies to fully exercise their advanced management capabilities, engage in basic research which is difficult for the private sector to pursue, develop fundamental technologies that facilitate verification tests and help in the formulation of technical standards, allocate R&D funds to other organizations and serve as driving force in the innovation system.

### 1 National R&D Agency Reforms

The “Act on the General Rules for Incorporated Administrative Agencies” (Act No. 66, 2014) was revised in 2014 in line with the revised “Act on Improving the Capacity, and the Efficient Promotion of Research and Development through Promotion of Research and Development System Reform (Act No. 63, 2008)” (entered into effect in December 2013) and the “Basic Policy on the Reform of Independent Administrative Agencies” (entered into effect in December 2013). This revision led to the promotion of 27 independent administrative agencies to roles as national R&D agencies (as of March 31, 2018), which are expected to facilitate the sound development of the Japanese economy and meet the public interest by making maximum R&D efforts and raising Japan’s scientific and technological standards. In addition, the “Act on Special Measures Concerning the Promotion of Research and Development by Designated National Research and Development Agencies” (Act No. 43 of 2016, hereinafter as “NRDA Act”) passed in May 2016 (entered into effect in October 2016). This act promoted three national R&D agencies (the National Institute for Materials Science, RIKEN and the National Institute of Advanced Industrial Science and Technology) to the status of designated national R&D agencies. Their shared mission is to serve as core organizations in promoting the production, popularization and use of world-class R&D accomplishments and to lead R&D innovation in Japan. The Cabinet subsequently approved the “basic policy to promote R&D by designated national R&D agencies” on June 28, 2016 (revised on March 10, 2017). Expert Panel on Evaluation of the Council for Science, Technology and Innovation (CSTI) compiled “approach of opinions and suggestions to the evaluation of designated national research and development agencies and the content of the next medium- to long-term goals” on July 4, 2017. Based on the NRDA Act, and in light of the opinions given by CSTI in terms of the consistency with the 5<sup>th</sup> Basic Plan and Policy (in December 2017 and February 2018), MEXT formulated new medium- to long-term goals for the period starting from FY2018 for RIKEN, as its period of medium- to long-term goals ends in FY2017.

## Section 3 Strategic International Implementation of STI Policies

As R&D activities become increasingly globalized, it is important for Japan to produce results, thereby promoting its scientific and technological innovation and increasing its international presence and credibility. Therefore, Japan needs to promote comprehensive S&T diplomacy by promoting scientific and technological innovation internationally and by actively engaging with the Ministry of Foreign Affairs (via the Science and Technology Adviser to the Minister for Foreign Affairs).

### 1 Utilization of international frameworks

#### (1) Activities related to summit meetings

In 2008, the G8 Science and Technology Ministers' Meeting was held under the auspices of the then Minister of State for Science and Technology Policy Fumio Kishida, according to a proposal made by Japan, which held the presidency at the time. Subsequent meetings were held in the United Kingdom in 2013, in Germany in 2015, and in Japan (Tsukuba City, Ibaraki) in 2016. Through these meetings, Japan intends to actively facilitate international S&T policy discussions between the Japanese Minister of State for Science and Technology Policy and officials from other countries to cooperatively solve global issues using S&T. In September 2017 the meeting was held in Italy and Ms. Yuko Harayama, a member of CSTI, attended from Japan.

The Group of Senior Officials (GSO) assembled to discuss international research facilities was founded following discussions at a 2008 meeting. The 9th GSO meeting held in Italy in May 2017 included discussions on the sharing of information on international research facilities and international collaboration frameworks. A progress report was submitted to the G7 ICT and Industry Ministerial Meeting held in Torino in September. The 10th GSO meeting was held in Russia in October of the same year.

LCS-RNet, a network of researchers/research organizations that are contributing to individual countries' low-carbon policy-making processes, had its 9th annual meeting in UK in September 2017. As of 2017, 17 research organizations from 10 countries including Japan were LCS-RNet members.

#### (2) Asia-Pacific Economic Cooperation (APEC)

Meetings of the APEC Policy Partnership on Science, Technology and Innovation (PPSTI) are held to promote scientific and technological innovation in the APEC region through joint projects and workshops. The 9th, 10th and 11th meetings were held in February 2017 and May 2017 in Vietnam and in February 2018 in Papua New Guinea to plan PPSTI activities.

#### (3) Association of Southeast Asian Nations (ASEAN)

The ASEAN Committee on Science and Technology (COST) and Japan, China and South Korea (COST+3) are cooperating on science and technology. MEXT is taking a leadership role in Japan's contribution to the ASEAN COST+3. In January 2015, the 8th ASEAN COST+3 Meeting was held in Tokyo for the exchange of opinions on cooperation between ASEAN and the three countries. As a framework for cooperation between Japan and COST, the 8th ASEAN-Japan Cooperation Committee on Science and Technology was held in Bandar Seri Begawan (Brunei) in May 2017 for the exchange of

opinions about Japan and overall ASEAN scientific and technological cooperation in the future.

#### **(4) Other**

##### **A. Asia-Pacific Regional Space Agency Forum (APRSAF)**

Since 1993, Japan has been hosting the annual APRSAF, the largest framework of space cooperation in the Asia-Pacific region. This forum has been used for exchanging information about space activities and utilization in the region as well as for promoting multilateral cooperation. The 24th APRSAF meeting held in India in November 2016 gathered about 540 attendees from 31 countries and regions, and ten international organizations. Six directors and three vice directors of space agencies in Asia-Pacific region attended the meeting and exchanged views on the roles of space science and technology in achieving SDGs. In response to increasing needs for opinion exchange on the space policies of emerging space exploring countries, the first session focusing on space policies was held gathering a large number of policy makers around the world.

##### **B. International Space Exploration Forum (ISEF)**

In order to promote international cooperation in space exploration, ministerial meetings had been held with European initiative since 2009. In this context, the International Space Exploration Forum (ISEF) was held in Washington DC in 2014. At the forum, Japan expressed its intention to hold the next meeting in Japan and held the second meeting (ISEF2) in March 2018.

Countries announced their space exploration plans while private sector activities are also becoming brisk. As the interest in exploration of the moon and Mars is increasing in the world, ISEF2 discussed the importance of space exploration and international cooperation for this purpose, the basic approach to their promotion and other matters. Side events for young people and industry were also held at the opportunity of the minister-level meeting.

##### **C. Global Biodiversity Information Facility (GBIF)**

The GBIF is an international organization that engages in the development of information infrastructure and data acquisition/analysis tools for the purpose of collecting data on biodiversity so that the data can be made available worldwide. The 24th meeting of the GBIF Governing Board was held in Helsinki, Finland in September 2017, with the participation of member countries and others. The purpose was approval of the budget for 2018 and of the Implementation Plan.

##### **D. Group on Earth Observations (GEO)**

GEO is an international framework pursuing the development of the Global Earth Observation System of Systems (GEOSS) in accordance with the “GEO Strategic Plan 2016-2025” approved at the ministerial-level meeting in November 2015. A total of 223 countries and organizations participate in GEO as of February 2018.

GEOSS is a system for comprehensive Earth observation. It consists of diverse observation systems, including artificial satellites and ground-based observation systems, whose linkage aims for the development of an information base that helps policy-making in eight areas related to social benefits (biodiversity and

ecosystem sustainability, disaster resilience, energy and mineral resources management, food security and sustainable agriculture, infrastructure and transportation management, public health surveillance, sustainable urban development, and water resources management) and on global issues related to these eight areas, such as climate change.

#### **E. Intergovernmental Panel on Climate Change (IPCC)**

IPCC was established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) for the purpose of comprehensively assessing anthropogenic climate change, its impacts, vulnerability, adaptation to such impacts, and the mitigation of climate change from scientific, technological and socioeconomic viewpoints. The IPCC published the Fifth Assessment Report (AR5) in 2014 and started its sixth round of assessments. In addition to the Sixth Assessment Report (AR6) to be published from 2021 to 2022, IPCC plans to compile the Special Report on Global Warming of 1.5 °C, Special Report on the Ocean and Cryosphere, Special Report on Land, and methodology guidelines for national greenhouse gas inventories.

#### **F. Innovation for Cool Earth Forum (ICEF)**

In order to promote innovations and their spread in the fields of energy and environment, which are key to combining solution of climate change problems and economic growth, Japan, at the proposal of Prime Minister Shinzo Abe, established Innovation for Cool Earth Forum (ICEF) in 2014 as a knowledge platform where industry, government and academia leaders in the world hold discussions and promote international cooperation. The forum has been held in October every year.

More than 1,000 people from about 80 countries and regions participated in the 4th annual ICEF conference in 2017.

#### **G. ARGO Program**

MEXT and the Japan Meteorological Agency (JMA) joined an advanced ocean monitoring system (the Argo Program) to understand the details of oceans worldwide and to improve the accuracy of climate change prediction (See Chapter 3, Section 3, Paragraph 1.).

#### **H. Global Research Council (GRC)**

The GRC is an international conference comprised of the heads of major science and engineering funding agencies from various countries. The sixth annual GRC meeting was held in Ottawa in May 2017, co-hosted by the Natural Sciences and Engineering Research Council of Canada (NSERC) and the National Council for Science, Technology and Technological Innovation (CONCYTEC) of Peru. A total of 54 agency heads from 47 countries and two international organizations discussed research support issues and the roles of science and engineering funding agencies. They also approved two outcome documents entitled the “Statement of Principles on Active Interaction between Basic Research and Innovation” and “Statement on Principles of Capacity Building and Collaboration among Research Support Agencies.”

## Convening the 2nd International Space Exploration Forum (ISEF2)

On March 3, 2018, the 2nd International Space Exploration Forum (ISEF2) was held in Tokyo. The forum gathered about 300 participants from 45 countries and international organizations, including ministers of countries interested in space exploration and heads of space agencies. They had an animated discussion throughout the day chaired by Minister Yoshimasa Hayashi of MEXT. The discussion covered: expansion of the sphere of human activities; importance of space exploration that is pursuit for knowledge, experiences and benefits shared by humanity, the meaning of international cooperation, and modalities of future cooperation, for example. Through the discussion, participants confirmed that: expansion of interest in space exploration in many countries is welcomed; there is an expectation for innovative partnerships including collaboration with the private sector; exploration activities from low earth orbit to the moon, Mars and further in the solar system are widely shared goals; and, the continued implementation of manned and unmanned explorations remains important. These conclusions were compiled in a joint statement. Participants agreed to the administrative provision to make ISEF a continuing meeting and the “Tokyo Principle on International Space Exploration” was formulated as the foundation for smooth implementation of international space exploration. The principle includes peaceful purposes, benefits to mankind, scientific aspects, securing of feasibility and economy, international cooperation, relationship with the private sector, continuity of exploration and other important matters to which countries should pay attention when pursuing space exploration.

Side events for industry and young people were also held at the opportunity of ISEF2. I-ISEF2 (ISEF for Industry) for companies and investment institutions including those not related to space provided opportunities for awareness raising about space exploration, discussions on expansion of opportunities for private companies to enter the space industry and networking among participants. At Y-ISEF (ISEF for Young Professionals) for young professionals of universities, space agencies, private companies (including those of non-space industries) and S-ISEF (ISEF for Students) for Japanese high-school students, participants exchanged freewheeling opinions on space exploration. These events generated interest in space and development among young talents who will lead space exploration in the future.

The next meeting (ISEF3) is scheduled in Europe by 2021.



**Minister Yoshimasa Hayashi of MEXT serving as a panelist of Session 3**

Source: MEXT



## 2 Utilization of international organizations

### (1) United Nations system (UN system)

#### A. Science, Technology and Innovation for Sustainable Development Goals (STI for SDGs)

Toward achievement of the UN Sustainable Development Goals through Science, Technology and Innovation, the Advisory Board for the Promotion of Science and Technology Diplomacy (chaired by Science and Technology Advisor to the Minister for Foreign Affairs) compiled the "Recommendation for the Future (STI as a Bridging Force to Provide Solutions for Global Issues: Four Actions of Science and Technology Diplomacy to Implement the SDGs)" and submitted the recommendation to the Minister of Foreign Affairs on May 12, 2017. Elements of the recommendation (Society 5.0, solution enabled by global data, link across sectors and fostering of human resources) were presented by Japanese experts at the 2nd UN STI Forum held in the same month. The board and the World Bank jointly hosted a side event on the Science and Technology Research Partnership for Sustainable Development ("SATREPS"), and presented examples of partnership with business sector and data utilization toward solution of global issues, which attracted a high level of interest from countries from around the world. Dr. Toshiya Hoshino, the Ambassador and Deputy Permanent Resident of Japan to the United Nations will assume the office of co-chair of the 3rd STI Forum in December.

#### B. United Nations Educational, Scientific and Cultural Organization (UNESCO)

Japan has been participating and actively cooperating in various science and technology projects and activities of the United Nations Educational, Scientific and Cultural Organization (UNESCO), a specialized agency of the U.N.

In UNESCO bodies, such as the IOC, the International Hydrological Programme (IHP), the Man and the Biosphere Programme (MAB), UNESCO Global Geoparks, the International Bioethics Committee (IBC) and the Intergovernmental Bioethics Committee (IGBC), international rules are formulated and projects are implemented towards solving global-scale problems. Japan also helps to promote UNESCO activities by sending experts to contribute to discussions of committees/commissions. Japan has established funds-in-trust at UNESCO as a way of cooperating in science and technology human resources development in the Asia-Pacific region.

### (2) Organisation for Economic Cooperation and Development (OECD)

The OECD engages in activities related to science and technology by developing statistical data and fostering exchanges of views, experiences, information and human resources among the member countries at the following OECD bodies: the OECD Ministerial Council, the Committee for Scientific and Technological Policy (CSTP), the Committee for Information, Computer and Communications Policy (ICCP), the Committee on Industry, Innovation and Entrepreneurship (CIIE), the Nuclear Energy Agency (NEA), and the International Energy Agency (IEA).

In the CSTP, information and views concerning science and technology policies have been exchanged and the role of science, technology and innovation (STI) in economic growth, enhancements of research systems, and the roles of government and the private sector in R&D and international collaborations in R&D have been studied. The CSTP has four subgroups: the OECD Global Science Forum (GSF), the Working Party

on Innovation and Technology Policy (TIP), the Working Party on Bio-, Nano- and Converging Technologies (BNCT), and the National Experts on Science and Technology Indicators (NESTI).

#### **A. Global Science Forum (GSF)**

The GSF discusses ways to facilitate international cooperation on solving global issues. In 2017 the forum compiled the final report of a project to study sustainable business models of data repository and international cooperation in research data network.

#### **B. Working Party on Innovation and Technology Policy (TIP)**

The TIP makes examinations and gives advice on policies related to innovation and technology. These policies are expected to enhance productivity, foster sustainable economic growth, facilitate the creation, diffusion and application of knowledge for both societal and economic goals, and promote the creation of highly skilled human capital.

The projects implemented by TIP in 2017 include: a project to consider the most desirable innovation ecosystem when the framework of the existing industrial structure is greatly changing due to the progress of digitalization, a project on analysis of the impact of digital innovation at the regional and national levels, and a project on assessment of the impact of public research on innovation. It also discussed plans to implement “digitalization and innovation policy mix” starting in 2018.

#### **C. Working Party on Biotechnology, Nanotechnology and Converging Technologies (BNCT)**

BNCT makes policy proposals for effective use of biotechnologies to contribute to sustainable economic growth and the prosperity of human kind, and has been advancing projects on the ripple effects of nanotechnology, internationalization of research and research infrastructure, etc.

#### **D. Working Party of National Experts on Science and Technology Indicators (NESTI)**

NESTI supervises, provides advice on and coordinates statistical work and contributes to the development of indicators and quantitative analysis helpful for the promotion of STI policies. Specifically, with regard to science and technology indicators related to R&D expenditure, science and technology human resources and the like, NESTI has been discussing and examining the development of survey methodologies and indicators, and frameworks for international comparisons of indicators.

#### **(3) International Science and Technology Center (ISTC)**

The ISTC is an international organization established by the four parties of Japan, the U.S.A., the EU and Russia in March 1994, with the aim of providing former weapons scientists from Russia and the CIS, who had engaged in the development of weapons of mass destruction with opportunities to redirect their talents to R&D conducted for peaceful purposes. With the withdrawal of the Russian Federation from the ISTC in July 2015, the ISTC head office was relocated from Moscow to Astana, Kazakhstan. In December of that year, the Agreement on the Continuation of the ISTC was signed by representatives of Japan, the European Union, the European Atomic Energy Community, the U.S.A., Georgia, Norway, Kyrgyzstan, Armenia, Kazakhstan, the Republic of Korea, and Tajikistan. The agreement came into effect in 2017.



### 3 Utilization of research institutions

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

ERIA is an institution that provides policy analyses and recommendations towards promoting East Asian economic integration. Under the three pillars of deepening economic integration, narrowing development gaps and achieving sustainable economic development, ERIA implements research, symposiums and human resources development in a wide range of areas, including innovation policies.

### 4 Promotion of Strategic International Activities Related to Science Technology Innovation

For Japan to assume a leading role in solving global issues and to maintain a strong position in the world, the nation needs to strategically promote STI policies from the perspective of international cooperation.

Since FY2008, MEXT has been implementing SATREPS and promoting international joint research with Asian and developing countries in other regions by combining excellent science/technologies and the ODA of Japan. The research will contribute to solving global issues in the fields of environment, energy, bioresources, natural disaster prevention and mitigation, and infectious diseases control.

Since FY2009, the ministry has been implementing the Strategic International Collaborative Research Program (SICORP) to promote diverse international collaborative research according to the potential of the partner country/region, the field and the cooperation phase in equal partnership based on agreement among ministries and agencies toward creation of innovations through strategic international cooperation.

Furthermore, since FY2014, MEXT has been implementing the “Japan-Asia Youth Exchange Program in Science (Sakura Science Plan)” The program aims to increase interest in Japan’s leading-edge science and technology among young people in Asia and develop excellent foreign human resources needed by Japanese universities, research institutions and companies and thereby contribute to the development of science and technology in Asia and Japan (See Chapter 4, Section 1, 2 (2) A (B)).

The Japanese Ministry of the Environment has been supporting the Asia-Pacific Network for Global Change Research (APN) which was established to improve researchers’ capabilities and solve issues common to the nations in the Asia-Pacific region. The APN held its 22nd annual intergovernmental meeting in India in April 2017. The sixth annual LoCARNet (Low Carbon Asia Research Network) meeting was held in Thailand in November 2017 with the aim of sharing the latest research outcomes and knowledge toward low-carbon growth of Asia.

The UN General Assembly unanimously approved the sustainable development goals (SDGs) in September 2015 to address global issues comprehensively. Because scientific and technological innovation is necessary to achieve various goals, S&T-related ministries and agencies have been discussing the potential contribution of scientific and technological innovation for achieving SDGs.

### 5 Cooperation with Other Countries

#### (1) Cooperation with the United States and European countries

Japan has been actively advancing science and technology cooperation with the U.S.A. and European countries in advanced research areas such as life sciences, nanotechnology, materials science, environmental sciences, nuclear technology and space exploration. Specifically, Japan has held meetings of joint committees

on science and technology cooperation based on bilateral science and technology cooperation agreements, has been exchanging information and researchers with the above-mentioned countries and has been supporting the implementation of joint research.

Japan and the United States held the ministerial-level joint committee meeting in 2015 and the working-level joint committee in 2016. The committees were set up based on the Agreement between the Government of Japan and the government of the US on Cooperation in Research and Development in Science and Technology. At the meetings, opinions were exchanged on many subjects including research cooperation in individual fields.

Following consultations with the European Commission, Japan and the EU published the first coordinated call for international joint research projects on ICT topics in October 2012, based on an agreement made with the EU. Joint ICT research started in 2013. The Fourth coordinated call for joint ICT research was made in October 2017. Japan also convened the Joint Committee on Science and Technology Cooperation with: Italy in June 2017, Slovenia in October 2017, the EU in November 2017, Bulgaria in December 2017, Czech Republic in January 2018, Switzerland in February 2018, Romania in March 2018. In addition, when the Science and Technology Adviser to the Minister for Foreign Affairs visited the Netherlands in 2017, he presented Japan's overseas outreach efforts via the Cross-ministerial Strategic Innovation Promotion Program ("SIP Caravan") which was formulated by the Cabinet Office and the Ministry of Foreign Affairs.

In October 2017, the 7<sup>th</sup> EU-US-Japan Trilateral Conference on Critical Materials was held in the United States by major rare metal consumer countries. Policy makers and experts of the three economies participated in a workshop for cultivating a shared understanding of the global situation related to rare metals including rare-earth minerals, and also for discussing the development of rare-earth alternative materials and rare-earth recycling technologies.

## **(2) Cooperation with China and Republic of Korea**

In July 2017, Minister Wang Zhigang of Science and Technology of the People's Republic of China visited Japan to attend the Japan-China Science Technology Exchange Symposium held by the Japan Science and Technology Agency and talked with Minister Hirokazu Matsuno of MEXT for the first time in five years.

Within the framework of Japan-China-South Korea trilateral cooperation, the Minister of MEXT has attended the Japan-China-South Korea Ministerial Meetings on Science and Technology Cooperation. The Japan-China-South Korea Ministerial Meeting on Science and Technology and the Trilateral Director-General's Meeting are held biennially and alternately, and these meetings have resulted in support for research activities through the Japanese-Chinese-Korean Cooperative Joint Research Collaboration Program (JRCP) and Young Researchers' Workshops. In order to lead high-level research activities in Asia with focus on academic exchange between Japan, China and Korea, the JSPS holds meetings of heads of Japanese, Chinese and Korean academic organizations and supports exchanges between research institutions in Asia towards establishing scientific research networks and fostering young researchers by launching the A3 Foresight Program and conducting other activities.

### **(3) Cooperation with ASEAN and India**

In Asia, Japan can make use of its science and technology for solution of problems in many fields including environment, energy, food, water, natural disaster prevention, and infectious diseases control. It is necessary to play an active role in solving Asia's common problems and build relationships of mutual trust and benefits in the region.

In June 2012, MEXT in cooperation with the Japan Science and Technology Agency (JST) launched the e-ASIA Joint Research Program for multilateral joint research. The program aims to strengthen R&D capabilities and solve common problems facing Asian countries by accelerating research exchange in science and technology. Institutions of East Asia Summit member countries participate in the program that covers seven fields: material (nanotechnology), agriculture (food), alternative energy, health research (infectious diseases and cancer), disaster prevention, environment (climate change and marine science) and advanced technology fusion toward innovation. The health research field has been supported by the Japan Agency for Medical Research and Development since April 2015.

As the SICORP International Joint Research Center Project, support started in ASEAN (environment/energy, bioresources, biodiversity and disaster prevention fields) in September 2015 and in India (ICT field) in October 2016. With the aim of creating innovation, improving Japan's science and technology strength and strengthening the foundation of research cooperation with the partner country/regions, JST has been promoting sustained joint research and cooperation activities under a Japanese flag.

### **(4) Advanced S&T cooperation with Russia**

A meeting of the Joint Committee on Science and Technology Cooperation was held between Japan and Russia to confirm the status of progress in S&T cooperation and discuss plans to expand cooperation.

Japanese Prime Minister proposed an eight-point cooperation plan at the Japan-Russia Summit in Sochi, Russia in May 2016. Russian President Vladimir Putin praised the plan, and the two leaders agreed to put it into practice. One of the eight points entitled "Cooperation on cutting-edge technologies" stipulates that two countries cooperate in various fields, including nuclear energy, medical care and agriculture. The two leaders signed multiple documents on the cooperation when President Putin visited Japan in December 2016. In September 2017, MEXT and Ministry of Education and Science of Russia signed the Memorandum of cooperation on the Japan-Russia science and technology joint project in Vladivostok, Russia.

### **(5) Cooperation with other countries**

Japan is also holding joint committee meetings, promoting exchanges of information and researchers, and promoting the implementation of joint research with South Africa, Israel, New Zealand and other countries, based on bilateral Science and Technology Cooperation Agreements.

From 2017 to 2018, the Cabinet Office and the Ministry of Foreign Affairs (diplomatic missions abroad) implemented the SIP Caravan in Indonesia, Thailand, the Philippines, Malaysia and other countries by taking an opportunity of an overseas business trip of the Science and Technology Advisor to the Minister for Foreign Affairs.

Human resource development and exchanges, as well as collaborative research, are promoted for the future

with emerging countries.

## Section 4 Pursuing Effective STI Policies and Enhancing the Chief Controller Function

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To enforce the fifth, medium-to-long-term Science and Technology Basic Plan, the CSTI has been annually revising the Comprehensive Strategy on Science, Technology and Innovation depending on the status of priority policy implementation. In addition, the CSTI has been strengthening its leadership functions.

### 1 Following up the Basic Plan

In order to promote STI policies based on objective grounds, the fifth Science and Technology Basic Plan stipulates that progress and achievements of the plan shall be assessed by setting target values and key indicators and combining quantitative and qualitative data.

After the CSTI formulated the basic plan, it has collected data of target values, key indicators, etc.

MEXT—which plays a central role in promoting scientific and technological innovation—monitors the progress of the basic plan. To facilitate this task, the ministry created “overhead maps” to visualize implementation status of individual policies stipulated in the plan. MEXT is in the process of determining indicators that will facilitate planning, formulation and evaluation of policies, and measures and projects specific to each map. MEXT plans to formulate effective measures and update current measures while monitoring changes in indicator values specific to individual maps and changes in the environment related to STI policies.

### 2 National Guideline on the Method of Evaluation for Government R&D

To promote STI policies effectively and efficiently, it is necessary to set clear performance targets, such as policies, measures and implementation systems. It is also necessary to conduct timely follow-ups to ensure progress, and to consider the results when reviewing policies and resource allocation. Finally, it is necessary to plan new policies by establishing PDCA (Plan-Do-Check-Action) cycles. For this reason, the government has been promoting efforts to ensure the effectiveness of PDCA cycles. Specifically, the government has established the National Guideline on the Method of Evaluation for Governmental R&D (hereinafter referred to as the “National Guidelines”) instituted by the Prime Minister on December 21, 2016.

In April 2017, MEXT revised the Guideline on the Method of Evaluation for Government R&D by MEXT (approved by the MEXT Minister) to be consistent with the revised National Guidelines. MEXT’s revision supplemented the priority goals of (1) creating scientific and technological innovation and enhancing problem-solving systems, (2) promoting challenging, interdisciplinary and collaborative research, (3) promoting training of and support for young researchers who may lead the next generation and (4) improving the quality of R&D evaluation and avoiding evaluation becoming a burden to researchers. In addition, MEXT is aiming to implement more constructive R&D evaluation which will encourage researchers to perform high-quality R&D effectively and efficiently.

Ministry of Economy, Trade and Industry (METI) evaluates R&D projects before, during and after their

implementation and performs follow-up evaluations. In light of the revision of the National Guidelines that added points to consider in evaluating challenging R&D and expanded descriptions on preparation of roadmaps and evaluation of their appropriateness, METI reviewed and revised “the Guidelines for Technology Evaluation” and “the Standard Evaluation Items and Criteria based on the Guidelines for Technology Evaluation.”

Incorporated administrative agencies and national universities are evaluated pursuant to the Act on General Rules for Incorporated Administrative Agencies and Act on National University Corporation, (Act No. 112 of 2003). The national R&D agency is evaluated by the competent minister pursuant to the Guidelines for Incorporated Administrative Agency Evaluation, mainly with the aim of maximizing R&D outcomes.

### **3 | Promoting Policies Supported by Objective Evidence**

In order to make effective use of limited resources to increase public trust in administration, the government is promoting Evidence-based Policymaking (EBPM) based on the final report of the Statistics Reform Promotion Council (decision of the Statistics Reform Promotion Council in May 2017). The government has been developing the EBPM promotion system by holding the EBPM Promotion Committee as a cross-ministerial function in August 2017 and by creating the office of Deputy Director-General for EBPM promotion in ministries in FY2018. It is also promoting practice of EBPM in each stage of policies, measures and businesses.

The CSTI and other ministries, agencies and organizations are collaboratively collecting, sharing and analyzing information necessary to formulate PDCA cycles in line with the Science and Technology Basic Plan, and the Comprehensive Strategy on Science, Technology and Innovation, etc. under the framework of existing efforts. The CSTI is also studying comprehensive methods to formulate PDCA cycles.

With the aim of formulating policies for science, technology and innovation by following a rational, evidence-based process, MEXT has been promoting Science of science, technology and innovation policy program (See Chapter 6, Section 1, Paragraph 3).

MEXT invites the public to submit R&D proposals to be considered for competitive funding from the national government using the Cross-ministerial R&D Management System (e-Rad). The CSTI uses the data collected by e-Rad to formulate objective policies to promote scientific and technological innovation.

The National Institute of Science and Technology Policy (NISTEP) has conducted research and analyses based on administrative needs, and has established an information base for the collection and accumulation of data that are necessary for the formulation of STI policies and for research, analysis and study on STI (See Chapter 6, Section 1, Paragraph 3).

## Promotion of Evidence-based Policymaking (EBPM)

Evidence-based Policymaking (EBPM) is an initiative to clarify “basic policy frameworks” based on objective evidence obtained by analysis of statistics and business data. EBPM includes clarification of policy objectives and identification of effective administrative means to achieve the objectives.

Japan is facing the progress of a declining birth rate and aging population such as the world has never seen. There is an increasing need to understand the current state and policy challenges promptly and correctly, choose effective measures and verify their effects. However, it has been pointed out that statistics and business data have not been sufficiently used for policy formation in Japan and that policy making has been often based on episodes such as occasional observations and limited experiences.

Against this background, the Statistics Reform Promotion Council chaired by the Chief Cabinet Secretary was held in February 2017 with the aim of promoting establishment of EBPM across the government and responding to the needs of the people from the perspective beyond statistics departments. The council compiled a final report in May of the same year. In response, the EBPM Promotion Committee consisting of persons responsible for EBPM promotion in individual ministries was held and a system to promote initiatives across the government was established in August of the same year. Recognizing the need to develop a high-level system to offer feedback, guidance and support from the perspective of EBPM to department heads in charge of various policy making and implementation, responsible officers of the Deputy Director-General level who review EBPM activities will be appointed within FY2018.

The EBPM Promotion Committee is to formulate basic guidelines for judgment on data provision by ministries combining utilization of data including statistics and protection of personal information, and for a basic policy on securing and development of human resources who engage in the practice and promotion of EBPM.

## 4 Strengthening the Leadership Functions of the CSTI

While continuing its effort to strongly promote the Strategic Innovation Promotion Program (SIP) and the Impulsing Paradigm Change through Disruptive Technologies Program (ImpACT), CSTI secured budget for the 2<sup>nd</sup> phase of SIP in the FY2017 supplementary budget and started the project ahead of the schedule. The CSTI and the Council on Economic and Fiscal Policy jointly held a meeting of the Committee for the Activation of STI and Economy and Society. Based on the final report on the “Public and Private Investment Expansion Initiative for Science and Technology Innovation” compiled by the committee, the CSTI is working to implement the three actions specified in the initiative: reforming budgeting processes, reforming systems to encourage greater R&D investment, and effective increase of public and private R&D investment based on evidence. For reforming budgeting process, CSTI decided the fields where ministries’ measures to stimulate private R&D investment will have big effects toward establishment of the Public/Private R&D Investment Strategic Expansion Program (PRISM) in FY2018. For reforming systems to encourage greater R&D investment, the CSTI studied specific measures that will assist universities and national R&D agencies to acquire funds from various sources and smoothly distribute funds, information and human resources. For effective increase of public and private R&D investment based on evidence, the CSTI started to build the “Evidence System” for systematic collection and analysis of information from inputs through outputs and outcomes concerning STI policies.

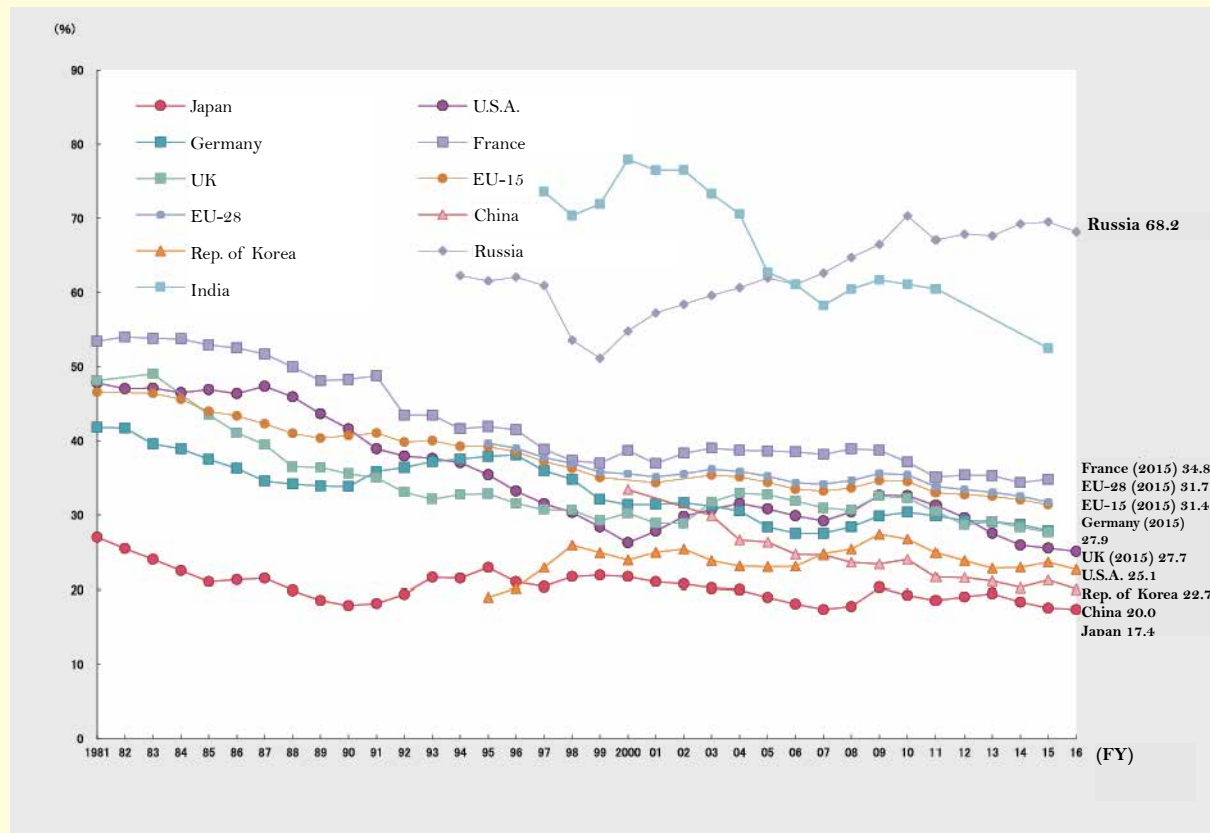


## Section 5 Ensuring R&D Investment for the Future

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The 5th Science and Technology Basic Plan states as follows: With a view to continuing the efforts to promote science and technology, the quality of S&T policies needs to be continuously enhanced. It is necessary to set specific goals for increased government investment in R&D from a comprehensive perspective by taking into consideration various factors, including the following: the fact that many other countries are increasing their government investment in R&D, government funding as a share of all R&D funds in Japan and the need for increased government R&D investment to produce the synergistic effect of promoting private sector investment. Accordingly, the government aims for an increase in R&D investment by the public and private sectors to at least 4% of Japan's GDP. Additionally, the government has set the goal of investing 1% of GDP in R&D. This goal is to be achieved while securing consistency with the Plan to Advance Economic and Fiscal Revitalization stated in the Basic Policy on Economic and Fiscal Management and Reform 2015 (Cabinet decision, June 2015). On the assumption that the nominal GDP growth rate during the period of the 5th Basic Plan is 3.3% on average, the total amount of government investment in R&D during the same period is estimated at 26 trillion yen.

**Figure 2-7-1 Trends in the percentage of Government-financed R&D Costs to Gross Domestic Product**



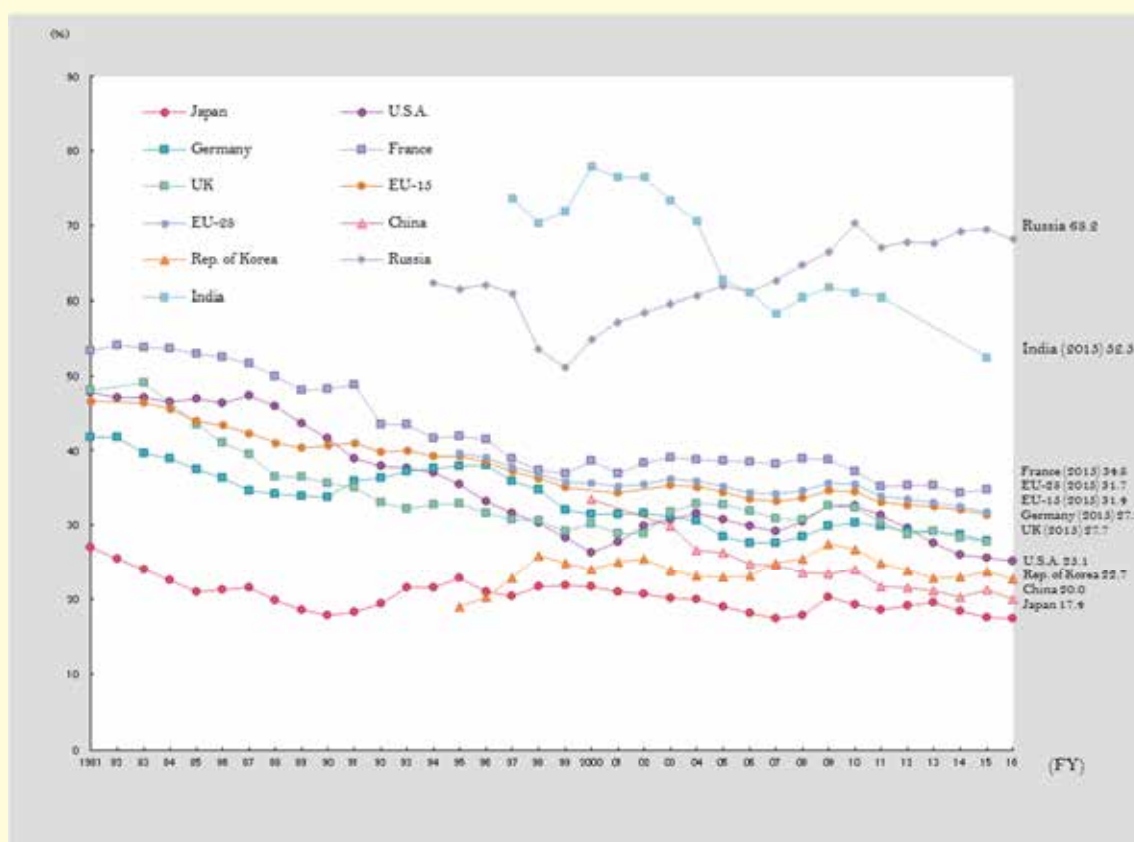
- Note: 1. Humanities and social science were included in this analysis, except for the Republic of Korea up to FY2006.  
 2. The UK values for FY1981 and 1983 were estimated by the OECD. The UK values for FY2008, 2009, 2010, 2012, 2014 and 2015 were estimated by other organizations and those for FY2015 are provisional.  
 3. The German values for FY1982, 1984, 1986, 1988, 1990, 1992, 1994, 1995, 1996, 1998, 2000 2002 and 2010 were estimated.  
 4. The U.S.A. values for FY2015 were provisional.  
 5. The Rep. of Korea values for FY2008-11 were estimated.  
 6. The EU values were estimated by the OECD.  
 7. The Indian values for FY2006 and 2007 were estimated. It is unknown whether these values take national defense research into account.

Source: Japan: Adapted by MIC (the Statistics Bureau) based on *the Report on the Survey of Research and Development*

India: UNESCO Institute for Statistics S&T database

Other countries: OECD, Main Science and Technology Indicators, Vol. 2017/2

Figure 2-7-2 Trends in Government-financed R&amp;D Costs in Major Countries



- Note: 1. Humanities and social science were included in this analysis, except for the Republic of Korea up to FY2006.  
 2. The UK values for FY1981 and 1983 were estimated by the OECD. The UK values for FY2008, 2009, 2010, 2012, 2014 and 2015 were estimated by other organizations and those for FY2015 are provisional.  
 3. The German values for FY1982, 1984, 1986, 1988, 1990, 1992, 1994, 1995, 1996, 1998, 2000, 2002 and 2010 were estimated.  
 4. The U.S.A. values for FY2015 were provisional.  
 5. The Rep. of Korea values for FY2008-11 were estimated.  
 6. The EU values were estimated by the OECD.  
 7. The Indian values for FY2006 and 2007 were estimated. It is unknown whether these values take national defense research into account.

Source: Japan: Adapted by MIC (the Statistics Bureau) based on *the Report on the Survey of Research and Development*

India: UNESCO Institute for Statistics S&T database

Other countries: OECD, Main Science and Technology Indicators, Vol. 2017/2

### (Government R&D investment)

Government R&D investment in FY 2017 was 4.4686 trillion yen. The breakdown was 3.9615 trillion yen (including the supplementary budget) from the central government and 507.1 billion yen from local governments. (As of March 2018; For details on R&D investment by the central government (See Chapter 1, Section 4, Paragraph 2.)