

Chapter 5 Establishing a Systemic Virtuous Cycle of Human Resources, Knowledge and Capital for Innovation

Making the most of domestic and international intellectual resources, we will foster and take advantage of “new value.” To this end, we will develop an innovation creation system by circulating human resources, knowledge and funds beyond organizations, sectors and borders to fully bring out their respective abilities, by fostering strong, deep collaboration among private businesses, universities and public research institutions and by strengthening establishment of startups. This will strengthen the international competitiveness of the whole country and accelerate economic growth.

Section 1 Enhancing Mechanisms for Promoting Open-innovation

Innovations are realized mostly by private businesses. However, collaboration with universities and public research institutions as well as more flexible business partnerships are important to accelerate commercialization. In order to promote open innovation globally, it is important to develop a system for cooperation and co-creation where partners can use their respective strengths and complement each other. It is also important to increase the mobility of human resources, knowledge and funds to create an environment that facilitates innovations.

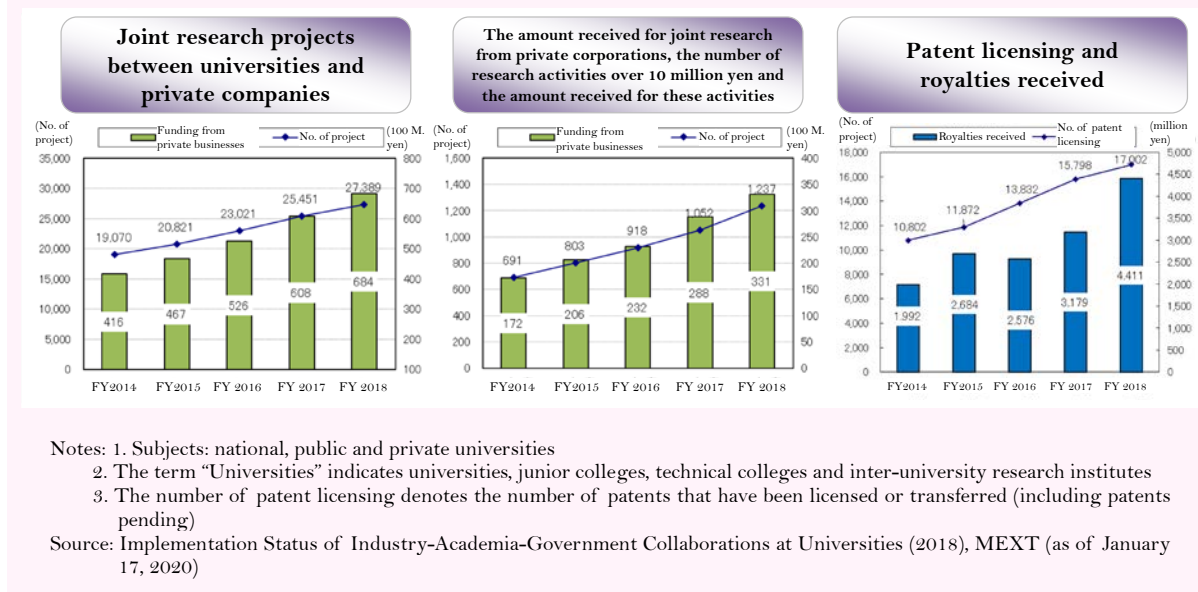
1 Enhancing systems of promotion in companies, universities, and public research institutes

(1) Current status of domestic and international industry-academia collaborative activities

A. Status of industry-academia-government collaboration at universities

Since the corporatization of national universities in April 2004, industry-academia-government collaboration activities have been increasing. In FY 2018, the number of collaborative research activities between universities and private corporations was 27,389 (a 7.6% increase over the previous year) and the amount received for joint research from private corporations was about 68.4 billion yen (a 12.5% increase over the previous year). Among them the number of collaborative research activities over 10 million yen was 1,237, the amount received for this research was about 33.1 billion yen and the number of licensed patents reached 17,002. These numbers also steadily increased from the previous fiscal year (Figure 2-5-1).

■ Figure 2-5-1/Transition in achievements of joint research at universities



B. Activities of the Technology Licensing Organization (TLO)

As of February 1, 2020, 34 TLOs had been approved by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the Ministry of Economy, Trade and Industry (METI) under the Act on the Promotion of Technology Transfer from Universities to Private Business Operators (Act No. 52 of 1998). In FY2018, the number of patent licenses reached 12,032.

In this regard, also as a response to the 4th industrial revolution in recent years, further promotion of the return of research results of universities back to society will contribute to improvement of industrial technology and creation of new business fields. To this purpose MEXT launched “Program to Support Formation of Innovation Management Hub” in FY2019 and has been promoting environmental improvement contributing to effective utilization of intellectual property and formation of joint research at universities through strengthening of the network of universities, industry and TLO.

(2) Development of industry-academia-government collaboration systems at universities

With regard to industry-academia-government collaboration systems for joint research by Japanese universities and National R&D Agencies with foreign enterprises, the government commenced studies on guidelines for collaboration with foreign enterprises while giving consideration to security trade control.

The Government sets a goal to strengthen the industry-academia-government collaboration systems and triple the investment from private businesses to universities and National Research and Development (R&D) Agencies over the next 10 years. To this purpose, at the Council of Industry-Academia-Government Dialogues for the Promotion of Innovation that was held jointly with METI, MEXT formulated the Guidelines for Fortifying Joint Research Through Industry-Academia-Government Collaboration in November 2016, compiling the challenges for universities and National R&D Agencies in strengthening industry-academia-government collaboration and prescriptions for the challenges from the industry perspective. While working to spread the guidelines, MEXT started studies for improvement of the effectiveness of the guidelines in FY2019. In FY2018 the ministry started development of “Open

Innovation System” to encourage private investment by promoting large-scale joint research through development of a system for centralized management of large-scale research that is deeply involved with corporate business strategies (with focus on competing areas).

Further in July 2019, the ministry jointly with Japan Business Federation and METI published the “University Fact Book 2019” to advance “visualization of universities’ efforts for industry-academia-government collaboration.

Under the Industry-Academia Collaborative Support Project, the Ministry of Agriculture, Forestry and Fisheries (MAFF) has allocated industry-academia collaboration coordinators (experts in agriculture, forestry and fisheries and in the food industry) around the country to capture needs, collect and provide research seeds, support industry-academia-government matching, introduce and support R&D funding, and support commercialization.

(3) Enhancement of R&D through industry-academia-government collaboration

The Japan Science and Technology Agency (JST) is conducting the following programs: 1) the Adaptable & Seamless Technology Transfer Program through Target-Driven R&D (A-STEP), which seamlessly covers the exploration of prospective technological seeds developed at universities and public research institutes and their practical application in industry, 2) the Strategic Promotion of Innovative R&D (S-Innovation), which supports R&D carried out under themes selected from excellent research outputs in academia and aims to create technological foundations of new industries, 3) Collaborative Research Based on Industrial Demand, which supports basic research in academia that could resolve technical challenges commonly seen in industry and 4) the Newly extended TEchnology transfer Program (NexTEP) to support private corporations that are working on the large-scale practical application of university research outputs, whose application involves development risks.

The Ministry of Internal affairs and Communication (MIC) is promoting technological and social demonstrations of IoT and a new generation network in industry-academia-government partnership using the NIST comprehensive test bed that has been developed and managed by the National Institute of Information and Communications Technology (NICT).

(4) Preferential treatment to promote R&D investment by the private sector

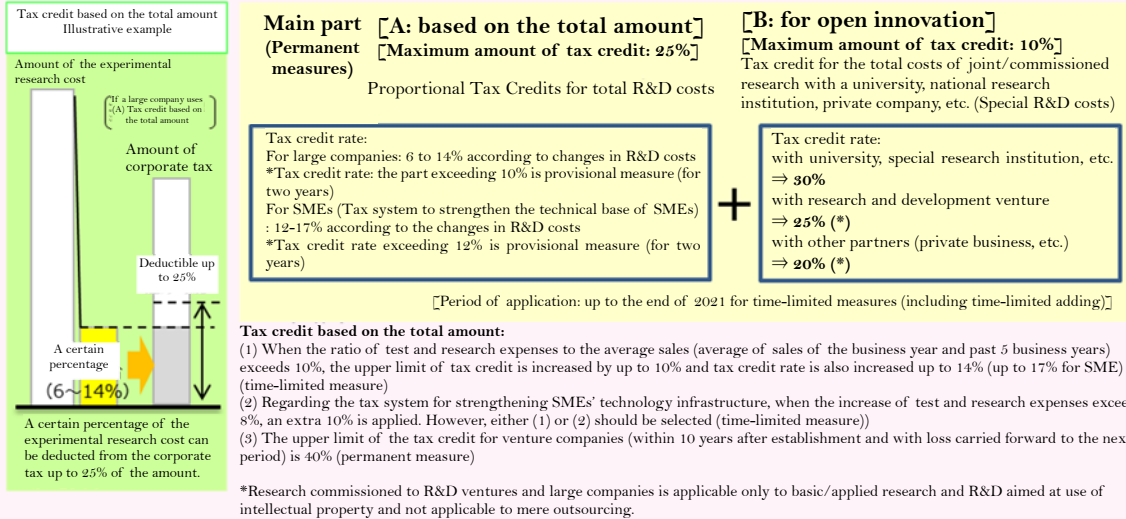
To promote R&D in the private sector, the government provides various tax measures (Figure 2-5-2).

The R&D tax system is a system to allow companies conducting R&D to deduct the amount obtained by multiplying their experiment and research costs by the tax credit rate from their corporation tax as a measure to transform Japan into “the world’s most innovation-friendly country.” The aim is to encourage innovative medium- to long-term R&D contributing to innovation creation through maintenance and expansion of R&D investment by private companies and thereby strengthen Japan’s growth and international competitiveness.

Figure 2-5-2/R&D taxation system

Outline of the R&D tax system

If there is an amount of experimental research expenses to be included in deductible expenses for the purpose of calculation of the amount of income, the amount obtained by multiplying the amount of the experimental research expense by the tax exemption rate may be deducted from the corporation tax of the fiscal year.



Source: METI

(5) Utilization of awards programs and authorization systems

A. The 1st Japan Open Innovation Prize (FY2019)

With an eye toward acceleration of innovation creation in Japan, 14 pioneering or original initiatives/projects that serve as role models of open innovation were given this award by the Prime Minister and other ministers for their contributions to this effort (Table 2-5-3). In FY2019 the Japan Sports Agency Commissioner's Award was established to promote science, technology and learning in the field of sports.

Table 2-5-3/The 2nd Japan Open Innovation Prize

Award	Initiative/project	Key organizations
Prime Minister's Award	Intelligent Robot Controller Development	Mujin, Inc. Kawasaki Heavy Industries, Ltd. NACHI-FUJIKOSHI CORP. Mitsubishi Electric Corporation YASKAWA Electric Corporation
Minister of State for Science and Technology Policy Award	Producing blood in factories- Aiming to commercialize regenerative medicine using iPS cells	Megakaryon Corporation Otsuka Pharmaceutical Factory, Inc. Kyoto Seisakusho Co., Ltd. Satake Chemical Equipment Mfg.,Ltd. CMIC HOLDINGS Co., Ltd.
Minister of Internal Affairs and Communications Award	Hon'yaku Bank, a scheme that brings revolution to the translation industry by realizing high-precision AI translation using big data	National Institute of Information and Communications Technology Kawamura International Co., Ltd. TOIN Corporation AstraZeneca K.K.

Award	Initiative/project	Key organizations
Minister of Education, Culture, Sports and Science and Technology Award	Kyushu Daigaku Kigyobu (a startup activity club of Kyushu University)	Kyushu University QU Ventures Medmain Inc. QB Capital, LLC AGS Consulting Co., Ltd.
Minister of Agriculture, Forestry and Fisheries Award	Life Intelligence Consortium (LInC)	Kyoto University National Institutes of Biomedical Innovation, Health and Nutrition RIKEN Urban Innovation Institute
Minister of Economy, Trade and Industry Award	AI food material inspection device to guarantee “safety and security of food and raw materials”	Kewpie Corporation Shiba Seisakusho k.k. BrainPad Inc. Yanai Denki Co., Ltd. National Institute of Advanced Industrial Science and Technology (AIST)
Minister of Land, Infrastructure, Transport and Tourism Award	Creation of a new society through innovation taking advantage of IoT-FinTech combination	Global Mobility Service Inc. Kawasaki Heavy Industries, Ltd. Toppan Printing CO., LTD. RICOH LEASING COMPANY, LTD.
Minister of Agriculture, Forestry and Fisheries Award	Realization of the “MaaS of things” for expedited delivery of light cargo on the same day covering the entire country	CBcloud Co., Ltd. SAGAWA EXPRESS CO., LTD. ANA Cargo Inc.
Minister of Environment Award	“TABETE” that is an application to solve the food loss problem and social problem through collaboration of local governments	CoCocking co.jp Yokohama City Kanazawa City Hamamatsu City Tokyo University of Agriculture
Japan Sports Agency Commissioner Award	SPORTS TECH TOKYO	DENTSU INC. Dentsu Group Inc. Scrum Ventures
Keidanren (Japan Business Federation) Chairman Award	Utilization of business data by AI/DL human resources Initiative to create opportunities of practice “CDLE HACKATHON”	The University of Tokyo Japan Deep Learning Association (JDLA) connectome.design inc. FiNC Technologies Inc. GAUSS,inc
President's Award, SCJ	Creation of a smart society of health and longevity by pioneering quantum beam applications	Osaka University National Institutes for Quantum and Radiological Science and Technology RIKEN High Energy Accelerator Research Organization (KEK) Sumitomo Heavy Industries, Ltd.
Selection Committee Special Award of the Japan Open Innovation Prize	Development of innovation talents in business engineering course	Osaka University The Kansai Electric Power Company, Incorporated Graduate School of Management, Globis University
	Social implementation of cellulose nanofiber for structure and value creation in cross-field partnership - Connecting forests and shoes -	Kyoto University Kyoto Municipal Institute of Industrial Technology And Culture ASICS Corporation SEIKO PMC CORPORATION

B Research support service/partnership authorization system

In October 2019 MEXT established the “Research support service/partnership authorization system” to authorize private research support services that meet certain requirements as “research support service/partnership.” The aim is to improve the research environment for researchers, promote science and technology and accelerate innovation creation in Japan, while at the same time supporting development of diverse activities related to research support service. For FY2019: the first year of the system, eight services were authorized in March 2020 (Table 2-5-4).

■ Table 2-5-4/Services authorized under the Research support service/partnership authorization system in FY2019

Service	Business operator	Outline of the service
Impact Science	Cactus Communications K.K.	International research PR service
L-RAD	Leave a Nest Co., Ltd.	Industry-academia matching service using information of unsuccessful applications for competitive funds, for example
Research equipment sharing service	JEOL Ltd	Service to provide researchers with physical, chemical and measuring devices based on pay per use
JDream Expert Finder	G-Search Limited	Collaborator search service that can discover young researchers
Japan Digital Archives Center (J-DAC)	MARUZEN-YUSHODO Company, Limited	Online provision of valuable historical materials
University collaboration project “Security contribution”	Music Securities, Inc	Support for raising contributions to university education and research
BRAVE	Beyond Next Ventures Inc.	Commercialization support program for university researchers, etc.
Recycle network, multi-vendor support, lab stock support ZAICO ZAI	RIKAKEN HOLDINGS CO., LTD., Hitachi Capital Services Co.,Ltd., ZAICO Inc.	Package service of research equipment from asset management to maintenance and secondhand equipment trade

2 Inducing a virtuous cycle of human resources for innovation creation

For innovation creation, it is necessary to promote mobility of the world’s leading researchers across organizational barriers of universities, public research institutions and companies.

The cross appointment system enables researchers to work employed by an organization and engage in R&D and education according to their role at the respective organization based on an agreement on temporary transfer among multiple organizations and under a certain degree of defined effort management. MEXT, METI and other ministries/agencies concerned are promoting the system (Chapter 4, Section 1, 2 (3)).

MEXT is also conducting review toward flexible direct cost expenditure to enable paying of labor costs to the principal researcher (Chapter 4 Section 3, 3).

3 Creating “spaces for co-creation” to concentrate human resources, knowledge, and capital

(1) Developing platforms for industry-academia-government collaboration

To promote STI promptly and effectively, it is necessary to develop forums for industry-academia-government collaboration. Since FY2019 JST has been promoting the projects (a) to (d) below integrally under a framework: “Open Innovation Platform for Industry-Academia Co-creation.”

A. Formation of a world-leading locally oriented R&D and demonstration base

JST has been implementing Research Complex Program towards the creation of world-class innovations and regional revitalization. The program aims to develop research complexes to assist local industries, universities, governments and financial institutions in their efforts for commercialization of the results of advanced and collaborative R&D by researchers in different fields in Japan and abroad, which is integrated with human resource development. In FY 2019, the ministry provided support for three complexes (Figure 2-5-5).

Figure 2-5-5/ Research Complex Program

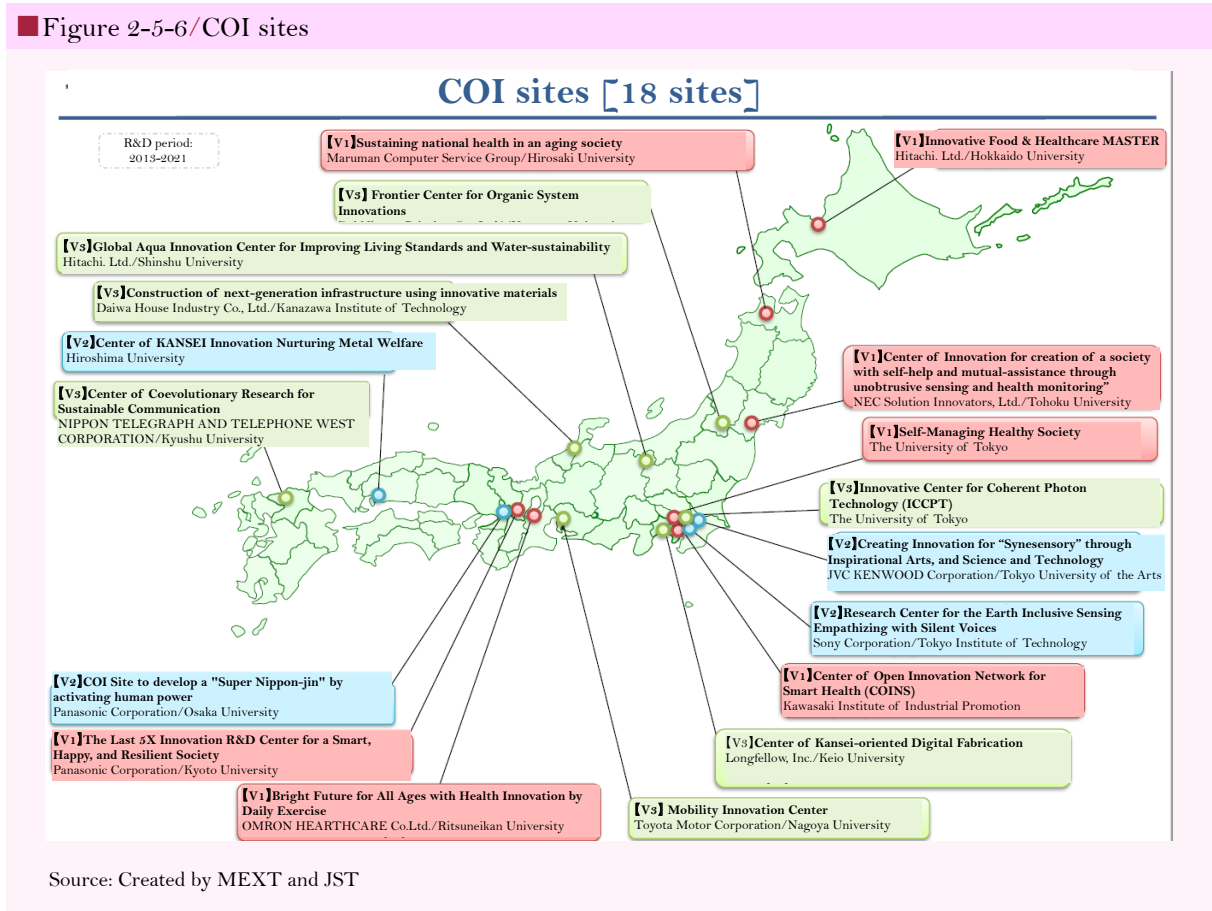


B. Developing centers for the creation of cutting-edge innovation

Since FY2013 JST has been implementing the Center of Innovation (COI) Program. Under the Center of Innovation (COI) Program, R&D is promoted in 18 bases to realize cutting-edge innovations in industry-

academia collaboration (Figure 2-5-6) (Part I, Chapter 3 Section 2).

Figure 2-5-6/COI sites



C. Forming Open Innovation Platform with Enterprises, Research Institute and Academia

Japan Science and Technology Agency has been implementing the Program on Open Innovation Platform with Enterprises, Research Institute and Academia (OPERA) since FY2016. Using funds for matching with private companies, the program aims to realize full-scale industry-academia partnership at the organization level toward full-fledged open innovation in Japan. The activities under the program include: integrated promotion of large-scale joint research in noncompetitive fields in consortiums of multiple companies, human resource development of master's course students and reform of industry-academia partnership of universities.

D Exploration of technology seeds and promotion of R&D projects by AIST

The National Institute of Advanced Industrial Science and Technology (AIST) has been exploring technological seeds and promoting R&D projects while capturing the various technological needs of industry and society. Specifically, AIST is promoting activities of TIA¹ as an open innovation hub, while participating in its 17 Technology Research Associations as part of the effort to form a place of co-creation (as of February 10, 2020.)

1 Tsukuba Innovation Arena

(2) Developing open innovation centers

A. Tsukuba Science City

Tsukuba Science City has been developed as a center of R&D and education of the highest level in Japan, away from the congestion of Tokyo. The city has approximately 150 research institutes and corporations, including 29 national experimental research and education institutes, and has been promoting many governmental plans, such as those for research exchanges and the functional improvement of international research exchanges.

TIA is a center of open innovation operated under the leadership of four public organizations in the city (NIMS, AIST, Tsukuba University and the High Energy Accelerator Research Organization) and the University of Tokyo. In FY2019: that was the 10th year after its establishment, a venture company that uses algae to produce functional food material emerged from a task adopted by Kakehashi: TIA collaborative research program. New Energy and Industrial Technology Development Organization (NEDO), JST, Japan Agency for Medical Research and Development (AMED) and others launched large research projects also in the fiscal year. TIA held the “TIA Graduate School Summer Open Festival” as its human resource development project and “Nanotech CU PAL¹” aimed at development of young researchers.

B. Kansai Science City

Kansai Science City is promoting the construction of towns that will play a role as bases for developing the world’s culture, science and research and the nation’s economy. As of the end of FY2019, it had around 150 facilities at which various research activities were under way.

(3) Promoting Open Innovation Platform for industry academia partnership in diverse fields

MAFF has been promoting development of the Field for Knowledge Integration and Innovation (FKII)[®] to promote technological innovation and realize commercialization based on the market needs at an unprecedented pace by introducing innovative technologies of various fields into agriculture, forestry, fisheries and foods.

In April 2016 MAFF set up the Council of Industry-Academia-Government Collaboration of the FKII. As of December 2019 the council had 3,269 members including companies from diverse industries, with 156 R&D platforms set up to work on specific research tasks. In addition, the R&D platforms formed a research consortium to conduct innovative R&D, which has supported R&D of 62 tasks through projects based on requests for proposals using the matching fund method.

(4) Creating an environment that facilitates matching of technology seeds and needs

MEXT and METI, in cooperation with the JST and New Energy and Industrial Technology Development Organization (NEDO), held the Innovation Japan 2019 - University Trade Fair & Business Matching Event, which was Japan’s largest matching forum, with people gathering from universities, public research institutions and private corporations at Tokyo Big Site on August 29 and 30, 2019.

In cooperation with the relevant ministries and institutions, MAFF holds the Agribusiness Creation Fair

¹ Nanotech Career-up Alliance

every year. The objective is to exhibit technology seeds from private corporations, universities, public experimental research institutions and independent administrative institutions, and to promote collaboration with institutions which are in need of technology. In FY 2019, the exhibition was held in November in an exhibition hall where private corporations were promoting industrial use of their new technologies. At the fair, 134 institutions from throughout Japan exhibited their seeds and about 36,000 people attended.

■ Table 2-5-7/ Major measures for strengthening of the system to promote open innovation (FY2019)

Ministry	Implemented by	Project
MEXT	MEXT	Development of an open innovation organization

Section 2 Enhancing the Creation of SMEs and Startup Companies to Tackle New Business Opportunities

Entrepreneurial startups of modest size that are flexible and quick in making decisions are better suited to innovation and the commercialization of technological seeds in a short period of time. It is important to build a system for continued and effective support in close industry-academia-government collaboration to support business activities of small and medium-sized enterprises and startups toward speedy creation of new markets.

1 Cultivating entrepreneurship

Since FY2017 MEXT has been implementing Exploration and Development of Global Entrepreneurship for NEXT generation (EDGE-NEXT) to enhance creation of startups in Japan through an entrepreneur development program for undergraduate and graduate students, young researchers and others.

2 Promoting the creation of startups at universities

The number of university-launched startups was on the decrease for a period of time, but has been increasing in recent years, reaching 185 in FY2018. For the future, it is necessary to improve the environment for sustainable management including business tasks such as market cultivation toward creation of high-quality university-launched startups that can identify true market needs and grow into global businesses.

The JST implements the Program for Creating Start-ups from Advanced Research and Technology (START). Under this program, from the stage before starting business, it provides supports for creation of university-launched startups with growth potential by combining public funds and commercialization knowhow in the private sector. Since FY2017 START includes program of Start-up incubation from Core Research (SCORE) that provides human resources who are willing to undertake social implementation of research results with entrepreneurship education and supports their exploration for business models. In addition, the Support Program of Capital Contribution to Early-Stage Companies (SUCCESS) invests in the foundation and capital increases of startups that utilize R&D outcomes of the JST, or offers labor and technical support whereby early-stage startups can promote the commercialization of R&D results through

their business activities.

3 Creating environments conducive to new business

(1) Create startup ecosystem to compete with the world's top ecosystems

Toward solution of social challenges through creation of a startup ecosystem and innovations, the Cabinet Office, MEXT and METI formulated “Beyond Limits. Unlock Our Potential - Strategies for creation of startup ecosystem to compete with the world top ecosystems-” in June 2019. Based on the strategies, the ministries together with cities and universities have been promoting creation of startup ecosystem centers to compete with the world's top ecosystems through globally-oriented entrepreneur education and dramatic strengthening of the accelerator function. For the purpose of creation and development of a Japanese-style startup ecosystem taking advantage of excellent human resources, strength of R&D activities, corporate activities, funds and other strengths of the country, cities with a certain accumulation of resources and potential are designated for focused support as city where local governments, universities, private organizations, etc. collaborate to create a startup ecosystem.

(2) Support for R&D-type startups

Through NEDO, METI is implementing the R&D-based Startup Support Program with integrated support ranging from discovery of technology seeds to their commercialization in Japan. In addition, METI surveyed and summarized the actual state, challenges and precedents of collaboration through questionnaires and hearings and published the result as “Handbook for collaboration (first edition)” for people responsible for outside-company collaboration at both operating companies and ventures in May 2017. In June 2018, the “Handbook for collaboration (second edition)” was published for people responsible for outside-company collaboration at operating companies. The second edition summarizes challenges (obstacles) in operation faced by operating companies and compiles precedents to serve as countermeasures based on the results of company hearings, case research, etc. in Japan and abroad. In April 2019, METI implemented case research, etc. in Japan and abroad with focus on Corporate Venture Capital (CVC) that is attracting attention as a method for collaboration in recent years and conducted study together with people responsible for outside-company collaboration at operating companies, venture company executives, university personnel and experts for legal affairs and IP. Results were compiled and published as the “Handbook for collaboration of operating companies and R&D oriented ventures (third edition)” for people responsible for CVC at operating companies.

(3) Support by the Small Business Research System (SBIR system)

Under the small business innovation research (SBIR) system, subsidies and commissions have been granted (special subsidies) to provide small and mid-sized businesses and private persons not running a business¹ with assistance for R&D on new technologies. Several industrialization support measures, including the provision of special loans by the Japan Finance Corp., have also been taken. In FY 2019, seven ministries (MIC, MEXT, MHLW, MAFF, METI, MLIT and MOE) designated 98 special subsidies in all and earmarked about 46 billion yen as expenditures for small and medium enterprises (SMEs) and

¹ For example, university researchers and other individuals who intend to start a new business or establish a company.

micro enterprises. For the purpose of creating innovation, the system is positioned in “the Act on Activation of the Creation of Science and Technology Innovation” and an amendment bill to strengthen cross-ministerial collaboration led by the Cabinet Office was presented in the 201st Diet session (see Part I Chapter 3 Section 1-1.)

4 Helping initial demand and endorsing the trustworthiness of new products and services

(1) Development and strengthening of SMEs and startups using public procurement

In order to support startups and SMEs through public procurement, the Cabinet Office implemented the “Cabinet Office Open Innovation Challenge 2019.” This project where startups, SMEs and others tackle themes set based on specific problems of ministries, agencies and local governments is expected to contribute to discovery and commercialization of new technologies and ideas. Applicants of adopted 11 proposals were given advice from advisors provided by the Cabinet Office and opportunities to meet responsible persons of the ministries, agencies and local governments

Section 3 Strategic Use of International Intellectual Property and Standardization

In order to further improve the quality of intellectual property management, it is important to develop a strategy to not only use but also to maximize the value of our IP. To this end, we promote incorporation of IP and standardization strategies into business strategy, while at the same time encouraging creation of new open innovations through heightened awareness of IP holders and utilization of patents.

1 Promoting use of IP assets in innovation creation

In response to changes in the world innovation environment, the following approaches towards the development and implementation of international standardization strategies, the review of IP systems and the improvement of IP-related systems have been promoted.

(1) IP (IP rights/R&D data) management of the government’s R&D projects

A. Initiatives concerning patent rights and other intellectual property rights

In order to commercialize national R&D results as much as possible, METI ensures appropriate IP management for each R&D project commissioned by the government based on the Guidelines for IP management in commissioned R&D” (May 2015).

In national R&D pertaining to agriculture, forestry and fisheries, MAFF is working on IP management assuming commercialization of research outcomes from the initiation stage of research based on the Intellectual Property Policy for Agriculture, Forestry and Fisheries” (February 2016).

B. Initiatives concerning R&D data

In the light of the progress of the 4th industrial revolution, METI developed the Guidelines for Data Management in Government-commissioned Research and Development (December 2017) in order to create new businesses and strengthen competitiveness by promoting utilization of R&D data. Based on the

guidelines, the ministry launched the Natiopro Data Catalog¹ to register available R&D data in March 2018.

(2) Development and provision of patent information

To respond to the increasingly sophisticated and diversified user needs, the Japan Patent Office (JPO) through Patent Information Platform (J-PlatPat²) operated by the National Center for Industrial Property Information and Training (INPIT) has provided patent information of Japan, China, South Korea and other foreign countries.

JPO also provides patent information of some ASEAN³ countries through FOPISER⁴.

Furthermore, in order to help promotion of open innovation the INPIT provides a data base service covering information on licensable patents and research tool patents which companies, universities, public experiments and research institutions, etc. intend to license or transfer.

The JST is making efforts that range from the discovery of high-quality research achievements through support for patent acquisition and onward to industrialization. Specifically, the agency is giving full support to the utilization of intellectual property through the Promotion of the Use of Intellectual Property. This includes supporting the strategic acquisition of foreign patents by universities through use of their research results, collecting and packaging some patent rights scattered across some universities for more efficient use and offering patent information to universities free of charge through the Internet (J-STORE⁵).

(3) Acceleration of the examination

To meet the need among patent applicants for expedited patent rights acquisition, the JPO has conducted an accelerated examination that applies under certain conditions. Additionally, they have, since August 2011, been implementing the Accelerated Examination and Accelerated Appeal Examination to Support Recovery from Earthquake Disasters, in order to speed the examination of patent applications from people and business facilities affected by earthquakes, so as to allow them to apply intellectual property towards restoration.

(4) Developing and strengthening patent examination system

The JPO worked to maintain and improve its examination capacity also in FY2019 by re-employing some examiners under limited-time contracts after the termination of their term, for example. Continued efforts were also made for development and strengthening of the patent examination system.

(5) Collective examination for IP portfolio supporting business activities

In recent years, along with the globalization of business activities and the diversification of business structure, the intellectual property strategies of businesses have been changing to those that originate from their business. The JPO studied a new examination system to meet the needs of patent applications in response to the Global IP Initiative. The JPO has conducted a new initiative, collective examination for IP portfolio supporting business activities, under which it examines applications and grants rights

1 https://www.meti.go.jp/policy/innovation_policy/datamanagement.html

2 <https://www.j-platpat.inpit.go.jp/>

3 Association of South-East Asian Nations

4 Foreign Patent Information Service <https://www.foreignsearch2.jpo.go.jp/>

5 <https://jstore.jst.go.jp/>

interdisciplinary according to the timing of the applicant's business development, in order to support applications for comprehensive intellectual property. The new initiative applies to groups of intellectual rights (i.e., patents, design rights and trademarks) that are associated with domestic and overseas projects.

(6) Implementation and the publication of a survey on technology trend

There are calls for coordination between R&D strategies and intellectual property strategies, to facilitate the utilization of patent information on R&D. Therefore, the JPO has comprehensively analyzed technology trends by analyzing patent application trends in light of R&D trends and market trends. It has published the results.

(7) Experts' support for IP utilization

JPO launched the "Project for Dispatching IP Strategy Designers to Universities" in FY2019 to help universities identify research results whose IP rights are not protected and formulate their IP strategy. 22 IP designers have been dispatched to 28 universities. Through INPIT the office also continues the "Project for Dispatching IP Producer" and "Project for Dispatching IP Advisor for Industry-Academia Collaboration." The former supports activities to accelerate social implementation of research results at universities, R&D consortiums, etc. promoting publicly-funded R&D projects that promise innovative results. The latter supports IP management at universities deploying industry-academia collaboration toward commercialization. In FY2019, 22 IP producers were dispatched to 39 projects and 9 IP Advisors for Industry-Academia Collaboration were sent to 22 universities.

In order to assist in the formulation of research plans that are to be implemented in collaboration among universities, national R&D agencies and public experimental research institutions under national research projects, etc. MAFF deploys approx. 150 coordinators throughout the country who are specialized in the agriculture, forestry, fisheries and food industries. This support includes the introduction of viewpoints of the management of technology (MOT), including the strategic use of intellectual property.

(8) Efforts for security export control

In FY2019 METI in cooperation with MEXT and other ministries/agencies concerned promoted strengthening of systems of universities, etc. to prevent the leak of technical information by: (1) holding briefing sessions on security trade control for universities, etc.; (2) dispatching export control experts to universities, etc.; (3) supporting network construction by people in charge of export control at universities and national research and development agencies; (4) providing education materials for researchers, for example.

(9) Efforts for management of technical information

The revised Act on Strengthening Industrial Competitiveness that was enacted in May 2018 established a system where companies can receive certification for appropriate management of important information held by them from a certification body authorized by the government (as of the end March 2020, five certification bodies were authorized.). In FY2019 brochures were distributed at chambers of commerce and industry, Bureaus of Economy, Trade and Industry and other appropriate places and 32 seminar sessions were held across the country in order to spread the system.

2 Accelerating strategic international standardization and enhancing related support systems

(1) Promoting an intellectual property strategy and an international standardization strategy

With the progress of economic globalization, the importance of various intellectual activities that are sources of economic growth has been increasing. To enhance the competitiveness of Japanese industries and improve the lives of the citizens, it has become important for Japan to create advanced technologies and rich culture, and to link these to the creation and expansion of businesses. The Intellectual Property Strategy serves as the foundation for such activities.

In June 2019 the Intellectual Property Strategy Headquarters decided the “Intellectual Property Promotion Plan 2019.” This is the first plan for implementation of integrated and consistent IP strategy toward realization of the “Value Design Society” held up in the “Intellectual Property Strategy Vision” (decided by the Intellectual Property Strategy Headquarters in June 2018) that is a medium- to long-term vision on IP strategy. The Promotion Plan includes: “Fostering the creativity and advancement of edgy human resources,” “Support for strengthening intellectual property strategies of local and small and medium-sized enterprises,” “Promotion of open innovation,” “Establishment of systems and rules to promote the appropriate use of data, AI, etc.,” “Construction of a creation ecosystem” and “Sustainable Strengthening of the Cool Japan Strategy.” Following the plan, the Intellectual Property Strategy Headquarters has been leading the activities to promote the Intellectual Property Strategy in collaboration with the ministries and agencies concerned.

(2) Active efforts for international standardization

In order to strengthen the competitiveness of our industries in the global market, the amended Industrial Standardization Act was fully enforced On July 1, 2019. The amendment includes expansion of the coverage of the Japan Industrial Standard (JIS Act) to services, etc. and introduction of a system that enables speedy establishment of JIS.

The “Follow-up on Growth Strategy” (Cabinet Decision on June 21, 2019) and “Integrated Innovation Strategy 2019” (Cabinet Decision on June 21, 2019) states: “Toward enhancement of standardization activities in R&D, strengthen standardization functions of AIST and share standardization management methods of NEDO, etc. among national research institutes.” To this purpose, the government conducted study for establishment of a standardization promotion center (tentative name) at AIST and surveyed the actual conditions toward the goal of sharing of standardization management methods.

Specifically, international standardization was carried out on lifecycle and quality assurance of AI as part of “international standardization development activities in the government’s strategic fields in 2019.” AIST is playing the central role in the promotion with participation of several private businesses. For strategically important R&D themes and cross-cutting themes, a system to promote international standardization activities has been developed in cooperation with National R&D Agencies and private businesses. For human resource development, training courses are provided to develop young human resources who will lead international standardization based on the “three action plans to develop human resources for standardization (made public in FY2016).” METI also supported human resource development for standardization at universities by disseminating education materials for university teachers (faculty development teaching materials), and sending METI personnel for lectures on

standardization at universities. Furthermore, the Ministry has established standardization qualification schemes through the Japanese Standard Association (JSA).

The ministry has been conducting overseas technical cooperation for collaboration with European and Asian countries in international standardization activities and promotion of their active participation. In FY2019 METI participated in a meeting that gathered standardizing organizations of 24 countries and regions in the Pacific area and a meeting of standardizing organizations and businesses concerned gathered from Japan, China and South Korea and discussed possible fields of cooperation for standardization. METI has been working to strengthen cooperation with Asian countries in international standardization activities by holding human resource development seminars for Asia in cooperation with the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) and also advancing a project for international harmonization and standards development/dissemination at the Sub-Committee on Standards and Conformance of the Asia-Pacific Economic Cooperation (APEC).

Based on recommendations of the Telecommunications Council and others, MIC is promoting R&D and demonstration experiments as well as standardization activities at de jure standardization organizations such as the ITU¹ and standardization forums toward international standardization of information communication technologies (ICT) in the wireless factory, smart home and other priority areas.

Water supply has been included as a specific strategic field for international standardization, so the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and the Ministry of Health, Labour and Welfare (MHLW) are promoting its strategic international standardization under the IP Promotion Plan to ensure that Japanese corporations launching water supply and sewerage system businesses in the global market can achieve high competitiveness. Currently Japan is playing active and leading roles in the working groups, etc. on “Water Reuse (ISO/TC282),” “Sludge recovery, recycling, treatment and disposal (ISO/TC275),” “Asset management (ISO/TC224/WG6 and ISO/TC251),” “Stormwater management (ISO/TC224/WG11),” and “Risk management (ISO/TC224/WG7).”

(3) Promotion of the Global IP Initiative

Amidst growing economic globalization and open innovation, the JPO is promoting the Global IP Initiative (laid out by the JPO in July 2011) to incrementally improve global IP infrastructure, so that Japanese companies can smoothly engage in business internationally. Currently, the JPO is implementing the “patent prosecution highway (PPH)” with 44 nations (as of January 2020). This will allow patent applicants whose patents have been deemed patentable to apply for early examination in other countries. As a new effort to contribute to international cooperation in patent examination, the JPO and the U.S. Patent and Trademark Office (PTO) have conducted the JP-US Collaborative Search Pilot Program on August 1, 2015. Under this program, the patent examiners in Japan and the U.S.A. conduct independent searches on advanced technology applications and share the search results and opinions before forwarding the examination results to the patent office of each country. For Patent Cooperation Treaty (PCT) international application, the Patent Cooperation Treaty Collaborative Search and Examination (PCT CS&E) has been implemented since July 1, 2018. Under PCT CS&E, five offices of Japan, the U.S., EU, China and South Korea collaborate to produce international search reports.

¹ International Telecommunication Union

Section 4 Reviewing and Improving the Regulatory Environment for Innovation

In order to ensure speedy commercialization of knowledge and technologies that are the source of innovations, and their adaptation to the exponential development of ICT, the government will review the systems for new products and services to maximize innovations' potential to change society.

1 Reviewing systems in accordance to new products, services, and business models (1) Regulations and systems for accelerating innovation

Although regulations and systems have been established for the promotion of safe, smooth R&D, these could potentially impede innovation due to excessive strictness. The Japanese government has been promoting a system called “National Strategic Special Zones.” The system is positioned as a breakthrough point for regulator and system reforms under the Japan Revitalization Strategy. In addition, the conventional “Comprehensive Special Zone System” and other special zone systems are expected to be increased. These systems are expected to accelerate innovation.

A. Efforts for National Strategic Districts

Toward realization of the Super City vision aimed at completion of the “future city” that will create a future society using the latest technologies including AI and big data before the rest of the world, the government submitted a bill to amend the Act on National Strategic Special Zones: which includes development of systems for this purpose, to the 201st Diet session, while conducting studies and taking necessary budgetary measures to ensure interoperability of data coordination platforms. The bill also includes establishment of a regional sand box system for speedy and smooth implementation of demonstration experiments of advanced and innovative near-future technologies including automated driving, unmanned aircraft (drone) and related radio use. In National Strategic Special Zones, the government will continue to reform extremely restrictive regulations and accelerate nationwide expansion of special zone achievements with high economic effect and without particular harmful influence, in the order of need.

B. Efforts for the Comprehensive Special Zone System

The government designated International Strategic Zones, in order to form industrial and functional clusters that will drive Japan's economic growth. It has also designated Comprehensive Special Zones for Local Revitalization to strengthen regions through local vitalization in which the use of local resources is maximized, and it has been comprehensively supporting these zones through preferential measures on regulations and support measures regarding taxation and financing.

2 Improving IP systems in response to the tremendous development in ICT

In the age of the 4th industrial revolution, use of new information properties including AI creations, 3D data and databases whose creativity is hard to recognize will spread beyond contents industries (e.g. novels, music and paintings) to other industries (manufacturing, agriculture, advertising, insurance and financial, transportation, healthcare, etc.) Building an IP system that forms their foundation has become increasingly

important in order to strengthen our industrial competitiveness.

In this context, The Intellectual Property Strategy Headquarters states, in the IP Promotion Plan 2019, that the headquarters will consider establishment of rules concerning copyrightability of creation of AI when necessary according to the status of utilization of data, AI, etc. Regarding the patent system, the headquarters states that whether or not it is necessary to establish a system to distinguish the part solely created by AI from the part with human involvement can be a future issue.

At the committee on the approach to IP system with the 4th industrial revolution in mind, METI studied corporate strategies in response to the 4th industrial revolution and the intellectual property system and operations that support the strategies, and compiled a report in April 2017. For the initiatives that the report found appropriate to implement in the future, the government submitted to the 2018 regular diet session “a bill to partially amend the Unfair Competition Prevention Act, etc.” which includes the Unfair Competition Prevention Act, the Industrial Standardization Act and the Patent Act, in order to develop an IP system environment in response to the 4th industrial revolution. The Act was enacted on May 25 of the same year and promulgated on the 30th of the same month, and its provisions relating to technological restriction measures, shared data with limited access, expansion of the fields covered by JIS, introduction of a system that can speed up JIS establishment and in-camera system were enforced.

To ensure appropriate protection of AI-related inventions, JPO published examples of patent examinations on AI-related technologies in January 2019 and widely publicized the examples among users through various briefings, international conferences, international symposium and other occasions.

■ Table 2-5-8/Major measures toward realization of Society 5.0 (FY2019)

Ministry	Implemented by	Project
CAO	Office for Promotion of Overcoming Population Decline and Vitalizing Local Economy in Japan,	Project to promote Super City development

Section 5 Developing Innovation Systems that Contribute to “Regional Revitalization”

We can find strengths and buds to create innovations in various regions. In order to make use of regional features to create new products/services and increase added-value of the existing industries, it is important to build an autonomous and sustainable innovation system in each region.

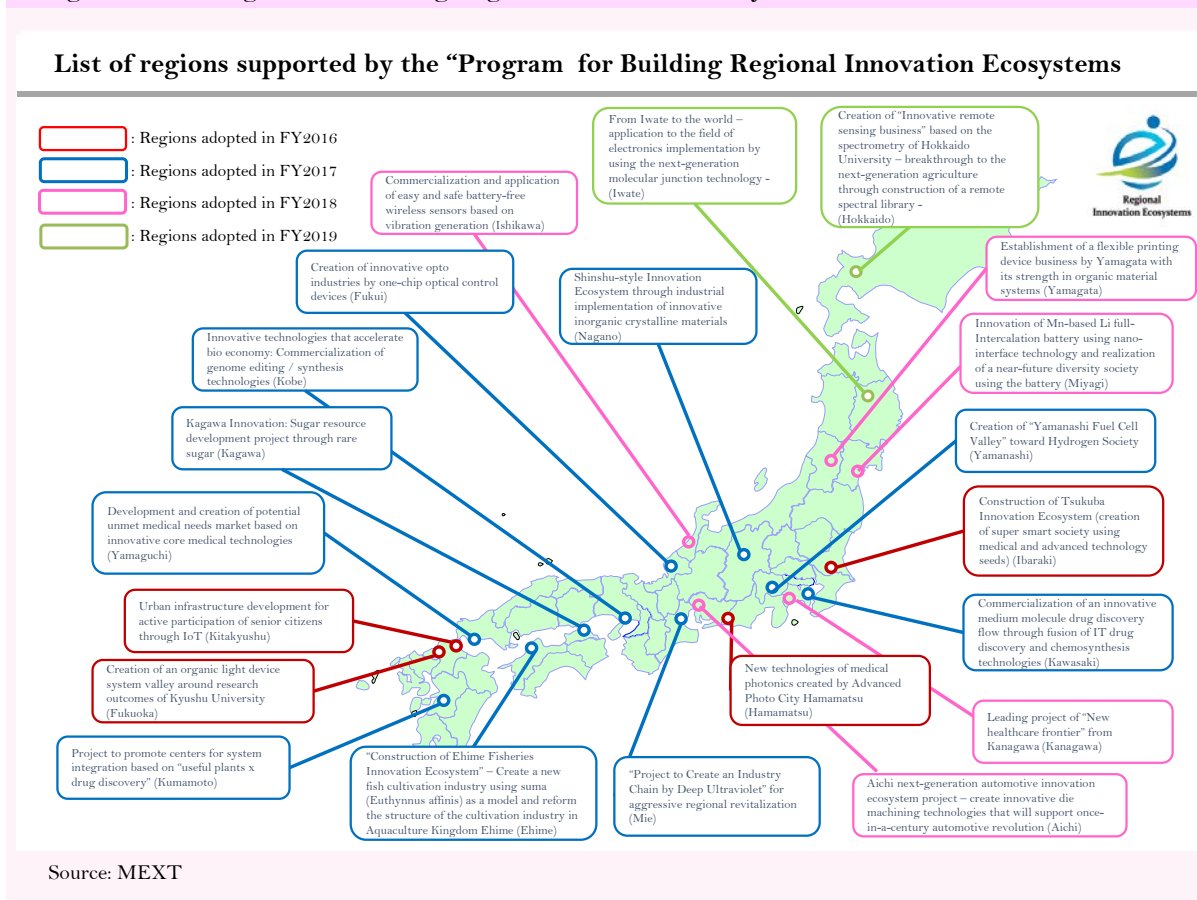
1 Revitalizing regional companies

Toward formation of regional innovation ecosystem and regional revitalization, it is necessary to shift from the stage of quantitative expansion of mechanism building to start innovation to the stage of using regional technology seeds to create successful models with a large social impact with an eye to their global expansion. To this end, MEXT launched the “Program to build regional innovation ecosystems” in FY2016. Under this program, MEXT is supporting commercialization projects with high risk but big social impact by setting up project producing teams in regional universities that are trying to contribute to the growth of the region, gathering human resources and technologies around the source of the regional

competitiveness (core technology, etc.) and developing a commercialization plan that can be globally deployed. 21 regions have been adopted in total by FY2019 (Figure 2-5-9).

In order to support attempts to open up a new field or launch a new business by enterprises that will lead local economies, METI is pushing construction of support networks of organizations (e.g. universities, public testing/research laboratories, financial institutions) supporting regional innovation, and comprehensive support by these networks in accordance with the development stage of the business. In addition, METI established the “Global Network Council” by organizing experts in the international markets and other areas. The council is supporting development of commercialization strategies and cultivation of markets with a view to the global market.

Figure 2-5-9/Program for Building Regional Innovation Ecosystems



By utilizing the New Market Creation Standardization System, the ministry decided on the standardization of 32 items that had been proposed by well-established businesses from 2014 to the end of March 2020. In addition, METI expanded the partner organizations of the Partnership System for Supporting Utilization of Standardization to 164 in 47 prefectures across the country in the period from 2015 to the end of March 2020. Under this system, local authorities and business promotion organizations, local financial institutions, universities and public research institutions (partner organizations), and the Japanese Standards Association work in collaboration and provide information and advice to local businesses on their strategic utilization of standardization.

2 Driving innovation ecosystems that make use of local characteristics

(1) Development of a regional innovation system

Toward realization of the “Future Vision” of individual regions, MEXT launched “DEaling with Social Issues in ReGioNs through Science and Technology Innovation (DESIGN-i)” in FY2019 and adopted four regions. DESIGN-I aims to construct needs-pull regional innovation ecosystems and reform of the communities through support for activities to solve various social obstacles for the realization of the “Future Vision” by science technology innovation.

Under the Strategic Information and Communications Research and Development Promotion Program (SCOPE) and based on the 1st and 2nd Interim Reports on Desirable New Information Communication Strategy” MIC has been promoting R&D of ICT that will contribute to creation of new value, change of social systems, regional vitalization and problem solution while keeping in mind practical application and social implementation in response to the era of IoT/BD¹/AI.

In order to facilitate innovation creation and productivity improvement by local companies amid rapid progress of technological innovation, through the “regional innovation infrastructure project” METI is supporting early introduction of advanced equipment and human resource development, which contributes to establishment of an enterprise support system by public testing/research laboratories and universities.

In order to create innovations in the fields of agriculture, forestry, fisheries and food under “the program to promote research for innovation creation” implemented by NARO Bio-oriented Technology Research Advancement Institution (BRAIN), MAFF is promoting R&D based on proposal solicitation with focus on R&Ds that combine diverse knowledge and technologies in various fields. It specifically supports research on local innovation strategies. In addition, MAFF has assigned industry-academia-university collaborative coordinators nationwide who are experts in agriculture, forestry and fishery and on food industries. They promote R&D in these fields through collection/identification of needs and collection/provision of seeds while supporting industry-academia-government matching, introducing and supporting R&D funding and supporting commercialization. MAFF also hosts local matching forums to support local R&D and the diffusion of technology.

AIST is working in close coordination with public experimental research institutions (PERIs) through human exchange to discover needs of local companies and provide them technical support using technology seeds of AIST. Specifically, AIST commissions or employs 134 PERI personnel and former senior officials as AIST Innovation Coordinators who coordinate “bridging” to local companies, and has been strengthening the cooperation system among PERIs as well as their cooperation with AIST through the Industrial Technology Liaison Council and also supporting improvement of technical abilities of personnel and human resource development at PERIs. Furthermore, AIST is actively promoting cooperation with local authorities by signing a comprehensive agreement, and cooperation in the technical field suitable for the characteristics of the regional industry by using the subsidy program of local authorities. This way, by transferring its technical seeds to business activities at the local and national levels to contribute to technical competitive power of local companies, AIST is working on regional revitalization.

¹ Big Data

(2) Supporting protection of regional IP

JPO conducted visiting interviews where examiners and appeal examiners travel to interview places across Japan, TV interviews in which applicants can participate using their own personal computer through an internet channel, and circuit appeal/trial board for oral proceedings across Japan. Using INPIT¹ Kinki Headquarters (INPIT-KANSAI) the JPO provided local IP support with focus on Kinki District.

3 Promoting policies that encourage local initiative

(1) Support for independent and sustainable regional growth

Support from a medium- to long-term perspective is important for individual regions to build their innovation system based on their respective strengths toward independent and sustainable growth.

The Cabinet Office is making a study on setting inspection indicators so that ministries, agencies and local authorities can understand the situation of Innovation Ecosystem in the regions.

Toward the “goals to be achieved by 2019 with consideration of the characteristics of each prefecture” that were set based on the action plan for revitalization of regional IP formulated in September 2016, the JPO provided support for the regions and SMEs and examined the current challenges and future improvements. In order to continue the support for the regions and SMEs in the next fiscal year and after, JPO is conducting studies toward formulation of the second action plan for revitalization of regional IP.

■ Table 2-5-10/ Key measures for construction of an innovation system that will contribute to Regional Vitalization (FY2019)

Ministry	Implemented by	Project
MAFF	Bio-oriented Technology Research Advancement Institution, NARO	Program to promote research for strengthening of innovation creation

Section 6 Cultivating Opportunities for Generating Innovation in Anticipation of Global Needs

In response to global challenges including energy, resources and food security and natural disasters, we will explore opportunities to create innovations by strategically taking leadership using our technical capabilities and experience in field implementation and anticipating future needs.

1 Promoting R&D that anticipates global needs

For the purpose of referring to overseas information in formulating policies on science and technology, a system needs to be created for the continuous collection, accumulation and analysis of overseas information in a structured and organized manner, and for the use of such information across multiple sectors and disciplines. MEXT and other organizations have been working on this.

As part of its exploration and analysis of long-term changes toward R&D meeting global needs in the future, the National Institute of Science and Technology Policy (NISTEP) has been conducting science and technology foresight surveys every 5 years or so since FY 1971 and published the report of the 11th survey in December 2019. This survey studied the “future image of desirable society” and “medium- and

¹ National Center for Industrial Property Information and Training

long-term perspective of science and technology development” and presented a conceptual scenario: “flexible society brought about by reviving and rethinking humanity” as “a future image of society brought about by the development of science and technology.” The survey also identified eight “close-up science and technology areas” (areas with high potential for multidisciplinary and interdisciplinary R&D) based on AI-related technologies and examination by experts.

The Center for Research & Development Strategy (CRDS) of the JST is investigating and analyzing overseas trends that benefit the formulation of STI policies.

In order to contribute to strategic technology development in light of the rapidly changing R&D trends including technological innovations and progress of globalization, MAFF is studying R&D trends in other fields and countries, identifying technologies applicable to Japan and analyzing the country’s strengths and weaknesses.

JSPS Overseas Offices collect information on trends in scientific research, support efforts by Japanese universities to expand their international bases and activities, collaborate with overseas organizations engaging in science promotion and hold symposiums. The Overseas Offices are also strategically promoting international joint research and research exchanges with the world’s leading science and technology nations to address the economic and social challenges we are facing (Chapter 4 Section 2-1(4), Chapter 7 Section 3).

■ Table 2-5-11/Key measures to capture global needs in the future (FY2019)

Ministry	Implemented by	Project
MAFF	MAFF	Strategic research promotion

2 Developing systems to promote inclusive innovation

(1) The promotion of cooperation with developing countries on issues of global concern

To promote science and technology cooperation with developing countries in Asia, Africa and Latin America etc., MEXT, the JST, Japan Agency for Medical Research and Development (AMED), the Ministry of Foreign Affairs (MOFA) and Japan International Cooperation Agency (JICA) have been collaboratively implementing the Science and Technology Research Partnership for Sustainable Development (SATREPS) program by utilizing Japan’s advanced science and technology and Official Development Assistance (ODA). The program promotes international joint research toward addressing global issues and utilization of research outcomes based on the needs of these countries. These projects address issues relating to the environment, energy, bioresources, disaster prevention and mitigation, and infectious diseases control. From FY 2008 through FY 2019, 145 SATREPS projects in 51 countries (including 77 projects in Asia, 39 projects in Africa and 21 projects in Latin America and so on) were adopted for implementation.

MEXT launched a program that combines international joint research with government scholarships for international students. Specifically, the government provides scholarships for international students who wish to study at Japanese universities that participate in the SATREPS program. This program makes it possible for young researchers from countries participating in international joint research projects to earn degrees in Japan. Thus, MEXT is cooperating with other countries in developing their human resources.