[Tentative translation]

Integrated Innovation Strategy 2021

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Chapter I general theory

1. Basic concept

Integrated Innovation Strategy 2021 will be the first annual strategy designated as an action plan for the Sixth Science, Technology and Innovation Basic Plan (hereinafter referred to as the "Sixth Basic Plan".) approved by the Cabinet on March 26, 2021. In the Sixth Basic Plan, the target society is defined as "a sustainable and resilient society that protects the safety and security of the people and a society that realizes the well-being of individuals" and in order to achieve it, the Six Basic Plan is composed of medium targets to major targets, as well as a group of programs to achieve such targets. In order to evaluate the achievement status, indicators linked to each target are set.

Integrated Innovation Strategy 2021 seeks to improve the quality of science, technology, and innovation policies on a constant basis by identifying whether or not programs are functioning as initially envisioned, by analyzing changes in indicators and other evidence, and by embodiing evidence-based policymaking (EBPM), which reviews existing policies and formulates policies to supplement shortfalls or more effective policy proposals.

2. Changes in the domestic and international situation

In the Sixth Basic Plan, in addition to the current challenges such as the rapid evolution of information and communications technology (ICT); global energy, resources, and food constraints; as well as the declining birthrate and aging population in Japan and the impoverishment of local economies and societies, the Government of Japan states that new social changes that deserve special mention include (1) the reorganization of the world order, such as the escalation of the U.S.-China confrontation; (2) global agenda such as intensifying large-scale natural disasters, which have become a real threat; and (3) the exposure of the limitations of the information society (Society 4.0), such as the restriction of free competition due to the international monopoly of information by IT platformers; and that these changes are accelerating the spread of the coronavirus disease 2019 (hereinafter referred to as “COVID-19”).

Against this backdrop, even after the formulation of the Sixth Basic Plan, there has been significant progress both in Japan and abroad in post-corona efforts such as vaccination, as well as in the fight for technological supremacy among countries and in measures against the climate change.

(1)Further intensification of competition for technological supremacy

The Sixth Basic Plan states that science, technology and innovation are at the center of the struggle for supremacy among nations that are intensifying, and this movement is accelerating. At the National People's Congress of China held in March 2021, it was announced that self-reliance in science and technology was the strategic pillar of national development, and that the R&D expenditure of society as a whole would increase by more than 7% per year on average. In the United States, President Biden said at a press conference that the United States would increase its investment in science and technology, such as quantum computers and medical care, from 0.7% to about 2% of the GDP in terms of technology competition with China.

Globally, emerging technologies such as AI and quantum, as well as advanced fundamental technologies

such as advanced semiconductor manufacturing, are being recognized once again for their security importance, and the United States, China, European countries, etc. are investing large amounts into innovation in order to lock their technologies into each respsective country. Therefore, our country's innovation policy also needs to take economic security into consideration. In particular, with the advance of online operations in response to COVID-19, demand for semiconductors has increased around the world, causing supply delays in some areas, such as automotive semiconductors, from the beginning of 2021, which has had an impact on automobile production and affected supply chains. In February 2021, in order to secure supply chains in key areas, President Biden signed an executive order requiring the submission of reports on ten areas, including semiconductors, including specific policy recommendations on supply chain risks such as materials and manufacturing capabilities[1]. In March 2021, the European Commission announced the "Digital Compass" plan, which sets the European Union's digitalization target for the period up to 2030, and set a target to increase the production of next-generation semiconductors in the region and increase the EU's share from 10% to more than 20%.

(2)Progress in concrete efforts to address the climate change issue

Global progress has also been made in tackling the climate change issue, which was included in the Sixth Basic Plan. Immediately after President Biden took office, the United States decided to return to the Paris Agreement and announced its active measures to address climate change. In April 2021, the United States hosted Leaders Summit on climate, inviting leaders from about 40 countries and regions, including 17 countries and regions that account for about 80% of global greenhouse gas emissions. In preparation for the 26th session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP26) in November 2021, the United States appealed to each country to strengthen their 2030 greenhouse gas reduction targets. At the Summit, Prime Minister Suga expressed that Japan would “set a target to reduce its greenhouse gas emissions by 46 percent in fiscal year 2030 from its fiscal year 2013 levels while continuing strenuous efforts in its to challenge to meet the lofty goal of cutting its emissions by 50 percent.”

In December 2020, the European Commission announced that it would invest at least 35% of the total budget of 95.5 billion euros for Horizon Europe, its R&D investment strategy for seven years starting from 2021, in measures to combat climate change, aiming to recover from COVID-19 through green investment. The European Parliament officially approved the budget in April 2021.

3. Evaluation and issues of past efforts and matters to be focused on

Amid major changes in domestic and international situations, the first Science, Technology and Innovation Basic Plan based on the Basic Act on Science, Technology and Innovation (Act No. 130 of 1995) was approved by the Cabinet, and the medium- to long-term policy directions up to 2025 with a view toward 2030 were presented.

In the future, as well as strengthening the control tower function, the ministries and agencies concerned must work together to accelerate efforts to realize Society 5.0 in line with the direction of science,

[1] June 8, 2021: "Building Resilient Supply Chains, Revitalizing American Manufacturing, and Fostering Broad Based Growth." was submitted.

technology and innovation policies set out in the basic plan, "social change through the convergence of knowledge" and "sound cycle of investment in knowledge and people."

(1)Transformation into a sustainable and resilient society that ensures the safety and security of the people

① Creating new value through the fusion of cyberspace and physical space

(General remarks)

The formation of a digital society such as a digital twin utilizing cutting-edge technologies including AI forms the basis for realizing Society 5.0. In order to establish a control tower and a national strategy for the formation of a digital society at an early stage and to promote necessary regulatory reforms, the government submitted digital reform-related bills and is now preparing for the establishment of a digital agency in earnest following the enactment[2] of these bills. Social implementation at an early stage has become one of the top priorities of the government. Under the Digital Agency, which will be established in September 2021 as the control tower, in addition to formulating policies for the development of information systems in the national and semi-public sectors, Japan will steadily implement "a comprehensive data strategy[3]" based on its architecture.

(Comprehensive Data Strategy)

In December 2020, the Data Strategy Task Force's initial report presented urgent issues such as the development of trust frameworks, platforms, and data. However, more specific efforts must be made based on the Comprehensive Data Strategy of June 2021.

In this context, discussions are progressing on the designation of specific data in the base registry[4], the development and expansion of digital infrastructure, the modality of platforms, the construction of trust foundations, and fostering human resources concerning data.

Many countries around the world have formulated and strongly promoted data strategies, recognizing that data is the foundation of national wealth and international competitiveness. The United States has been rapidly improving the value of data and building a governance system based on the Federal Data Strategy of June 2019. In 2021, the foundation is being developed in earnest, for example, by improving data skills of federal government employees and expanding interagency collaboration. In addition, the US digital strategy, which has been laissez-faire about the private sector, is now at a major turning point, as concerns over privacy violations by large IT companies, the spread of fake news, the exposure of the vulnerability of democracy, and competition issues are drawing attention. In Europe, based on the European Data

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[2] Basic Act on the Formation of a Digital Society (Act No. 35 of 2021), Act for the Establishment of the Digital Agency (Act No. 36 of 2021), Act on the Development of Related Acts for the Formation of a Digital Society (Act No. 37 of 2021), Act on the Registration, etc. of Deposit Accounts for the Prompt and Reliable Implementation of the Payment, etc. of Public Benefits (Act No. 38 of 2021), Act on the Management, etc. of Deposit Accounts by Using Individual Numbers Based on the Intention of Depositors (Act No. 39 of 2021), and Act on the Standardization of Local Government Information Systems (Act No. 40 of 2021)

[3] The "Comprehensive Data Strategy" attached to the Priority Policy Program for the Realization of a Digital Society (approved by the Cabinet on June 18, 2021)

[4] A database of basic social data, such as people, corporations, land, buildings, and qualifications, that is registered and published by public organizations and referenced in various situations, and serves as the foundation of a society that ensures accuracy and currency.

Strategy of February 2020, the European Commission released in November 2020 a draft Data Governance Act focusing on the rules framework for data sharing service providers. By the end of 2021, a draft data act is scheduled to be released to promote the public use of privately owned data and the proper sharing of data among companies. In April 2021, a comprehensive draft for AI regulation based on a risk-based approach was released as a core component of the EU Digital Single Market strategy, which supports the EU's goal of being a global leader in the development of a safe, credible and ethical artificial intelligence and ensures protection of the ethical principles required by the European Parliament.

However, we must admit that social implementation of platforms necessary for the digitalization of local governments, establishment of base registries, and AI and data linkage in our country, is behind the American IT giants GAFA[5] and the GAIA-X project in Europe, which is rapidly developing and expanding rules and tools in an integrated manner. In addition, it will be important in the future to improve the environment for data utilization through measures such as infrastructure (SINET[6], Beyond 5G[7], computing resources, etc.), consideration of the direction of international cooperation, and training of AI ready human resources.

For this reason, the base registry, which is the basis of data utilization services, will be put into operation in some of the preceding projects in FY2021, with the aim of implementing it by 2025. Furthermore, in order to activate data utilization services provided by the public and private sectors, with the aim of ensuring interoperability with other countries in mind, the government will accelerate discussions on the full-scale operation of connectors, which are technologies for data linkage infrastructure, and rules to be considered in order to promote data distribution and eliminate factors that impede it, implement platforms, and establish them as infrastructure. In addition, the government will consider the establishment of a data exchange market and steadily promote the social implementation of Personal Data Trust Banks and other entities.

When it comes to AI utilization in the social implementation of the data strategy, it is important to coordinate with AI strategy.

(Development and improvement of next-generation social infrastructure suitable for AI utilization)

It is necessary to promote the development of human resources that support society and the development and improvement of next-generation social infrastructure suitable for the utilization of data and AI, and to work on the establishment of a foundation that enables anyone, anytime, anywhere, to utilize data and AI and continuously create services that have not been realized before. To this end, we will operate, disseminate, and publicize the Mathematics, Data Science, and AI Smart Higher Education Program Certification System (literacy level) that started in FY2020, and will steadily advance core R&D based on AI strategies, using the AI-related Core Centers as bases, which will promote the development and locations

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[5] GAFA: Google, Amazon, Facebook, and Apple

[6] SINET: Science Information NETwork. The information and communications network built and operated by National Institute of Informatics (NII) as an academic information infrastructure for universities and research institutions, etc. across Japan.

[7] Beyond 5G is an important infrastructure in the Society 5.0 era with features such as ultra-large capacity exceeding 5G and post 5G, ultra-low latency, ultra-multiple simultaneous connections, ultra-low power consumption, and ultra-safety/reliability, and is expected to start service around 2030 as a foundation of all industrial and social life in the 2030s.

of advanced semiconductor technologies, promote the optimal placement of next-generation data centers, conduct R&D on post-5G[8] and Beyond 5G, and strengthen computing resources.

② Promoting social change and disruptive innovation to overcome global challenges

(Measures against global warming)

In response to the SDGs[9] and other global challenges, various social reforms need to be advanced, and in particular, it has become apparent that reducing greenhouse gas emissions to net zero and making contributions to achieve carbon neutrality worldwide are becoming a core element of international competition.

In our country, Prime Minister Suga declared in October 2020 that Japan will aim to reduce greenhouse gas emissions to net-zero 2050, and in order to accelerate efforts to achieve this goal, in December 2020 the Green Growth Strategy Through Achieving Carbon Neutrality in 2050 was formulated and a 2 trillion yen Green Innovation Fund was established to provide continuous support for the development of innovative technologies. As stated above, the Prime Minister stated that Japan should "aim to reduce its greenhouse gas emissions by 46 percent in fiscal year 2030 from its fiscal year 2013 levels while continuing strenuous efforts in its challenge to meet the lofty goal of cutting its emissions by 50 percent." Although the reduction in FY2019 was 14.0% (compared to FY2013), it is necessary to accelerate development in innovative new technologies and social implementation, and promote research and development that leads to the creation of disruptive innovation, in order to achieve the ambitious targets mentioned above. To this end, the government will review its Plan for Global Warming Countermeasures and Strategic Energy Plan from this perspective.

In particular, it is important to address the energy sector, which accounts for more than 80% of greenhouse gases in our country. In addition to promoting thorough energy effiency, decarbonization of the electric power sector is a major premise. The government will address maximum introduction renewable energy, maximize the use of thermal power on the premise of recovery of CO_2, reduce the dependence on nuclear power as much as possible, and restart nuclear power generation when the Nuclear Regulation Authority determines that it meets the world's strictest regulatory standards. In addition, decarbonization other than in the electric power sector by decarbonized power sources will be promoted. Thus, in order to become carbon neutral in 2050, it is necessary to pursue the possibility of utilizing various energy sources.

(Utilization of diverse energy sources)

In order to utilize a variety of energy sources, based on the concept of the Strategic Energy Plan, etc., we will promote research and development, demonstration, and international cooperation necessary for energy conservation, renewable energy, nuclear power, fusion energy, etc. With regard to energy conservation, we will develop, commercialize and demonstrate innovative energy conservation technologies across various fields in order to develop further energy conservation potential. We will also conduct demonstrations to realize net zero energy for houses and buildings and improve transportation efficiency throughout the

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[8] 5G is a next-generation mobile communication system with features such as ultra-high speed, ultra-low latency, and multiple simultaneous connections, and post-5G has further enhanced functions such as ultra-low latency and multiple simultaneous connections.

[9] SDGs: Sustainable Development Goals

supply chain. With regard to renewable energy, the government will promote the development of next-generation solar cells and elemental technologies related to floating offshore wind power based on the Technology Development Roadmap for the Enhancement of Industrial Competitiveness for Offshore Wind[10] Power Generation to maximize the introduction of renewable energy. With regard to nuclear energy, which is one of the option for decarbonization at the practical stage, in light of the domestic and international situation surrounding nuclear energy, including carbon neutrality, we will steadily promote R&D and fostering of human resources with a view to further improving safety and promoting innovation that meets diverse needs such as coexistence with renewable energy, hydrogen production, and heat utilization.

(Economic and social redesign through the transition to a decarbonized society, a recycling-based economy, and a decentralized society)

In order to transform Japan into a society that creates a virtuous cycle between the economy and the environment, it is necessary to redesign the economy and society by accelerating the transition to a recycling-oriented economy and a decentralized society in addition to the aforementioned decarbonized society through the realization of carbon neutrality, and to create a regional recycling-oriented society (local SDGs) that realizes these three transitions. In terms of decarbonization, based on the Regional Decarbonization Roadmap[11], a decarbonization domino effect will be realized, which will spread throughout the country with the decarbonization leading areas as the core. With regard to the transition to a circular that also utilizes local natural resources, the government will work to accelerate the recycling of plastic resources by implementing appropriate measures under the Act for on Promotion of Resource Circulation for Plastics (Act No. 60 of 2021), developing and expanding the use of innovative materials such as bioplastics, and will also review the National Biodiversity Strategy[12]. Through these efforts, the government will deepen discussions on changes in people's lifestyles and socioeconomic changes, and lead international discussions and cooperation toward a series of international conferences starting with the 15th meeting of the Conference of the Parties to the Convention on Biological Diversity (COP 15) to be held in October 2021 and COP26 to be held in November. In addition, based on the Sustainable Food Systems Strategy[13] formulated in May 2021, the government will promote research and development aimed at improving the productivity and sustainability of the food, agriculture, forestry, and fisheries industries.

③ Building a resilient, safe and secure society

(Response to safety and security concerns in the biotechnology/cyber fields, etc.)

Responding to emerging threats, such as the spread of COVID-19 and growing concerns about economic security, is an urgent issue in building a safe and secure society.

For example, in the biotechnology field, following the anthrax attacks in 2001, three projects started in

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[10] Announced by the Working Group of the Public-Private Council on Enhancement of Industrial Competitiveness for Offshore Wind Power Generation on April 1, 2021.

[11] Decided by the Council for National and Local Decarbonization on June 9, 2021.

[12] Cabinet decision of September 28, 2012.

[13] Decided by the Headquaters of the Strategy for Sustainable Food Systems on May 12, 2021.

the United States: Project BioWatch, which detects pathogenic bacteria in the air in normal times; Project BioSense, which detects when and where abnormal accumulation of sick patients is occurring by accumulation and analysis of consultation data; and Project BioShield, which accelerates the development of vaccines and drugs in emergencies. Based on the Ebola hemorrhagic fever outbreak (2013-16), the targets were expanded from terrorism to include emerging infectious diseases. As a result, the US Department of Health and Human Services led COVID-19 countermeasures, and the Department of Defense and other organizations cooperated from the beginning to invest heavily in the development, manufacture and distribution of vaccines for domestic and foreign companies. As a result, Pfizer Inc. and Moderna, Inc. succeeded in developing vaccines in a short period of time. In our country, from FY2021, the government will promote research and development that contributes to the enhancement of systems for the analysis and provision of information on infectious diseases, the compilation of information as needed, and the analysis of infectious diseases for effective risk communication.

In the cyber field, along with the expansion of cyberspace and the advancement of integration with real space, the growing complexity and sophistication of threats such as cyber attacks using new technologies and methods, has led to the emergence of attacks on critical infrastructure and supply chains, and the importance of securing cyber security has been increasing year by year. In contrast, in the United States, National Cyber Strategy 2018 was formulated as a cyber security strategy which emphasizes peace by force and cyber deterrence. The Cybersecurity Strategy in our country (approved by the Cabinet in July 2018) also indicated that " in close coordination with our ally and like-minded countries, Japan will utilize political, economic, technological, legal, diplomatic, and all other viable and effective means and capabilities, depending on the threat, and take resolute responses" toward the "enhancing deterrence capabilities." The draft outline for the next Cyber Security Strategy, which was discussed at the National Center of Incident Readiness and Strategy for Cybersecurity meeting held on May 13, 2021, states that "Japan will enhance deterrence capabilities to detect, investigate, and analyze cyberattacks."

(Response to natural disasters)

In response to increasingly frequent and severe natural disasters, in order to be able to demonstrate comprehensive disaster prevention capabilities that make use of knowledge from the humanities and social sciences in addition to state-of-the-art ICT, efforts have been made to develop the Shared Information Platform for Disaster Management (SIP4D[14]), which plays a role in the mutual distribution of disaster prevention information across organizations, in prefectures and the like, and to construct and operate the Data Integration and Analysis System (DIAS[15]), which accumulates and analyzes global environmental data. The Information Support Team (ISUT[16]), which is operated by the Director General for Disaster Management Bureau of the Cabinet Office, has been using SIP4D for information sharing on site since FY2019. Of the prefectures that participated in the demonstration test of technology development related to automatic connection for further rapid information sharing, 15 prefectures have already decided on automatic connection with SIP4D in the future. The government will continue to work in cooperation with

[14] SIP4D: Shared Information Platform for Disaster Management

[15] DIAS: Data Integration and Analysis System

[16] ISUT: Information Support Team

relevant ministries and agencies to realize the use of SIP4D through automatic connection by all prefectures by FY2023, by conducting demonstrations and explanatory meetings at training sessions held by prefectures. In addition, the government will continue to promote research and development on a disaster-prevention cyberphysical system (CPS4D[17]) that uses collected data on disasters and damage in physical space, predicts trends in cyberspace, and generates and transmits information for optimizing disaster responses, and will also promote initiatives toward social implementation. Furthermore, research and development issues that contribute to disaster response support (disaster response DX) will be considered by combining integrated information and analysis of disaster response knowledge and utilizing it as the convergence of knowledge. In addition, work will be undertaken to establish a control tower structure for systematic and strategic R&D in disaster risk reduction research from a medium- to long-term perspective and for management of social implementation.

(Strengthening the resilience of infrastructure)

Regarding the construction, maintenance, renewal, and improvement of infrastructure, in order to realize efficient infrastructure management for building national resilience, social implementation of maintenance technologies developed in the first phase of the Strategic Innovation Promotion Program (SIP[18]) has been advancing, and statutory inspections of about 720,000 bridges across Japan are being conducted in Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and other places by utilizing the developed alternative technology for visual inspections. In the future, in Public/Private R&D Investment Strategic Expansion PrograM (PRISM[19]), the legal inspection results will be compiled in a database, and be linked with the National Land and Transportation Data Platform. In addition, technologies for inspecting and repairing invisible components, which have been identified as a new issue, will be developed and made into a manual. The government, industry, academia and the private sector will work together to promote the cross-sectoral use of databases and the social implementation of the developed maintenance and management technologies through the National Conference on Infrastructure Maintenance. In addition, the government will publicize DX measures in the infrastructure field and the terms and conditions of use of the National Land and Transportation Data Platform. By FY2022, the government will build a platform that links national land, economic activities, and natural phenomena data held by national and local governments and the private sector. The Cabinet Office is working on the arrangement of basic concepts, etc. for the construction of an infrastructure data platform that links platforms in all infrastructure fields, including the National Land and Transportation Data Platform, in networking. The Cabinet Office will work on the implementation of model projects and preparation for the construction of an operational structure, etc. toward the conclusion of an agreement to participate in the platform, which has become an issue, by the end of FY2021.

(Efforts on comprehensive security)

In order to respond to a wide range of issues on comprehensive security, to maintain peace in our country,

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[17] CPS4D: Cyber-Physical Synthesis for Disaster Resilience

[18] SIP: Cross-ministerial Strategic Innovation Promotion Program

[19] PRISM: Public/Private R&D Investment Strategic Expansion PrograM

and to ensure the safety and security of the country and its people, it is necessary to strengthen science and technology capabilities, which is the basis of comprehensive security, while taking into account the polysemy of science and technology. The government of Japan has promoted various initiatives to "know" the threats and the technology to respond to them," “develop" the necessary technology," "utilize" the developed technology in social implementation, and "protect" the leakage of such technology. The government also take necessary measures for the following urgent issues while establishing policies to deal with them in stages and consolidating them from existing projects.

With regards to the new think tank functions, which is the pillar as "know" , the government will launch the function in FY2021, directs survey and analysis to them of the subject set by the ministries and agencies concerned, work together to establish an organization by FY2023. The government also launch a new project for ensuring and strengthening economic security, to provide strong support for the practical application of key technologies in emerging fields such as space, quantum, AI, supercomputers and semiconductors, nuclear energy, advanced materials, biotechnology, and oceans, in close cooperation with relevant ministries and agencies, universities, research institutes, and companies, while utilizing new think tank functions.

Furthermore, in order to promote necessary international joint research amid concerns about new risks associated with the internationalization and openness of research activities, the government will revise the relevant guidelines on competitive research funds in early FY2021, based on the government's policy on ensuring research integrity and other documents. In addition, the government will continue to collect information in order to implement appropriate countermeasures to prevent technology leakages in stages in accordance with the actual condition of various technology leakages, strengthen security trade control measures including cooperation with like-minded countries and a review of deemed export control, strengthen investment examination and follow-up monitoring in the Foreign Exchange and Foreign Trade Control Act (hereinafter referred to as the "Foreign Exchange Act;" Act No. 228 of 1949), strengthen examination for the acceptance of international students and foreign researchers, examine the desirable system for patent disclosure, examine the desirable system for the appropriate preservation of important technical information, expand the scope of requirements for the security trade control system in government research and development projects, and take appropriate measures. In addition, the government will strengthen the systems necessary for the collection, analysis, aggregation, and sharing of information related to economic security in order to grasp the actual situation and concerns regarding technology leakages and to prevent them from occurring.

The government will also consider and aim for early build ways to provide support, including a framework to secure medium- and long-term financial contributions aiming strengthening R&D capabilities related to emerging key technologies for strengthening and promoting economic security and to secure strategic industrial infrastructure in Japan, such as the capacity to produce and supply important technologies and materials for the supply chain.

④ Formation of an innovation ecosystem as a foundation for creating new industries based on value co-creation

(Growing gap between startups and the world)

With regard to the formation of an innovation ecosystem that creates and fosters startups that seek to resolve issues by leveraging social needs as a driving force, in order to support the creation and growth of startups based on social needs and create unicorns from our country that fly around the world, we have been working on the revision of the Japanese SBIR[20], the designation of startup cities, and the establishment of the platform for unified support for startups (commonly known as "Plus[21]"). Under these circumstances, venture capital investment in our country, even in the context of the pandemic, increased by 4.1% in value and 3.6% in number from 277.8 billion yen (1,761 cases) in FY2018 to 289.1 billion yen (1,824 cases) in FY2019, reaching a high record after a decline following the financial crisis triggered by the bankruptcy of Lehman Brothers. However, in terms of the amount of investment, there is still a large gap between Japan and other countries (14.5 trillion yen in the U.S. and 3.5 trillion yen in China). Therefore, it is an issue to make the above-mentioned measures function more effectively in the future.

(Formation of an innovation ecosystem by mobilizing all government, industry, region and academia)

For this reason, the government will increase government procurement from startups based on the new SBIR, support human resources such as for startups and entrepreneurs in Plus, and stimulate discussion on support measures for hub cities. The government will actively promote the establishment of a support system for startups, such as cooperation among hubs centered on the working group of Hub Cities Promotion Council, strengthening cooperation with universities, etc., strengthening gap funds, and improving the environment for large-scale fund procurement at the late stage, and promote these as a "innovation ecosystem formation package."

Efforts have also been made to sort out the requirements required for innovation management and to select excellent companies. In order to further promote corporate innovation activities, the government will continue to work on the development of an environment in which companies that take on the challenge of innovative management are highly evaluated by the capital market, and the development of an environment in which companies can survive in global competition by increasing corporate diversity and respond to newly emerging social issues.

(Strengthening of industry-academia-government collaboration)

In order to promote new value co-creation through industry-academia-government collaboration, efforts have been made to promote industry-academia-government joint research, to strengthen the matching between young researchers and the industry, and to support the formulation of sustainable industry-academia-government collaboration projects and the advancement of business. As a result, the amount of joint research accepted from private companies at universities, etc. has been increasing steadily in recent years, with the amount more than doubling from 45.2 billion yen in FY2013 to 88.4 billion yen in FY2018 and to 96.1 billion yen in FY2019. However, given that the situation is expected to be severe for the time being due to the impact of the spread of COVID-19, the government will accelerate the matching of the knowledge possessed by universities and national research and development agencies with social needs and

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[20] SBIR (Small Business Innovation Research) is a cross-agency system that aims to increase opportunities for SMEs to receive R&D subsidies and to support the commercialization of the results.

[21] Plus: Platform for unified support for startups

will vigorously promote the establishment of open innovation bases in order to further strengthen cooperation and integration among various sectors.

⑤ Urban and regional development that will take over the foundation for the next generation

(Acceleration of nationwide expansion of smart cities)

In order to realize a society with a sustainable livelihood base, the government will seek to resolve issues faced by cities and regions, and aim to develop diverse, sustainable, and highly livable cities and regions (smart cities) nationwide that will proactively realize Society 5.0, which continues to create new values.

To date, the government has been provided to support for the demonstration and implementation of urban OS[22] and services that can link approximately 200 different data across the country. However, since there are still issues to be addressed in the expansion of initiatives, such as the fact that only 23 local governments and regional groups have implemented the technology, the respective ministries and agencies will implement smart city-related projects in conjunction with the government's digitalization policy, collect API information and develop services to promote the formulation of smart city and smart local plans in each region, and formulate and disseminate the Smart City Security Guidelines (Version 2.0).

Super Cities, which have received proposals for the designation of zones, will be designated by ensuring fairness and transparency after deliberation by the Expert Committee on the Designation of Super City Zones and the Council on National Strategic Special Zones.

In addition, in order to deploy smart city creation cases nationwide, the government will identify and horizontally deploy cases in various fields, such as social implementation and acceleration of the use of urban OS, lifestyle (health and child rearing), and greening (energy, zero carbon).

(International expansion of smart cities)

Japan has promoted initiatives such as encouraging sharing of knowledge between cities worldwide through the G20 Global Smart Cities Alliance in order to spread the knowledge gained through smart city construction as an advanced country in the field of problem-solving, to have Japan’s smart city initiatives and concepts gain wide recognition as a global norm and to contribute to the realization of a society that should be handed down to the next generation and the achievement of the SDGs. Going forward, efforts will be made to promote international standardization as an international competition strategy for overseas smart city projects (international markets), to conduct overseas public relations using the Smart City Catalog, to accelerate project formation through the acceleration of smart city project formulation surveys in the 10 ASEAN countries based on Smart JAMP[23], and to promote investment and financing.

⑥ Promoting R&D and social implementation to resolve various social issues and utilizing the convergence of knowledge

(Utilization of the convergence of knowledge)

In order to resolve various social issues, implement diverse and outstanding research results in society,

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[22] City operating system. A generic term for IT systems that facilitate the introduction of services in various fields to be introduced in smart cities by consolidating functions commonly used by regions seeking to realize smart cities.

[23] Support measures for developing smart cities in ASEAN (Smart JAMP: Smart City supported by Japan ASEAN Mutual Partnership)

and link them to innovation, it is necessary to utilize the convergence of knowledge which includes knowledge not only from the natural sciences but also from the humanities and social sciences. The revision of the Basic Act on Science, Technology, and Innovation, which took effect in April 2021, incorporates the need to pay attention to ensuring appropriate responses to various social issues by comprehensively utilizing knowledge on science and technology in all fields in order to promote the creation of science, technology, and innovation. In addition, moves to promote collaboration with a wide range of stakeholders across the boundaries of academia and moves to search for solutions to social issues by integrating the humanities and sciences are becoming more active at universities, etc., and how they can be utilized in actual social implementation is being questioned. Therefore, by the end of FY2021, the government will compile a basic concept on the convergence of knowledge and measures to strategically promote the creation and utilization of such knowledge, and will also consider relevant indicators, such as the degree of contribution to social implementation.

(Preparation for the next SIP and promotion of the Moonshot Research and Development Program)

For mission oriented R&D programs such as the Strategic Innovation Promotion Program (SIP), which aim to solve specific social issues, not only R&D but also the improvement of various social systems, and ELSI[24] from the initial stage of R&D has been promoted. In the first phase of SIP, social implementation, which has achieved R&D results such as SIP4D, forging simulator, dynamic map, and road surface condition grasping system by smartphone, were realized. In SIP Phase 2 as well, our country is tackling 12 issues to resolve social issues that Japan faces and to strengthen industrial competitiveness, including automated driving, optical quantum technology, strengthening national resilience, and advanced diagnosis and treatment systems through AI hospitals, while conducting R&D aimed at achieving social implementation. In order to enhance the SIP system, a mid-term evaluation of the system was conducted in FY2020 based on the operation guidelines, and recommendations were made for clarifying the definition of social implementation and ensuring a sufficient period for formulating a research and development plan. On the other hand, accelerating social reform by utilizing the results of advanced research and development has become an issue. With regard to the next SIP, the government will identify social issues to be addressed over the medium term, investigate and examine technological development themes to be tackled across ministries and agencies by utilizing the convergence of knowledge, and select candidates by the end of 2021.

In the Moonshot Research and Development Program, despite the extension of the open recruitment period due to COVID-19, following discussions at the Strategic Promotion Conference for Moonshot Research and Development Program, research and development started in stages from October 2020 onwards, and events were also held to disseminate the content of research to people in Japan and abroad. Going forward, while steadily promoting research and development in order to achieve the target, R&D projects will be drastically strengthened in the fields of the environment, agriculture, AI, robotics, quantum technology, health and medical care, through strengthening cooperation with other countries and flexible target changes. In order to promote research and development more effectively using the convergence of

[24] ELSI: Ethical, legal, and social issues.

knowledge, the government will enhance cross-cutting support (ELSI support/mathematical science, etc.) and strengthen international cooperation with Europe and the United States. In addition, outreach and public relations activities for research results (such as the dissemination of information on social media and the establishment of ambassadors) will be conducted, and cooperation with industry, which will play a key role in social implementation, will be enhanced to achieve the targets. Furthermore, in order to build a society for the future that takes into account changes in the socioeconomic situation caused by COVID-19, new Moonshot Goals will be established around the autumn of 2021, utilizing ideas from young researchers and other countries, and R&D projects will be launched toward their achievement by spring of 2022.

(Strengthening international standards strategy)

As we strive to resolve social issues and enhance its international competitiveness through the social implementation of leading-edge technologies, the platform business based on cyber-physical systems (CPS) is growing rapidly thanks to the advancement of digitalization. From the outset, this business model is designed to increase the benefits of networked solutions and services as the scale of users increases, and to compete for speed of growth. In other countries, international standard strategies for connectivity are being promoted from the business design and R&D stages as international competition strategies to capture global markets. In Europe, the United States, China, and other countries, the strategic use of international standards is being promoted by the public and private sectors as a whole, including the proactive involvement of top management of global enterprises in management strategies, support for the use of standards by the private sector by public standards organizations, and the active acquisition of important posts and lobbying to secure influence in international forums such as international standards organizations. On the other hand, in our country, efforts and awareness by the public and private sectors are generally lagging. For this reason, the our country will promote the strategic utilization of international standards through cooperation between the public and private sectors under the uniform policy for initiatives by ministries and agencies under the Task Force for the Promotion of Standards Utilization established in the Integrated Innovation Strategy Promotion Council, including the strengthening of initiatives in important growth fields such as smart cities, Beyond 5G, hydrogen and ammonia fuel, and smart agriculture, as well as support for collaboration among government-affiliated research and development institutes, etc. for private sector standards strategies.

(Promotion of science and technology diplomacy)

Japan has been promoting science and technology diplomacy by utilizing various diplomatic opportunities and funding projects to international organizations, but given. However, in light of recent geopolitical changes, the challenge is to strengthen the foundations that support strategic deployment of science and technology diplomacy's strategic development, such as in those of the United States and the United Kingdom, with a stronger awareness of the perspectives of international cooperation and competition. For this purpose, the government will strengthen strategic cooperation between the Science and Technology Advisor to the Minister for Foreign Affairs, the Advisory Board for Promoting Science and Technology Diplomacy, and other relevant ministries and agencies, and promote science and technology diplomacy in a government-wide effort.

In addition, through the Strategic International Collaborative Research Program (SICORP) and other

programs, efforts to strengthen the international research network architecture have been steadily developed, including the promotion of international joint research and the establishment of international research hubs. In the future, we will strategically promote more strategic bilateral and multilateral international joint research between Japan and the United States and other countries in leading-edge critical fields such as quantum technology, AI, and materials, as well as an inter-organizational framework for research and human resource exchanges between universities in our country and high-level universities in Europe and the United States. In addition, Japan will utilize its expertise in science, technology and innovation that contributes to the resolution of social issues in developing countries and promote the creation of business by Japanese companies in these fields through contributions to international organizations.

The government decided on a policy (at the Integrated Innovation Strategy Promotion Council in April 2021) to autonomously secure the soundness and fairness of research activities (research integrity) in response to new risks associated with the internationalization and openness of research activities. In the future, in cooperation with the research community, taking into account international trends and harmonization, the government will steadily implement measures that contribute to the autonomous securing of research integrity, such as revision of common guidelines for competitive research fund projects in early FY2021.

(2)Expanding the frontier of knowledge and strengthening research capabilities as a source of value creation

① Reconstruction of the environment that generates diverse and outstanding research

(Support for doctoral course students)

In response to the major issue of improving the environment in which young and other researchers are placed, such as a decrease in the rate of advancement to a doctoral program (18.7%: 1981 → 16.7%: 2000 → 9.4%: 2020), unstable employment for young researchers, and a decrease in the number of research hours for researchers, efforts have been made to improve the treatment of researchers, based on the comprehensive package to strengthen research capacity and support young researchers formulated in January 2020. In particular, support for students in doctoral programs will be steadily promoted. For example, 20 billion yen will be added to the Fund for the Promotion of Emergent Research to support an additional 7,800 students. In addition, in order to develop career paths in which young researchers can play an active role not only in academia but also in a wide range of fields such as industry, in FY2021, the government will conduct a survey to grasp the actual conditions of the active role of doctorate human resources in industry and identify issues, and will also implement long-term paid internships from FY2021. At the same time, the government will promote the establishment of a system to discover (match) outstanding young researchers by companies and universities.

(Improvement of the research environment of young researchers)

In order to improve our country's research capabilities, it is important to secure excellent researchers, mainly young researchers, and create an environment in which they can sit down and devote themselves to research. However, the ratio of those under 40 in a full-time university faculty as a whole has decreased to about 20% (29.5% in FY2001 to 22.1% in FY2019), and the ratio of national university teachers under 40

with fixed terms of office has increased to over 60% (38.8% in FY2007 to 64.2% in FY2017). As such, unstable employment conditions for young researchers and a decrease in the number of research hours have become tangible challenges, so it is an urgent task to improve the research environment for young researchers and others. Therefore, with the aim of creating an environment where outstanding young researchers can take on the challenge of becoming an independent researcher while ensuring sufficient time to devote to research, the government will develop a sustainable research system by supporting the securing of posts of young researchers and the promotion of young researchers across the entire organization, through measures such as the preparation of an additional edition of the Guidelines for Personnel and Remuneration Management Reform during FY2021. In addition, the government will steadily implement the Emerging Research Support Program[25], which provides continuous support for research funds related to emergent research for up to ten years, and will promote priority support for young researchers and seamless support for outstanding researchers by, for example, targeting 30% of new applications for the Grants-in-Aid for Scientific Research (KAKENHI) program. Furthermore, in order to develop research management specialists who contribute to enhancing the research capabilities of universities, etc. and to secure an environment in which researchers can concentrate on research, by the end of FY2021, the government will promote the improvement of the research environment through the establishment of an accreditation system for URAs[26] and the establishment of a team-based research system that integrates advanced specialist materials such as URAs, such as a nationwide network for improving the skills of engineers.

(Activities of female researchers)

With regard to the promotion of activities of female researchers, although efforts have been made to develop an environment in which to balance life events such as childbirth and childcare with research, and to enhance support systems, etc., it is necessary to further accelerate activities in full-time university faculty from the viewpoint of increasing research diversity, as shown by the fact that the percentage of women in female researchers is less than 30% (25.9% in FY2020) and the percentage of university teachers who are professors (president, vice president, professor) is less than 20% (17.7% in FY2020). Going forward, based on the Sixth Basic Plan and the Fifth Basic Plan for Gender Equality[27], the government will promote further efforts to promote the ratio of women in new employment and teaching positions at universities and public research institutes, and implement follow-up, inspection, and evaluation in the middle year (2023) of the Fifth Basic Plan for Gender Equality.

(Promotion of internationalization)

In order for our country to produce outstanding research, it is important to accumulate knowledge and experience in different research cultures and environments overseas, and to increase opportunities for overseas study and overseas experience so that researchers can actively engage in intellectual exchanges

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[25] A project to provide long-term support for free, challenging, and integrated research that is not bound by existing frameworks while ensuring a research environment in which researchers can concentrate on their research.

[26] URA: University research administrator.

[27] Cabinet decision of December 25, 2020

with various entities. However, the number of researchers dispatched overseas in the medium to long term has been on a decreasing trend in recent years (7,674 in FY2000 to 4,291 in FY2018), and the number of researchers accepted from overseas has been flat (13,878 in FY2000 to 13,172 in FY2018), indicating that Japan lags behind the flow of the international brain circulation in the global research network. In order to overcome this situation, it is an urgent task to promote the international brain circulation through the internationalization of universities. In order to achieve this, in FY2021, the government will formulate and implement strategies for the international deployment of science and technology, including support measures and environmental improvements, in order to promote the strong promotion of international joint research, and to expand overseas studies and experience of students and young researchers in Japan, promote inter-organizational exchanges between overseas high-level universities and universities in our country, invite excellent researchers from other countries, and promote the employment of foreign researchers.

② Construction of a new research system (promotion of open science and data-driven research, etc.)
(Importance of data utilization)

As the collection and analysis of various data such as big data, progresses, the impact of computer simulations and new data-driven research using AI becomes even greater. In addition, COVID-19 has accelerated the global trend of DX in research activities (Research DX), including research exchanges becoming remote, remote connections to research facilities and equipment, and the expansion of data-driven research. For this reason, our country has also been promoting the early development of research infrastructure, such as data platforms, networks, and computing resources, as well as the institutional environment, such as various guidelines. In the post-corona era, thorough utilization and further advancement of these are required.

(Promotion of management and utilization of research data with public funds)

In order to promote the management and utilization of research data obtained with public funds, “the Basic Concept on Management and Utilization of Research Data with Public Funds”[28] was formulated in April 2021.In this basic oncept, the NII Research Data Cloud[29], which was put into entire operation in FY2020, is positioned as core platform.In order to achieve a wide range of utilization by industry, academia, and government, it is an issue to establish a system that can retrieve information concerning research data(metadata) by FY2023. Therefore, with regard to NII Research Data Cloud, the government will consider specific measures to ensure a sustainable operation by FY2022 while further strengthening the system’s functions . In addition, the government will promote the formulation of data policies at research and development institutions such as universities etc, and the regisration of research data in institutional repositories. By FY2023, the government will introduce a mechanism to assign metadata to all new research using public research funds. The government will introduce a similar mechanism in the next SIP following the introduction of the Moonshot Research and Development Program. In addition, by the end of FY2023, the government will consider establishing a mechanism for cooperation between the research data

[28] Decision made by the Integrated Innovation Strategy Promotion Council on April 27, 2021.

[29] Started full-scale operation in FY2020 as core platform for managing and utilizingresearch data obtained with public funds.

infrastructure system and the field-specific data linkage infrastructure. In order to promote the management and utilization of research data, the government will consider the direction of the development of environment and support systems, and introduce the assessment of the status of efforts related to the management and utilization of research data into the evaluation system.

(Infrastructure development supporting research DX and promotion of data-driven research)

As for the infrastructure supporting Research DX, the development of an ultra-high-speed, large-capacity network (SINET) has been conducted as an academic information infrastructure. By FY2021, the government will consider measures to develop an environment that can be utilized as the social infrastructure of Japan that can utilize the knowledge of universities, etc., and in order to provide the most advanced research and education environment as the next-generation academic research platform, the government will start integrated development and operation along with the research data infrastructure in April 2022, and will continue to promote the advancement of the infrastructure and the research and development of necessary technologies. As for supercomputer computing resources, we started sharing the supercomputer Fugaku in March 2021, and will promote the creation of results. As the future computing infrastructure of our country will become an issue in the future, by the end of FY2021, with regard to next-generation computing resources, the government will evaluate supercomputers to date and examine the direction of next-generation computing resources, and promptly implement necessary measures, such as surveys and research based on the evaluation. In addition, it is a challenge to promote research and development based on new methodologies by utilizing platforms in various fields. In the fields of materials, biotechnology and life sciences, global environment, oceans and disaster prevention, mathematical sciences, humanities and social sciences, we will promote data-driven research and development utilizing advanced shared facilities and large-scale research facilities nationwide, as well as infrastructure and environment development to support them.

③ Promoting university reform and enhancing functions for strategic management

(Creation of world class universities)

Universities, which are the nodes of diverse knowledge and should be the largest and most advanced foundation of knowledge, do not always have a clear individuality and mission to achieve, and the depth of the university hierarchy is not fully utilized in creating value in our country. In particular, national universities have been incorporated since 2004, and efforts have been made to improve the environment. However, due to management by the national government, the limited discretion of universities, and the common follow-the-leader mentality within universities, they are still only halfway to realizing the "attractive national universities rich in vitality and individuality in a competitive environment" that was envisioned at the time of incorporation. For this reason, in December 2020, the Review Conference for the Realization of Strategic Management of National University Corporations proposed the establishment of a new framework for the relationship between national universities and the government ("autonomous contractual relationship"), based on the basic philosophy of ex ante supervision and ex post facto checks, so that national university corporations can expand their functions and have constant dialogue with society at their discretion, toward the 4th mid-term target period, which starts in FY2022. The necessary systems

are being developed.

However, in order for research universities in our country to be on par with the rest of the world, it is necessary to review their missions, their functions and governance. To this end, the government will compile an interim report by around the summer of 2021 on the requirements and necessary reforms for research universities that are on a par with the world. The government will also compile a conclusion on a new legal framework by the end of 2021 and submit it to the next ordinary Diet session.

In addition, the government will compile a conclusion by the end of FY2021 on the allocation rule for the new national university corporation budget subsidy, toward the 4th mid-term target period for national university corporations, and link the conclusion with university reform.

(Strengthening the research foundation through University Endowment Fund)

In the future, it will be necessary to break through the current situation of declining international competitiveness of universities in Japan and their weakening financial foundations, and universities will be required an even greater role in fostering human resources that will lead society, generating world-class research results, and creating university-originated startups that will lead social change, as the core of innovation ecosystem. For this reason, the government plans to expand University Endowment Fund to the scale of 10 trillion yen by the end of FY2021, in order to establish world-class with the aim of creating world class research universities, which will attract excellent human resources and abundant funds. By making use of the investment profits, the government will provide long-term and stable support for the development of common facilities and data linkage infrastructure at universities that conduct research and development at a level comparable to that of the world, as well as for fostering young human resources. The Basic Approach to Investment Policy of University Endowment Fund toward Building World-class Research Universities will be formulated around the summer of 2021, and the fund operation will begin in FY2021.

(Strengthening regional universities)

The policy direction of regional universities has always been to create universities with attractive characteristics, taking into account the circumstances surrounding individual universities. However, it is difficult to say that regional universities have been able to fully contribute to the development of the society and economy of their respective regions by taking advantage of their characteristics and strengths. Therefore, in light of the environment surrounding national, public and private universities, in order to promote the further strengthening of the characteristics of each university through the metabolism of organizations based on the management policies of each university, and to contribute to the revitalization of local communities and the enhancement of research capabilities of Japan as a whole, by the end of FY2021, the government will formulate a package for the promotion of regional universities to strengthen regional universities, establish them as bases for co-creation, and promote research and development that leads to fostering human resources that are sought by local communities and resolving issues in local communities, as well as promote diverse research activities that make use of the strengths of regional universities.

(3)Education and fostering of human resources to realize the well-being of individuals and the challenges they face

(Evolution of change)

While promoting education and fostering of human resources that realize the well-being of individuals, it is necessary to create an environment in which human resources with the ability and motivation to face challenges through trial and error can be produced, especially in a real society where there is not necessarily a single solution. In recent years, however, positive changes toward education in a new era are emerging.

(Realization of the GIGA School Concept)

With the implementation of the GIGA[30] School Concept, elementary and junior high schools will enhance their education using ICT under the concept of "one device per person" from FY2021, and for the first time in 40 years, a reduction in the standard for the class structure of elementary schools (from 40 to 35 persons) will be implemented over five years from FY2021. The development of an environment for the integrated enhancement of individualized optimal learning and collaborative learning that makes the most of the diverse individuality of children has begun through the enhancement of detailed guidance, learning activities and opportunities that are closely attuned to each individual.

In the future, the biggest challenge will be how to effectively utilize the ICT educational environment that is being developed by frontline schools and promote effective initiatives. To this end, the government will strongly promote the development of school support systems, such as the early completion of the development of "one device per person" and a more generous assignment of ICT human resources. At the same time, the government will steadily promote the reduction of teachers' burdens through the completion of the introduction of an integrated school administration support system, thereby creating an environment in which schools can focus on ICT education. In addition, we will promote DX in the field of education, such as the use of educational data, and realize individualized and collaborative learning based on data.

(STEAM education/growth of unique talents/diverse teacher groups/subject-based teacher assignments in elementary schools, etc.)

The new government curriculum guidelines, which have been in place since FY2020, emphasize cross-cutting learning and exploratory learning, and in particular, the enhancement of math and science education and information education in high schools. In addition, in order to enhance STEAM education[31], which is essential from the viewpoint of creating innovation, it is important not only to improve classes at schools, but also to participate in and utilize external human resources and other resources to support learning. In order to examine these specific measures, the government will promote the study of specific measures for the enhancement of STEAM education and the establishment of an educational environment for the development of the abilities of children with special talents, at an expert meeting with the participation of

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[30] GIGA: Global and Innovation Gateway for All

[31] Cross-sectional education in science, technology, engineering, arts, mathematics, etc., to make use of learning in each subject for solving problems in the real world.

members of the Central Council for Education to be established in the CSTI[32] in FY2021. Members of the Industrial Structure Council shall participate in the council as appropriate in order to promote cooperation with the business community. In addition, in order to strengthen science and mathematics education, Japan will steadily promote initiatives such as support for high schools and other institutions providing advanced science and mathematics education, review of the teacher's license system to make it easier for diverse human resources with specialized knowledge and skills, such as those with advanced science and technology knowledge, to participate in schools, and promotion of a subject-based teacher assignment system in the upper grades of elementary school.

(Improvement of recurrent education)

Given the drastic changes in the environment surrounding recurrent education, such as the diversification of working styles, the double-tracking of career paths, and the emergence of a "new normal" triggered by COVID-19, realizing an environment that enables those who wish to receive a diverse and high-quality recurrent education will be a key to enhancing the mobility of people with motivation and abilities, promoting the circulation of "knowledge" as a whole society, and leading to the creation of new value. In this regard, although some universities have begun to diversify their education and fostering of human resources, including the use of MOOCs[33], currently only on third of all students are students returning to universities or other institutions after entering the workforce, indicating that recurrent education has not made sufficient progress. Therefore, it is necessary to simultaneously promote the development of an environment and culture in which society and companies promote continuous learning, and the development of an environment for both recipients and providers of recurrent education. In the future, in order to consider measures to promote the use of the educational and training leave system and to promote the introduction of recurrent education for employees at companies, the relevant ministries and agencies will newly establish a forum for discussion, and will study concrete measures to develop the environment for the recipients, while promoting efforts to provide diverse curricula and programs at universities and technical colleges to develop the environment for the providers.

(4)Promoting sectoral strategies through public-private partnerships

Based on the fundamental technologies field of AI technology, biotechnology, quantum technology, and materials, as well as the sector-specific strategies for application fields of environmental energy, safety and security, health and medical care, space, oceane, food, agriculture, forestry, and fisheries, the government and the private sector will cooperate to steadily advance social implementation, R&D, and fostering of human resources. Sectoral strategies will be flexibly formulated and reviewed.

See (1) and (2) for the environmental energy field and (1) and (3) for the safety and security field.

[32] CSTI: Council for Science, Technology and Innovation. One of the important councils aimed at formulating plans and conducting comprehensive coordination for comprehensive and basic science, technology and innovation policies from a position one level higher than respective ministries, under the leadership of the Prime Minister and Minister of State for Science and Technology Policy.

[33] Massive open online courses

(Fundamental technologies should be addressed strategically)

① AI strategy

Based on AI Strategy 2019[34] and its follow-up, the government ministries have been steadily promoting measures in cooperation. Based on the follow-up, the following initiatives will be promoted based on AI Strategy 2021[35]. In addition, based on the progress of DX and international trends, a new AI strategy will be formulated by the end of 2021 with the aim of further promoting the social implementation of AI.

- In order to support the employment of many human resources who have participated in the certification program of the Mathematical, Data Science, and AI Certification System and acquired basic skills related to AI, etc., a forum will be established to consider further development of digital human resources, and education reform will be carried out, including the start of examination of concrete measures and the trial implementation of education on AI for government employees.
- Research and development will be carried out on deep learning theory systems, knowledge integration AI technology, and multilingual simultaneous interpretation aiming for use at the 2025 World Exposition, Osaka, Kansai, Japan. In addition, regarding research and development on explainable AI, etc., the government will consider cooperation measures for the group of AI-related core centers and start concrete efforts within FY2021.
- Based on the National Data Strategy, the government will promote the construction of a data utilization environment and the social implementation of an AI service that utilizes prepared data, such as a base registry, domain specific data exchange platforms, and a comprehensive trust platform, as well as the expansion of data federation by utilizing inter-domain data exchange infrastructure.

② Biotechnology

In order to realize the world's most advanced bio-economy in 2030, the government ministries have been steadily promoting measures based on Bio Strategy 2019[36] and Bio Strategy 2020[37]. In particular, examinations are being conducted so that the first phase of regional bio communities can be certified by the summer of 2021. In order to expand the market area, it is necessary to aim for the establishment of a bio first concept, a sustained virtuous cycle of people, goods, and money, and a sustainable, resilient, recycling-oriented community and a healthy community based on biotechnology all over Japan. To this end, based on the Bio Strategy Follow-up[38], which is a polished version of the existing strategies, the following initiatives will be promoted in particular.

- In light of the status of local bio-community recruitment and certification, by the end of FY2021, the government will recruit and certify global bio-communities in the Tokyo area and the Kansai area to create an overall picture of a bio-community that is optimal for Japan. The government will also accelerate the expansion of market areas by promoting the cooperation and utilization of bio-data.

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[34] Decision made by the Integrated Innovation Strategy Promotion Council on June 11, 2019

[35] Decision made by the Integrated Innovation Strategy Promotion Council on June 11, 2021

[36] Decision made by the Integrated Innovation Strategy Promotion Council on June 11, 2019

[37] Fundamental measures: decision made by the Integrated Innovation Strategy Promotion Council on June 26, 2020; Definitive version of market area measures: decision made by the Integrated Innovation Strategy Promotion Council on January 19, 2021

[38] Decision made by the Integrated Innovation Strategy Promotion Council on June 11, 2019

- The government will coordinate and develop the outcomes of the three major biobanks in Japan, Tohoku Medical Megabank (TMM) Project, BioBank Japan (BBJ), and National Center for Biobank Networks (NCBN), and advance the creation of large-scale genome and data infrastructure.

③ Quantum technology

As global momentum toward carbon neutrality rapidly increases and the use of real-time data to promote behavioral change of people is becoming more sophisticated, secure and eco-friendly data utilization technologies are key. For this reason, given that competition in the development of quantum technology, which is a core technology, is intensifying, the following initiatives are being strongly promoted based on the Quantum Technology Innovation Strategy[39]. In order to respond to recent environmental changes such as growing concerns about economic security and carbon neutrality, the government will consider fundamentally strengthening initiatives, including a review of strategies.

- For the quantum computer social implementation, research and development on quantum computers, quantum AI, etc. will be advanced, and research and development on advanced control of solid state quantum sensors, quantum life technology, etc. will be promoted with the aim of realizing quantum measurement and sensing systems.
- With the aim of constructing a global quantum cryptography communication network, we will promote research and development and demonstration to realize long-distance quantum cryptography communication using various methods and networking.
- In addition, we will foster young researchers and engineers who are excellent at supporting quantum technology, and "quantum natives" who have been using quantum technology from an early stage, will be strategically developed. For this reason, in FY2020 the government will launch the Quantum Leap Flagship Program (Q-LEAP) for fostering human resources and, from FY2021, will steadily promote projects such as the creation of university fellowships toward the creation of science and technology innovation.
- With the goal of establishing and creating more than five quantum technology innovation hubs in Japan by FY2025, eight hubs were established by FY2020. In order to secure and strengthen international competitiveness, research and development at each hubs will be accelerated, and cooperation among hubs will be deepened and international cooperation will be promoted through the Promotion Council of Quantum Technology Innovation Hubs (established in April 2021).
- Based on the Japan-U.S. Joint Leaders' Statement of April 2021, Japan and the United States will strengthen joint research and exchange of researchers in the field of quantum technology.
- In order to apply quantum technology to current industries and create new industries, the Quantum Technology Innovation Council (tentative name) will be established by the end of this year.

④ Materials

Based on the Materials Innovation Strategy[40] decided in April 2021, the following initiatives will be strongly promoted.

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[39] Decision made by the Integrated Innovation Strategy Promotion Council on January 21, 2020

[40] Decision made by the Integrated Innovation Strategy Promotion Council on April 27, 2021

- In the field of materials, there is an urgent need to improve the efficiency, speed, and sophistication of research and development using data and AI, and it is necessary to promote data-driven research as a role model in other fields by promoting the sharing and utilization of unused data in addition to open paper data, utilizing Japan's strengths such as high-quality real data, advanced research facilities and equipment, and human resources. Therefore, in order to promote data-driven research in the field of materials, the development of common facilities and equipment capable of acquiring high-quality data, the development of a database for aggregating, accumulating, and utilizing data generated from these facilities, and the implementation of AI analysis functions will be promoted.
- From the perspective of decarbonization and overcoming resource constraints, research and development will be promoted by concretizing priority technological issues through the use of data-driven research.
- With regard to manufacturing processes, which are the source of competitiveness in the materials field, the government will work on the development and maintenance of fundamental technologies for data acquisition from materials such as highly reliable ceramics and functional chemicals, and will promote the construction and utilization of process databases.

(Strategic applied fields to be addressed)

⑤ Health and medical care

Based on the second term Healthcare Policy[41] and Plan for Promotion of Medical Research and Development[42] formulated in March 2020, the following initiatives will be strongly promoted. Moreover, in order to strengthen the vaccine development and production system in Japan, the strategy for strengthening systems to develop and produce vaccines[43] will be steadily promoted.

- In order to promote research and development in the medical field, the government will promote integrated research and development from the basics to practical application in the medical field, centering on support from AMED[44], in cooperation with other funding agencies, in-house research institutes, and private companies. At the same time, the government will promote challenging research and development in the Moonshot Research and Development Program and accelerate the rapid social implementation of cutting-edge technologies.
- In order to improve the environment for research and development in the medical field, the following will be promoted: development of systems and mechanisms at support bases in translational research core hubs and clinical research core hospitals; development and securing of specialist human resources such as biostatisticians and specialists in regulatory science; and dissemination and enhancement of regulatory science in research and development.
- As a platform for the utilization of data obtained from AMED-supported R&D, the government will consider a mechanism for the safe, secure, and efficient utilization of quality-controlled data in

[41] Cabinet Decision of March 27, 2020

[42] Decision made by the Headquarters for Healthcare Policy on March 27, 2020

[43] Cabinet decision of June 1, 2021

[44] AMED: Japan Agency for Medical Research and Development

industry-academia R&D, and will aim for the early commencement of its operation.

- The government will steadily promote the Action Plan for Whole Genome Analysis[45] and Roadmap 2021[46]. In addition to providing new individualized medicine to patients for whom treatment had not been available, the government will promote the establishment of a system that enables the relevant parties in industry, government, and academia to analyze and utilize the information widely.
- To create new industries, the government will promote health management to advance the health care industry outside the public insurance system, promote regional and occupational cooperation, and promote efforts to improve the health of individuals.
- With a view to contributing to the achievement of UHC[47], the government will promote overseas operations by Japan'st health and medical-related industries, aiming to contribute to the autonomous promotion of industries in each country and a wide range of health and medical fields, under the Asian[48] and African Health and Wellbeing Initiatives[49].

⑥ Space

The government will steadily promote initiatives based on the Basic Plan on Space Policy[50] and timetable. In particular, as the international situation surrounding space intensifies, it is increasingly important to maintain and strengthen the autonomy of Japan's space activities, including from the viewpoint of security, and to strengthen responses to future-oriented needs such as carbon neutrality, disaster countermeasures, and national resilience. From this perspective, the government will work to further strengthen space policy by establishing a small satellite constellation, developing and demonstrating fundamental technologies in cooperation with industry, government and academia (space computing, optical communications, quantum cryptography, fundamental technologies necessary for satellite constellations, digitalization, advanced sensors, etc.), developing satellites based on disaster response and other needs, researching and developing the Space Solar Power Systems, developing key rockets such as the H3 rocket and research and development for an innovative future space transport systems, promoting the Artemis Program and the Martian Moon eXploration (MMX) Program, promoting the fostering of human resources and other programs, and strengthening the mission assurance of the entire space system[51] to ensure stable utilization of outer space.

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[45] Action Plan for Whole Genome Analysis (first edition). Released by the Ministry of Health, Labour and Welfare on December 20, 2019

[46] Action Plan for Whole Genome Analysis Roadmap 2021. Released by the Ministry of Health, Labour and Welfare on June 9, 2021.

[47] UHC: Universal health coverage. It refers to the condition in which all people can receive appropriate health and medical services such as prevention, treatment, and rehabilitation at affordable costs, and is positioned as one of the targets of the SDGs.

[48] Basic Principles of the Asia Health and Wellbeing Initiative (Decision made by the Headquarters for Healthcare Policy on July 29, 2016, revised on July 25, 2018)

[49] Basic Principles of the Africa Health and Wellbeing Initiative (decided by Headquarters for Healthcare Policy on June 20, 2019)

[50] Cabinet Decision of June 30, 2020

[51] Mission assurance refers to the assurance of the ability to achieve the goals of relevant systems continuously and stably through the detection and avoidance of threats and risks, strengthening of the systems' own survivability, early function recovery, etc. even in situations in which space-related threats and risks emerge.

⑦ Ocean

Based on the Basic Plan on Ocean Policy[52], the following measures will be strongly promoted.

- Efforts will be made to promote measures against marine plastic litter, the development and demonstration of ocean resources survey technology the introduction of offshore wind power generation taking into consideration the Vision for Offshore Wind Power Industry (first) formulated in December 2020, and to contribute to taking measures in the international shipping sector against climate change by promoting the development and implementation practical application of low-carbon and decarbonizing decarbonization technologies for ships formulating international rules to promote the spread of new greener ships.
- In order to promote observation and research in the Arctic, from where observation data is not available, the government will steadily construct the Arctic research vessel by around 2026. Based on the joint statement adopted at the Third Arctic Science Ministerial in May 2021, the government will work to develop human resources for observation and research through international cooperation and cooperation with other countries.
- As part of the strengthen the capacity for Maritime Domain Awareness(MDA)[53], efforts will be made to upgrade and increase the efficiency of ocean observation technologies in order to make the most of Japan's vast exclusive economic zone. To share and utilize ocean data, the government will enhance the functions of the advanced information sharing systems will be enhanced with looking ahead of further utilization. With regard to the MDA Situational Indication Linkages (MSIL)the government will improve the environment of will be created to steadily facilitating ocean data linkage by FY2022.

⑧ Food, agriculture, forestry and fisheries

Japan's food, agriculture, forestry, and fisheries industries face severe challenges, including climate change and the large-scale natural disasters associated with it, weakening of production bases, such as the aging and decline of producers, and responding to changes in production and consumption triggered by COVID-19. On the other hand, the SDGs and environmental measures have come to be emphasized in various industries, and it is necessary to appropriately respond to them in the food, agriculture, forestry and fisheries industries in our country. In addition, it is necessary for Japan to propose a new food system from the standpoint of the Asian monsoon region in international discussions. Therefore, the establishment of a sustainable food system with the future of agriculture, forestry and fisheries industries and of the region in mind has become an urgent issue.

Under these circumstances, in May 2021, the government formulated the Strategy for Sustainable Food Systems as a new policy to achieve a balance between improving productivity and sustainability in the food, agriculture, forestry, and fisheries industries through innovation.

The strategy sets technology development targets and social implementation targets for the entire supply chain, from procurement to production, processing, distribution, and consumption, as goals from the

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[52] The Third Basic Plan on Ocean Policy was approved by the Cabinet on May 15, 2018. The Basic Act on Ocean Policy stipulates that the Basic Plan on Ocean Policy shall be reviewed approximately every five years.

[53] MDA: Maritime Domain Awareness.

perspectives of (1) reducing greenhouse gas, (2) reducing the use of chemical pesticides and fertilizers, (3) reducing labor and improving productivity, and (4) maximizing the use of local resources. In order to achieve these targets, the strategy will draw on the ambitious efforts of stakeholders from procurement to production, processing, distribution, and consumption, and will work on the development of innovative technologies and production systems and social implementation.

(5)Revitalizing the flow of funds to create knowledge and value

(Enhancement of investment in science, technology and innovation)

During the Fifth Basic Plan period, the government secured approximately 26.1 trillion yen (approximately 28.6 trillion yen when including Green Innovation Fund projects and University Endowment Fund on a scale of 10 trillion yen) for research and development investment. In FY2019, the research and development investment of the public-private sectors was 19.6 trillion yen (3.50% of GDP)[54]. However, other countries are also significantly increasing their investment in science, technology and innovation. In order for Japan to survive the fierce competition with other countries, it is important to secure a bold scale of government research and development investments and, using it as a catalyst, expand research and development investment in the public-private sectors.

During the period of the Sixth Basic Plan, the government will steadily expand the government budget for science and technology, while giving due consideration to the constant improvement of the quality of science and technology and innovation policies and fiscal sustainability, including through the thorough implementation of EBPM. In the next five years, the government will strive to achieve investment targets of 30 trillion yen in research and development investment and 120 trillion yen in research and development investment between the public and private sectors, leading the international R&D competition.

(Promotion of innovation in government projects and induction of private investment)

Furthermore, with a view to realizing Society 5.0, the government will promote the innovation of all public and private investments, including government projects, so as to the social implementation of the results of science, technology and innovation. For this purpose, the government will promote innovation in government projects in a wide range of fields, and take necessary measures to induce private investment, such as promoting the application of the R&D Tax Credit System and promoting ESG investment and financing and impact finance.

(6)Strengthening control tower functions in Council for Science, Technology and Innovation

① Strengthen functions to utilize the convergence of knowledge and formulate and disseminate information on policies for the future

By the end of FY2021, the government will compile measures to strategically promote the basic concept and the creation and utilization of the convergence of knowledge that contributes to the comprehensive understanding of human beings and society and the solution of problems through the fusion of knowledge in the humanities and social sciences and knowledge in the natural sciences.

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[54] Statistics Bureau, Ministry of Internal Affairs and Communications, 2020 Results of the Survey of Research and Development

In formulating science, technology, and innovation policies, it is important to increase public understanding and interest through science and technology communication and information dissemination to various sectors in a multilayered manner. In March 2021, the Cabinet Office started to disseminate information on science, technology, and innovation policies using social media, and will continue and enhance dissemination of information through various media.

Furthermore, in light of the importance placed on trans-science[55] in society, we will follow up on efforts by each stakeholder to consider ways to deal with problems with a trans-science-like structure.

② Strengthening policymaking functions and ensuring policy effectiveness through the use of the evidence system (e-CSTI)

In order to formulate effective science, technology, and innovation policies, Japan has worked to further upgrade the analytical functions of e-CSTI[56], and has promoted the sharing of analytical functions with related ministries and agencies, national universities, national research and development agencies, and other related organizations.

In the future, as the scope of capturing consolidated data, such as public research funds, research papers, and university finances, is expanded to include literature information, such as Japanese papers and preprints, it will become necessary to deal with the increasing complexity of extracting and analyzing factors that have a significant impact on research productivity. To this end, AI technology will be used to enhance the analysis of the relationship between research funds and research results. At the same time, the government will steadily strengthen the functions that enable analysis from various perspectives, such as policy analysis concerning researcher mobility, analysis of the relationship between the needs of fostering human resources in the industry and the educational content provided by universities, and visualization of budding research seeds for further activation of industry-academia collaboration activities, by expanding the analytical functions in fields for which detailed analysis had not been possible so far.

Furthermore, in order to promote the implementation of EBPM by the relevant ministries and agencies, schemes will be established to facilitate the smooth use of e-CSTI data.

③ Implementation of policy evaluation and formulation of integrated strategies linked to the Sixth Basic Plan

In the Sixth Basic Plan, the indicators for monitoring its progress was set. Perspectives for the evaluation, analysis and monitoring of the Basic Plan were arranged at the expert panel on evaluation meeting held in February 2021. In the future, we will monitor the main indicators and reference indicators of the Basic Plan based on these, grasp the progress of the Basic Plan, develop methods for evaluating and analyzing the progress, and reflect the evaluation results in the formulation of the integrated strategy.

④ Ensuring effectiveness of control tower function

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[55] A question that can be asked of science but cannot be answered by science alone.

[56] A system that accumulates scientific, technological, and innovation-related data (data on inputs (trends in funding and human resources), activities (activities of universities, research and development agencies, etc.), outputs (research papers, patents, etc.), and outcomes (economic and social trends, etc.)) and enables policy makers and corporate operators to easily analyze the data.

In April 2021, the Science, Technology, and Innovation Promotion Secretariat was established in the Cabinet Office. Through the Integrated Innovation Strategy Promotion Council, etc., the government will strengthen coordination with relevant control tower councils and relevant ministries and agencies. In the future, the functions and systems of the control tower will be reviewed as necessary, taking into account the strengthening of the control tower function by the Science, Technology, and Innovation Promotion Secretariat.

In Science Council of Japan, "Toward a Better Role for Science Council of Japan[57]" was just reported. It is important to incorporate external viewpoints, such as those from industry and academia, into the modality of Science Council of Japan. As part of this, the government will first hold policy discussions on the modality of Science Council of Japan at the advisory panel of experts in the Council for Science, Technology and Innovation established within the Cabinet Office, in order to deepen discussions.

[57] April 22, 2021, Science Council of Japan

Chapter II Science, technology and innovation policy toward realization of Society 5.0

1. Transformation into a sustainable and resilient society that ensures the safety and security of the people

(1)Creating new value through the fusion of cyberspace and physical space

[Ideal vision and direction toward its realization]

In order to realize Society 5.0, cyberspace and physical space will be able to merge and create new value by creating a high-quality digital twin using a wide variety of data in cyberspace. On the basis of this digital twin, physical space will be changed by actively using AI, and the result will be reproduced in cyberspace. This society will be transformed into a society that creates a dynamic virtuous cycle that is constantly changing.

To this end, we will build a sustainable and resilient society that secures the safety and security of the people by building and fully utilizing this new social system infrastructure and tackling global issues and domestic system reform, while reviewing necessary regulations under the control tower and national strategy to realize a digital society. It is also necessary to build a rational cyberspace based on the overall architecture, from strategy to infrastructure and human resources, and to reform physical space's business and industrial structure continuously on the premise of its utilization.

Such a society is supported by human resources and social infrastructure. To develop a large number of human resources capable of playing an active role in every field of society with a background in mathematics, data science and AI. In addition, we will implement technologies that utilize data and AI in an environment where next-generation infrastructure has been established all over the country. Through these efforts, we will build a foundation that enables anyone, anytime, anywhere, to use data and AI to create services that have never been possible before.

In addition, the government will play the role of a "data holder platform" and promote the development of a base registry and the standardization and opening to the private sector of data related to administrative services. In the fields of education, medical care, disaster prevention, etc. the public and private sectors will jointly utilize a safe, secure, and reliable data platform developed by the government, thereby creating a digital twin in cyberspace based on a wide variety of data concerning all goods and services.

Furthermore, by establishing a reliable data distribution environment, ensuring security and privacy, and establishing fair rules, we will activate highly convenient services that are developed and provided in various fields to support the mutual provision and utilization of data by companies and the convenience and safety of citizens. At the same time, we will respond to the negative aspects and ethical issues associated with the social implementation of data and AI, thereby promoting the social participation of diverse people and accelerating the development of society in Japan and overseas.

In response to these changes, a virtuous cycle will be created in which business reforms and digitalization based on the use of data will be carried out in all areas of business, industrial structures will be reformed and international industrial competitiveness will be improved, the social acceptance of data use by the people and the awareness of corporate cooperation will be heightened, and the use of data

across national borders will be further promoted.

By realizing such a society, Japan will support efforts to build a sustainable, safe, and secure society and to resolve various social issues. At the same time, Japan will send out to the world the vision of our country as the first country in the world to realize Society 5.0.

[Target]

- The completion of the Data Strategy will enable cyberspace and physical space to transform society into one that creates a dynamic virtuous cycle, enabling anyone, anytime, anywhere, to create new value using data and AI with confidence.

[Key targets in science, technology, and innovation policies] (Key indicators)

- Create an environment in which everyone, including startups and researchers, can collaborate and connect data across disciplines

  Disaster prevention: All prefectures

  Smart cities: About 100 local governments and regions (including startup and ecosystem hub cities)

[Current data] (Reference index)

- Status of opening of administrative service-related data (open data type): 27,635[58]
- Percentage of enterprises engaging in DX: 41.5% user companies, 33.8% IT companies (2020)[59]
- ICT market size: 99.1 trillion yen (2018) [60]
- IMD World Digital Competitiveness Ranking: 27th place/out of 63 countries (2020)
- Number of cross-sectional data infrastructure searchable catalog sets: 52,797 (Of which are private: 5,535) [61]
- Number of sites offering the above catalog sets: 35 (Of which are private: 1) [62]
- Published metadata of publicly funded research data included in the Research Data Infrastructure System (organizations, programs, etc.) [63]
- Status of telecommunications network development: 5G infrastructure deployment rate (no index as of the end of March 2020)[64], 530,000 households without fiber-optic infrastructure (as of the end of March 2020) [65]
- Awareness about Society 5.0, expectations and concerns about services: 12.9% awareness (2019)[66]

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[58] From Data.go.jp. As of November 27, 2020.

[59] IPA, IT Human Resources White Paper 2020

[60] Ministry of Internal Affairs and Communications, 2020 White Paper on Information and Communications in Japan

[61] As of October 2020

[62] As of October 2020

[63] In Chapter 2, 2. (2), it is stipulated that systematic assignment of metadata for research data obtained with public funds will be promoted by FY2023, and a system will be established in which such metadata can be retrieved on the research data infrastructure system from the same year.

[64] The ratio of the number of grid squares in which advanced specified 5G base station have been established to the total of approximately 4,500 grid squares in a 10 km2 grid nationwide.

[65] As of the end of March 2020. Ministry of Internal Affairs and Communications survey.

[66] The Fifth Science and Technology Basic Plan Review (August 2020)

・ Number of Certified Education Programs under the Mathematical, Data Science, and AI Education Program Certification System

R&D expenditure in the ICT field: 2,362.4 billion yen (FY2019) [67]

① Strategy and organization for building cyberspace

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○ Under the Basic Policy for Reform for the Realization of a Digital Society, we will launch a Digital Agency during 2021 as a control tower for the formation of a digital society, which will have a powerful comprehensive coordination function (advisory authority, etc.), form plans, and will manage and supervise information systems of the national government, local governments, quasi-public departments, etc., [68] as well as develop important systems by itself..[IT[69]]	・In the current ordinary session of the Diet, relevant laws concerning the establishment of the Digital Agency in September this year were passed.	・Establishment of the Digital Agency in September 2021 based on the Digital Agency Establishment Act. [IT]
○ We will review regulations from the viewpoint of promoting the formation of a digital society. [IT, Regulations Office, and relevant ministries and agencies]	・Administrative procedures requiring seals will be reviewed, and the obligation to affix seals will be abolished for 99.2% (15,493 types) of the total. The necessary measures, such as the revision of government and ministerial ordinances to abolish the obligation of affix seals for 15,188 types, or 97.3% of the total, have been completed by the end of FY2020. The remaining 305 types are scheduled to be abolished soon after FY2021.	・Review regulations that contribute to the formation of a digital society. [IT, Regulatory Reform, relevant ministries and agencies]
○ We will clarify the action principles of each player, including administrative organs and the private sector, regarding data, and confirm the progress of measures taken by the	・The Data Strategy (First Report) was formulated at the end of 2020, and a comprehensive data	・Compilation of the Comprehensive Data Strategy in June and promotion of various measures based on it. [IT, STI]

[67] Ministry of Internal Affairs and Communications, 2020 Results of the Survey of Research and Development (December 2020)

[68] For local governments and quasi-public departments, etc., limited to systems for which subsidies from the national government are granted.

[69] After the launch of the Digital Agency in 2021, the Digital Agency will handle operations. Hereinafter the same applies.

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
relevant ministries and agencies from FY2021, starting with the formulation of the First Report at the end of FY2020, with regard to data strategies for building cyberspace and creating new business and administrative services using data, and constantly review and implement them. [IT, STI]	strategy will be compiled in June 2021.	

② **Development of data platforms and provision of highly convenient data utilization services**

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○With regard to the base registry (individuals, corporations, addresses, land, offices, etc.), which will be the basis of data utilization services, the relevant ministries and agencies of the data holder and the IT Headquarters will cooperate to examine the direction of development by June 2021. Some of the preceding projects will start operation by the end of FY2021, and the development of data standards will be sequentially implemented. [IT, relevant ministries and agencies]	・The base registry will be specified at the end of May 2021	・Some of the preceding projects for the base registry started operation in FY2021. [IT, relevant ministries and agencies]
○We will enable each citizen to enjoy the same level of detailed administrative services and to perform procedures online in both regional and urban areas. For this purpose, the government will promote integration and unification of government information systems while ensuring mutual cooperation through standardization and unification, and promote the reform of administrative services and operational systems from the users' point of view in an integrated manner while facilitating cooperation with private systems. By doing so, we will further improve the convenience of citizens and businesses and reduce operating costs (by 30% by FY2025 compared to FY2020). The government will also promote standardization and commonization of information systems pertaining to	・Various initiatives are underway with the aim of shifting to information systems that conform to the standards by FY2025.	・Based on the Digital Agency Establishment Act, the establishment of the Digital Agency in September 2021 and the promotion of various initiatives aimed at the transition to information systems that conform to the standards by FY2025 are being implemented. [IT, MIC]

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
17 operations of local governments[70] and aim to shift to information systems conforming to standards (standard specifications) by FY2025. Based on the effects of standardization and cloud computing, the government will aim to reduce operating costs of local governments' information systems by at least 30% from FY2018 by FY2026, when the shift to standards-based systems is scheduled to be completed. [IT , MIC]		
○In the fields of education, medical care, disaster risk reduction, etc., the government and the private sector will work together to develop and implement a data platform that will contribute to the creation of private services by 2025 in accordance with the timeline of the data strategy. At the same time, the government will aim to establish and implement measurable indicators for the development and utilization of the data platform. [IT , STI, Disaster, MEXT, MHLW, MLIT, relevant ministries and agencies]	・We are studying the ideal form of platforms in each field, including health, medical care, nursing care, education, and disaster prevention.	・Compilation of the Comprehensive Data Strategy in June and promotion of various measures based on it. [IT , STI, Disaster, MEXT, MHLW, MLIT, relevant ministries and agencies]
○With regard to private services, in order to establish a data sharing platform in a collaborative area as soon as possible, the government will work on the creation of model cases by FY2021. In addition, in order to strengthen Japan's industrial competitiveness and distribute data safely and securely,, IPA[71] will develop and design architectures including standards to connect systems and data individually developed by different business and fields, and draw conclusions in multiple fields by FY2022. [METI]	・Steady progress based on project plans.	・Creation of model cases of the data sharing platform inthe of private sector collaboration area in FY2021 [METI] ・Conducting considerations on about the architecture to connect for systems and data of different business and fields, with setting the goal of reaching a conclusion by FY2022. [METI]
○In order to solve problems related to data distribution and utilization across fields and common problems	・Launch of the DSA in December 2020, development of	・Steady implementation of efforts to upgrade connectors and implement connectors on

[70] Information systems related to administrations directly related to people's lives and that require mutual connections (17 operations of Basic Resident Register Network, voter registration list management, property tax, individual inhabitant's tax, corporate inhabitant's tax, light vehicle tax, national health insurance, national pension, disabled persons welfare, late-stage elderly medical care, long-term care, child allowance, public assistance, health care, schooling, child-rearing allowance, and child and childcare support)

[71] Information-technology Promotion Agency

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
faced by relevant organizations by mobilizing the wisdom of industry, academia, and government in terms of technology, systems, and human resources to build a sustainable data ecosystem, we will build a data collaboration mechanism between fields with DSA[72] as the core in 2023. We will promote the interconnection of data infrastructure for each field, data collaboration infrastructure for smart cities and super cities, and research data infrastructure systems, which will be built on research and development issues (SIP, etc.) implemented by the Cabinet Office, and will work on raising awareness through DSA and smart cities public-private collaboration platform[73]. In addition, we will examine measures to realize more advanced data utilization in line with the expansion of the role of administrative organs as data holder platforms, the increase in international data distribution, and the development of services using data and AI. [IT, STI, Disaster, Police, FSA, MIC, MEXT, MHLW, MAFF, METI, MLIT, MOE]	connectors, release of V 1.0 (September 2020), etc. ・The Data Strategy TF was resumed in preparation for the compilation in June 2021. ・Deadline for public applications for the designation of super city-type special national strategic zones, and start of research and study for the designation of zones. ・In order to create more advanced examples of smart cities, a joint review meeting for smart city projects was held by the ministries and agencies concerned.	data bases inside and outside of SIP. [STI] ・Compilation of the Comprehensive Data Strategy in June and promotion of various measures based on it. [IT, STI, Disaster, Police, FSA, MIC, MEXT, MHLW, MAFF, METI, MLIT, MOE] ・Construction of data linkage infrastructure and implementation of advanced services through the super city project. [OPDVLE, relevant ministries and agencies] ・Dissemination of information on smart city cases selected by the joint review meeting. [STI, relevant ministries and agencies]

③ Building a reliable data distribution environment, including data governance rules

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○By the end of FY2021, we will consider the current situation, issues, and rules for the development of an environment for promoting data distribution (information banks, data transaction markets, etc.), and draw a conclusion on them. [IT, SIPSH, STI, PPC, MIC, METI]	・The present state and problems of environmental improvement for promoting data distribution and its rules are being examined.	・Compilation of the Comprehensive Data Strategy in June and promotion of various measures based on it. [IT, SIPSH, STI, PPC, MIC, METI]
○In order to promote the utilization of data held by the private sector, by the	・In the Data Strategy TF held on March 31,	・Compilation of the Comprehensive Data Strategy

[72] DSA: Data Society Alliance. Established in December 2020. Called dataex.jp (tentative name) since the launch of a preparatory council for the establishment of a new organization in July 2020. Going forward, DSA will provide functions related to data connection under the name DATA-EX.

[73] Established in August 2019 for the purpose of accelerating public and private sector cooperation for smart city efforts based on Integrated Innovation Strategy 2019 (Cabinet decision of June 2019).

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
end of FY2021, we will consider ideal rules for the handling of data held by the private sector, such as easing the concerns of citizens and companies on the side of providing data, and improving the reliability of organizations and to which data is provided. [IT, SIPSH, PPC, relevant ministries and agencies]	this paper reports the ideal way of handling rules of data held by the private sector.	in June and promotion of various measures based on it. [IT, SIPSH, PPC, relevant ministries and agencies] ・In FY2021, the government will continue to consider how to handle private-sector data. [IT, SIPSH, PPC, relevant ministries and agencies]
○With regard to trust services that support the data society as a whole, such as personal authentication and assurance of data authenticity, the direction of resolution will be indicated by the end of FY2021, and improvements will be made starting with those that are possible by FY2025. [IT, MIC, METI]	・A working team will be established under the Data Strategy Task Force to examine the data trust framework and summarize the issues.	・The direction of resolution will be indicated by the end of FY2021, and improvements will be made in order from what is possible by FY2025. [IT, MIC, METI]

④ Development and R&D of next-generation infrastructure and data/AI utilization technologies for the digital society

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○We will realize next-generation social infrastructure suitable for data and AI usage in terms of power saving, high reliability, and low delay, which will be spread like a net over the whole country. For this purpose, the development of 5G / optical fiber will be promoted. The 5G will cover 98% of the country by the end of FY2023, and the number of undeveloped optical fiber households will decrease to about 170,000 by the end of FY2021. In addition, the development and improvement of next-generation computing technologies including space systems (positioning, communication, observation, etc.), geospatial (G-space) information, SINET, and high-performance computing (HPC) in terms of software and hardware, quantum technology, semiconductors, and R&D for post-5G and Beyond 5G will be promoted. [G-space, Space, MIC, MEXT, METI]	・Progress is being made based on each project plan. ・Research and development on semiconductors and post-5G is being conducted with a fund established by the New Energy and Industrial Technology Development Organization (NEDO).	・Continue to steadily implement projects in line with initial targets. [G-spac, Space, MIC, MEXT, METI] ・Based on the strategy for the semiconductor and digital industries, we will promote the development and manufacturing locations of advanced semiconductor technologies, promote the optimal location of next-generation data centers, develop advanced technology bases in academia, and accelerate basic research that will contribute to the industry to social implementation. [METI, MEXT, MIC, STI]
○In addition to the development of post-5G systems and semiconductors	・Research and development on post	・We will promote R&D between the public and

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
used in such systems, the government will promote R&D by mobilizing the wisdom of both the public and private sectors by utilizing research and development funds in order to establish elemental technologies gradually from around 2025 toward the realization of Beyond 5G.. [MIC, METI]	5G and semiconductors was funded by the New Energy and Industrial Technology Development Organization (NEDO). ・A budget and legal revisions to create funds to promote Beyond 5G research and development were established. ・Started R&D on some issues at the National Institute of Information and Communications Technology (NICT) where the project is implemented. ・In December 2020, the Beyond 5G New Business Strategy Center was established with the participation of key players from industry, academia, and government. Seminars are being held and proposals for activities to be undertaken by the Center are bing solicited.	private sectors by utilizing the R&D Fund and radio spectrum usage fees, with the aim of establishing elemental technologies sequentially from around 2025. [MIC, METI] ・With the Beyond 5G New Business Strategy Center at its core, we will conduct seminars based on the results of the public call for proposals, strengthen the provision of various information, acquire intellectual property rights, and conduct full-scale efforts toward international standardization. [MIC] ・We will conduct international joint research with strategic partners in order to promote international standardization activities from the initial stage of R&D. [MIC]
○In order to provide services tailored to each and every person making full use of next-generation infrastructure, data, and AI, we will engage in core infrastructure R&D as specified in AI Strategy 2019. [STI, MIC, MEXT, METI]	・Augmentation of computing resources at AI-related core centers was conducted. ・Basic and comprehensive R&D based on the strategy has been implemented, and the following results have been obtained. - As a theory of deep learning, it is mathematically proven that global optimization is possible, that prediction performance is high even in high	・Further promote core research and development based on AI Strategy 2021. [STI, MIC, MEXT, METI] - Conduct the world's most advanced research, including the establishment of a theory system for deep learning. - Conduct R&D on multilingual simultaneous interpretation that captures the context and speaker's intention for use at the Expo 2025 Osaka, Kansai, Japan. - Implementation of the development of challenging knowledge-integration AI technologies to innovate industrial structures. - Regarding research and

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
	dimension, and that reversible neural network models have universal approximation power. - Introduced deep learning into multilingual translation technology to achieve a practical level of accuracy in short sentence sequential translation. Commercialization and popularization of private translation services using technology transferred from NICT have progressed. We also began research and development to realize simultaneous multilingual interpretation. - Based on the theory of quantum physics, we developed a new deep learning technology capable of interpreting the content of calculation physico-chemically, and by introducing the theory of wave function to this, we succeeded in significantly improving the accuracy of physical property extrapolation prediction for unknown compounds.	development of explainable AI, etc., and the ethical examination as the convergence of knowledge with researchers in the humanities and social sciences added, we will examine the cooperation measures of the AI-related core center group, and start concrete measures by the end of FY2021.

⑤ Fostering human resources who will play a vital role in the digital society

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○From FY2021, the government will accelerate dialogue between	・Progress on schedule, including the launch of	・Steady implementation of the Mathematics, Data Science,

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
universities and the government, and industry to further enhance the system for education of knowledge and abilities, which will form the foundation of a digital society, in cooperation with industry, academia, and government, so that human resources who will play a leading role in the digital society will be produced and employed and will be able to play an active role in society. In this way, the government will foster a common understanding of the ideal way of employment and the matching of learning provided by higher education by promoting the development of a system for the early development of specialized statistical teachers, measures for the dissemination of the mathematics, data science and AI education program accreditation system, and education that emphasizes learning results using internships and PBL.[74] [IT, CBPA, NPA, MEXT, METI]	the Mathematics, Data Science, and AI Education Program Certification System (Literacy Level) in FY2020. ・The Ministry of Education, Culture, Sports, Science and Technology and Keidanren are jointly running a committee to implement long-term paid internships in doctoral programs. ・In order to respond to the increasing sophistication of information technology, the government will promote the practical fostering of information technology human resources such as problem-solving learning (PBL) through industry-university collaboration and promote class improvement utilizing information technology, thereby strengthening education for Society 5.0 at universities, etc. ・We are establishing a practical educational network through industry-government-academia collaboration, applying data science to various fields, creating value from data, and developing human resources to answer business issues. ・The Project for Developing Experts on Statistics was started	and AI Education Program Certification System and enhancement of publicity and publicity activities. [IT, Cabinet Bureau of Personnel Affairs, NPA, MEXT, METI] ・Steady implementation of the Project for Developing Experts on Statistics . [MEXT] ・Based on deliberations by the job-based research internship promotion committee, a long-term paid internship program for doctoral programs has been implemented since FY2021 through the job-based research internship promotion project. [MEXT] ・In order to develop digital human resources, teaching materials based on mathematical, data science, and AI model curriculums will be developed at universities and colleges of technology throughout Japan. In addition to the literacy level, basic skills will be acquired that can be applied to one's own specialized field regardless of whether the field is in the humanities or sciences. In addition, an internationally competitive cross-sectoral doctoral education program will be established to develop the top human resources to be taught, and double majors will be promoted in graduate school education for human resources. [MEXT, METI] ・Implementation of AI education for government employees on a trial basis [STI]

[74] PBL: Problem based learning.

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
	in FY2021.	

⑥ Contribution to the international community on the ideal digital society

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○In order to establish a global framework for data distribution, by FY2021, the government will indicate the direction of the resolution of issues that need to be addressed in promoting international data distribution, such as data quality, privacy, security, mutual trust in infrastructure, rules, and standards, and will implement measures to resolve such issues. [Cabinet Secretariat, IT, SIPSH, PPC, MIC, MOFA, METI]	・In cooperation with relevant ministries and agencies, discussions are under way to compile a report in June 2021.	・Compilation of the Comprehensive Data Strategy in June and promotion of various measures based on it. [Cabinet Secretariat, IT, SIPSH, PPC, MIC, MOFA, METI]
○In order to promote international dialogue on the ideal way of a digital society, the government will lead international discussions by providing the results of good practices obtained through the above-mentioned efforts to the international arena such as the OECD, and by reflecting them in the outcomes of the G7[75] and IGF[76], for which Japan will host in 2023. [IT, STI, MIC, MOFA, METI]	・Relevant ministries and agencies are working together to address related international conferences.	・With a view to holding the G7 meeting and the IGF Summit and related meeting in Japan in 2023, the government will continue to coordinate relevant ministries and agencies to address related international conferences. [IT, STI, MOFA, METI]
○At the Expo 2025 Osaka, Kansai, Japan to be held in 2025, based on the Basic Policy on the Promotion of Preparation and Implementation Measures for World Expo 2025 (Expo 2025 Osaka, Kansai, Japan)[77] , Japan will embody the Society 5.0 by utilizing data and AI. Through this, Japan will widely demonstrate its mounting capabilities both at home and abroad and attract foreign investment. [Expo, STI, MIC, METI]	・In cooperation with related ministries and agencies, efforts are being considered based on the basic policy, etc. ・Research and development started in FY2020 to realize the implementation of advanced multilingual simultaneous interpretation services using AI and enhancement of multilingual support inside and outside the Expo site at the World	・The government will study concrete measures based on the basic policy, etc. [Expo, STI, MIC, METI] ・Towardsthe realization of efforts posicitioned in the basic policy, in order to realize simultaneous interpretation using AI in 2025, research and development such as the expansion of supported languages and further improvement of translation accuracy, and field demonstration in anticipation of Expo will be conducted in

[75] G7 Summit to be held in Japan in 2023.

[76] IGF: The Internet Governance Forum. To be held in Japan in 2023

[77] Cabinet Decision of December 21, 2020

	Expo 2025 Osaka, Kansai, which were positioned as the basic policy. [MIC]	FY2021. [MIC]

⑦ **New policy challenges**

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○In the midst of severe changes in the social situation surrounding digitalization, measures to promote the use of data across national borders, measures to promote the construction of digital twins in the public and private sectors, measures to attract highly skilled human resources from around the world to Japan, and measures to reflect social acceptance in policies are to be reviewed according to the situation at all times using evidence. By FY2023, policies will be evaluated and reviewed, and new policies will be considered. [IT, STI]	・The Data Strategy (First Report) was formulated at the end of 2020. ・The Data Strategy TF was resumed in preparation for the compilation in June 2021.	・Promote various measures based on the Comprehensive Data Strategy. [IT, STI]

(2)Promoting social change and disruptive innovation to overcome global challenges

[Ideal vision and direction toward its realization]

We will achieve carbon neutrality by 2050, which will reduce greenhouse gas's overall emissions to zero. We will also realize a circular economy through sound and efficient waste treatment and advanced recycling of resources. Our aim is to create a society that leads the world and creates a virtuous cycle between the economy and the environment by taking steps to achieve these goals, which will lead to economic growth through the development of the green industry.

In order to achieve this, discontinuous innovation is indispensable, along with the redesign of the economy and society through the three transitions to a decarbonized society, recycling-oriented economy, and decentralized society, which aims to reform people's lifestyles, industrial structures, the economy and society as a whole, and to solve social problems. To this end, it is necessary for industry, academia, and the government to work together as one to make a broad range of concerted efforts toward 2030, setting high goals and a vision.

From this perspective, in order to achieve carbon neutrality, we will promote thorough energy conservation, promotion of electrification, and decarbonization of electric power (accelerated diffusion of technology for maximum introduction of renewable energy and use of nuclear energy with top priority on safety) based on discussions at the Green Innovation Strategy Promotion Council, and will strongly promote innovative innovations such as next-generation solar cells, CCUS/carbon recycling, and hydrogen. At the same time, in order to promote the introduction of technologies and social implementation, the government will promote decarbonization of people's lifestyles, realize and expand zero-carbon cities, and foster public understanding, and will consider the necessary systems, standards, and other mechanisms.

In addition, by actively disseminating information on our country's efforts internationally and enhancing Japan's presence, the government will mobilize the wisdom of research institutes around the world, promote international joint research, and build supply chains. The government will also promote the incorporation of investment in energy and environment-related businesses into Japan and the active visualization of corporate activities.

Furthermore, in order to realize a circular economy, we will promote innovation such as the development of alternative materials in addition to waste treatment and proper management, by extending product life, long-term conservation and maintenance of resources, and minimizing the generation of waste. In addition, the government will promote the creation of sustainable communities and the transformation of people's lifestyles, while creating a Regional Circular and Ecological Sphere, an autonomous and decentralized society in which each region makes use of local resources, such as natural resources and ecosystem services, complements and supports each other according to the characteristics of the region.

[Target]

- As global challenges becomes more serious, our country will reduce its greenhouse gas emissions to net 0 by 2050, becoming a world carbon neutral, and by promoting the transition to a circular economy, will contribute to overcoming environmental problems in climate change and elsewhere

and ensure sustainability based on the SDGs.

[Key targets in science, technology, and innovation policies] (Key indicators)

- Japan's greenhouse gas emissions: net zero (2050)
- Resource productivity: approx. 490,000 yen/ton (FY2025)
- Market size of recycling-oriented social business: approximately twice that of FY2000 (FY2025)

[Current data] (Reference index)

- Progress of the Environmental Innovation Strategy (Innovation Action Plan, Acceleration Plan and Zero Emission Initiatives)[78]
- Number of Zero Carbon Cities: 408 local governments (June 14, 2021)
- R&D expenditure in the environmental field: 1,289.4 billion yen (FY2019) [79]
- R&D expenditure in the energy field: 1,165.4 billion yen (FY2019) [80]
- RE 100 member companies[81] (Japan): 54 companies (May 17, 2021) [82]
- Greenhouse gas emissions: 1,212 million tons (FY2019) [83]
- Average temperature rise in Japan: 1.26 °C per 100 years (1898 – 2020) [84]
- Resource productivity: approx. 423,000 yen/ton (FY2018) [85]
- Market size of business related to sound material-cycle society business: approximately 40 trillion yen (FY2000) [86]

① Promotion of R&D and cost reduction of innovative environmental innovation technologies

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[78] The Environmental Innovation Strategy (decided by the Integrated Innovation Strategy Promotion Council on January 21, 2020) is composed of (1) an Innovation Action Plan that identifies specific cost targets for 16 technical issues, (2) an Acceleration Plan that describes a research framework and investment promotion measures to realize these targets, and (3) the Zero Emission Initiatives (Tokyo Beyond Zero Week) that will be launched toward social implementation together with global leaders. The Innovation Action Plan will be published as an Innovation Dashboard as needed.

[79] Ministry of Internal Affairs and Communications, 2020 Results of the Survey of Research and Development (December 2020)

[80] Ministry of Internal Affairs and Communications, 2020 Results of the Survey of Research and Development (December 2020)

[81] A company that aims to use 100% renewable energy.

[82] Compiled from the RE100 website (http://there100.org/).

[83] Greenhouse gas emissions in FY2019 (Ministry of the Environment, April 13, 2021)

[84] Japan Meteorological Agency, Climate Change Monitoring Report 2020 (2021)
URL: https://www.jma.go.jp/jma/en/NMHS/indexe_ccmr.html

[85] Resource productivity = GDP/input of natural resources, etc.
Natural resource input refers to the total amount of domestic and imported natural resources and imported products (direct material input: DMI). Resource productivity is an index that comprehensively shows how much affluence each industry generates with less natural resources, such as whether each industry improves its production activities with less natural resources or how people's lives use products effectively, by calculating the real gross domestic product (real GDP) generated from the input of natural resources per certain amount. In international comparison, attention should also be paid to differences in industrial structure.

[86] Calculated from Ministry of the Environment's Report on the Market Size and Employment of the Environmental Industry 2019 (Published on July 20, 2020) (Reference: 4th Fundamental Plan for Establishing a Sound Material-Cycle Society (June 2018)).

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○With regard to the Innovative Environmental Innovation Strategy, the Innovation Dashboard, the Acceleration Plan, and Tokyo Beyond Zero Week will be reviewed in a timely and appropriate manner in light of the global situation, and industry, academia, and government will steadily promote the implementation of innovative technologies in society. In addition, regarding the fields essential for achieving carbon neutrality, the government will promote the implementation of innovative technologies in society by utilizing fund projects that provide continuous support for the development of innovative technologies based on the Green Growth Strategy Through Achieving Carbon Neutrality in 2050[87] that includes (i) targets with clear time frames, (ii) research and development and demonstration, (iii) institutional development such as regulatory reform and standardization, and (iv) international collaboration, and will promote the implementation of innovative technologies in society by utilizing fund projects that provide continuous support for the development of innovative technologies. [STI, MIC, MEXT, MAFF, METI, MLIT, MOE]	・Based on the Progressive Environmental Innovation Strategy formulated in January 2020, the Green Innovation Strategy Promotion Council was held to exchange opinions and share information among experts with the aim of steadily implementing the strategy and producing maximum results. ・In order to achieve the 2050 carbon neutral target, a Green Innovation Fund of 2 trillion yen was established in the third supplementary budget for FY2020.	・In cooperation with related ministries and agencies, the Green Innovation Strategy Promotion Council will be held to review and release the Innovation Dashboard, etc. [STI, MIC, MEXT, MAFF, METI, MLIT, MOE] ・With regard to the Green Innovation Fund, based on the basic policy for the fund's projects decided in March 2021, we will select projects to be supported and promote initiatives. [STI, MIC, MEXT, MAFF, METI, MLIT, MOE] ・We will accelerate basic research and development that will lead to the creation of innovative technology seeds in cooperation with relevant ministries and agencies. [MEXT] ・Japan's advanced basic strategies such as the Green Growth Strategy will be actively introduced overseas at international conferences and other events. [MOFA]
○In order to maintain data interoperability and system scalability between cities and fields, the implementation of urban OS (data linkage platform) in each region will be accelerated while referring to the Smart City Reference Architecture. In addition, support will be started in FY2021 to contribute to the progress of efforts for zero carbon cities so that local governments, etc. that have announced zero carbon cities will implement climate change	・In FY2020, reference to Reference Architecture was made mandatory for smart city-related businesses of the Cabinet Office and each ministry. Adopted regions are promoting the construction of smart cities based on this architecture.	・The Smart City Guidebook will be used to promote the implementation of urban OS and the creation of smart cities in local governments and regions across the country, while referring to the ideal form of the data linkage infrastructure discussed at the Study Group on Data Linkage in Super Cities and Smart Cities held in FY2020. [STI, MIC, MEXT, MAFF, METI, MLIT, MOE]

[87] Released by the Committee on the Growth Strategy on December 25, 2020.

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
measures using a wide variety of big data. [STI, MIC, MEXT, MAFF, METI, MLIT, MOE]		・Support will be provided to contribute to the progress of efforts toward zero carbon cities so that local governments and other entities that have announced zero carbon cities can take measures against climate change using a wide variety of big data. [MOE]
○ The government will accelerate necessary R&D to achieve the 2050 goals of the Moonshot Research and Development Program ("Realization of Sustainable Resource Circulation for Global Environment Restoration" and "Creation of a Sustainable Food Supply Industry with No Excess or Waste on a Global Scale through Full Utilization of Unused Biological Functions"), and will clarify the path toward social implementation. [STI, MAFF, METI]	・In 2020, we appointed project managers, and we are promoting research and development to achieve the targets.	・We will strongly promote R&D projects to achieve the targets. [STI, MAFF, METI] ・We will dramatically strengthen R&D projects to further contribute to the realization of a carbon-neutral society. [STI, MAFF, METI]
○In cooperation with the international community, the government will strengthen the functions of the "Innovative Global Research Centers" such as the AIST Global Zero Emission Research Center , the Next-Generation Energy Infrastructure Research Center, and the Tokyo Bay Area Innovation Area, and activate exchanges of human resources and knowledge both in Japan and overseas. [MEXT, METI]	・In January 2020, AIST established the AIST Global Zero Emission Research Center, and as of December 2020, established 45 overseas collaborations. ・The Tokyo Zero-emissions Innovation Bay Council was established. As of the end of January 2021, a total of 122 members have participated, and seminars and other events were held to introduce the members' cutting-edge demonstration activities.	・We will promote concrete international joint research with AIST's Global Zero Emission Research Center as the core. [METI] ・The third RD20 will be held in October 2021. [METI] ・In FY2021, innovative new technology will continue its international joint research and development projects in the clean energy field. [METI]
○By May 2021, the government will formulate the Green Food System Strategy, which will include achieving carbon neutrality by 2050 and active participation in international rule-making. The strategy will examine the development of new agricultural, forestry, and fishery policies and present a vision to be achieved by 2050. Based on this, the government will realize	・In December 2020, the Strategy for Sustainable Food Systems was published. ・In January 2021, the government began exchanging opinions with producers, organizations, and companies, and released an interim report in March. A strategy was formulated in May.	・Based on the Strategy for Sustainable Food Systems, we have established the targets for technology development and social implementation as the ideal state to aim for from the perspective of (1) reducing greenhouse gases; (2) reducing the use of chemical pesticides and fertilizers; (3) reducing labor and increased

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
both the improvement of productivity and the sustainability of the food, agriculture, forestry, and fishery industries through innovation. [MAFF, relevant ministries and agencies]		productivity; and (4) maximizing utilization of local resources, for the entire supply chain from procurement to consumption. [MAFF, relevant ministries and agencies] ・We will achiee significant improvements in productivity and sustainability at each stage of the supply chain through innovation, rather than extending conventional measures. [MAFF, relevant ministries and agencies] ・From the perspective of supporting the social implementation of innovative technologies and production systems as set out in the strategy, and sustainable efforts at each stage, the government will consider a gradual review of policy guidance methods such as subsidies, investments and loans, taxes, and systems. MAFF, relevant ministries and agencies] ・The strategy was proposed by our country as a model for sustainable food systems in the Asian monsoon region at the United Nations Food System Summit to be held in September 2021 and participated in international rulemaking. MAFF, relevant ministries and agencies]
○For the transition to a recycling-oriented economy, the government will promote the development of environment-friendly designs, the development of advanced recycling infrastructure technologies such as improved sorting efficiency of used products, the research and development of innovative materials with low environmental impact such as marine biodegradable plastics, and investment for the promotion of innovation. [MEXT, METI, ,	・Since August 2020, NEDO has been conducting R&D on advanced fundamental technologies for recycling and innovative materials with low environmental impact, such as marine biodegradable plastics. ・JSA has implemented international standardization on the technical evaluation method for marine biodegradable plastics, and is promoting	・In order to develop and promote the introduction of marine biodegradable plastics, we are continuing studies to develop new technologies and materials to meet future needs and to propose international standards for marine biodegradable plastics. [METI] ・We will promote the practical application of technologies to increase the resource efficiency and value of plastics. [METI]

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
MOE]	innovation of innovative materials with low environmental impact such as marine biodegradable plastics.	・Based on the National Action Plan for Marine Plastic Litter and other policies, accumulation of scientific knowledge through research and studies and international cooperation or waste disposal and capacity improvement in 3R etc. in developing countries will be promoted. [MOE] ・In order to steadily implement the Marine Initiative to realize the Osaka Blue Ocean Vision, we will implement support projects for surveys and verification of ocean runoff in developing countries. [MOFA]
○While climate change is a cause of biodiversity degradation, forest ecosystems, etc., which are the basis of biodiversity, are closely interrelated and related to each other such as CO2 sinks. Therefore, research and development will be conducted to realize carbon neutrality through synergies between biodiversity conservation and climate change measures, and the use of ecosystem functions in sinks and adaptation to climate change will be promoted. [MAFF, MLIT, MOE]	・The government conducted research and studies on Ecosystem-based disaster risk prevention and mitigation based on natural ecosystems to utilize ecosystem functions in adaptation to climate change.	・Research and studies will be promoted in order to compile guidelines that can be used as a reference when local governments, etc. are working on Ecosystem-based disaster risk reduction, prevention and mitigation based on natural ecosystems. [MOE]
○The government will promote efforts to save energy in social infrastructure facilities and to achieve zero emission as well as innovative technology development for reducing energy consumption at construction sites. At the same time, the government will promote the social implementation of green infrastructure that contributes to CO2 sink measures by utilizing various functions of the natural environment. [MLIT, MOE]	・The Green Infrastructure Public-Private Partnership Platform (1012 members as of the end of January), established in March 2020, conducts surveys and research on the social dissemination of green infrastructure, technology, and financing methods. ・Technical and financial support is provided to local governments and private businesses aiming to introduce green infrastructure.	・We will promote the social implementation of green infrastructure by advancing studies on the Green Infrastructure Public-Private Partnership Platform and providing technical and financial support to local governments and other entities. [MLIT, MOE]
○In order to contribute to the creation of highly accurate climate change prediction information and the resolution of	・We are enhancing the accuracy of climate change prediction information based on	・Through the advancement of climate change simulation model technology (fusion research with observation

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
climate change issues, the government will promote the accumulation and utilization of global environment big data such as observation data and prediction information on greenhouse gases. [MEXT, MOE]	needs, etc. ・The Data Integration and Analysis System (DIAS) is utilized tfor continuous continuously storage of observation data, forecast information, and other data for big data on the global environment. In addition, we are promoting the enhancement of the usage environment to expand utilization.	data, etc.), the clarification of climate change mechanisms and the enhancement of accuracy of prediction information based on needs, etc. will be carried out. [MEXT, MOE] ・In order to contribute to the clarification of global warming phenomena and the improvement of prediction accuracy, and to respond to policy needs such as the Global Stocktake, from FY2021, we will comprehensively develop observation and model research, and build a monitoring system that satisfies (1) spatial multi-scale in cities, countries, regions, and the whole globe, and (2) speed in the process from observation to balance evaluation. [MOE] ・We will establish a scientifically high-level monitoring system that will enable the steady provision of information to the Global Stocktake from 2023 and the foundation for its succession. [MOE] ・In order to acquire big data on the global environment over the long term and on an ongoing basis, we will combine various observation methods and research capabilities in a wide range of fields, and continuously advance observation technologies such as earth observation satellites while utilizing international frameworks such as the GEO. [MEXT, relevant ministries and agencies] ・Building on the results of DIAS to date, we will establish long-term, stable operations as an information platform that can be used for disaster prevention and mitigation and for global challenges such as climate change. We will also

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
		promote the utilization of the DIAS as a global environmental data platform that contributes to decision-making by the national government, companies, and local governments. [MEXT]

② **Promotion of R&D and demonstration for utilization of various energy sources**

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○Based on the Strategic Energy Plan, which is currently under review, the government will promote necessary research and development, demonstration, and international cooperation in energy conservation, renewable energies, fusion power, and fusion energy. [MEXT, METI]	・Based on the Fifth Strategic Energy Plan, the following initiatives are being promoted. ・In terms of energy conservation, we have provided support for net zero energy conversion of houses and buildings, verification of next-generation building materials, improvement of transportation efficiency through cooperation between truck operators and shippers, and technical verification support for coastal ships. ・Regarding renewable energy, we conducted R&D on solar power generation and offshore wind power generation to overcome location constraints, reduce costs, and improve efficiency, and conducted demonstration of the Japanese version of Connect & Manage to overcome system constraints and stabilize distribution systems. ・Regarding nuclear power, in addition to supporting the development of technologies to improve the safety of light water reactors, Japan provided support for the development of	・We will continue discussions on a review of the Strategic Energy Plan. [METI] ・In terms of energy conservation, we will develop, commercialize, and demonstrate innovative energy conservation technologies across various fields in order to develop further energy conservation potential. At the same time, we will conduct demonstrations aimed at achieving net zero energy for houses and buildings and improving transportation efficiency throughout the supply chain. [METI] ・As for renewable energy, while considering the utilization of the Green Innovation Fund, we are promoting the development of next-generation solar cells including perovskite, and elemental technologies related to floating offshore wind power based on the Technology Development Roadmap for the Enhancement of Industrial Competitiveness for Offshore Wind Power Generation. [METI] ・Regarding nuclear power, in addition to technologies for improving the safety of light water reactors, the government will promote R&D on innovative nuclear technologies such as fast reactors, small modular reactors, and high temperature gas reactors, as well as fostering human resources in the nuclear energy field. The government will also consider detailed design of a new test reactor to be installed at the

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
	innovative nuclear technologies such as fast reactors, small modular reactors, and high-temperature gas reactors, and also provided assistance to fostering human resources in the nuclear field. ・In 2020, the conceptual design of a new test reactor to be installed at the Monju site, which will serve as the foundation for research and development and fostering human resources, was started. ・In October 2020, the Advisory Committee for Natural Resources and Energy started discussions on a review of the Strategic Energy Plan. ・In response to the growing political demand for a decarbonized society and the smooth progress of the ITER Project, the United States and the United Kingdom have announced their own plans, including fusion power generation, since November 2020.	Monju site in accordance with the progress of conceptual design. [MEXT, METI] ・With regard to fusion energy, as part of the ITER Project, which is scheduled to commence operation in 2025, we are developing the main components that Japan is in charge of , which are the keys to realizing fusion power generation. At the same time, we are promoting R&D toward nuclear fusion power (prototype reactor) through the JT -60 SA Advanced Superconducting Tokamak System and the development of reactor materials and functional materials under the BA activities. [MEXT]

③ Promotion of economic and social redesign

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○With the aim of creating industries, reforming the economy and society, and solving social problems, concrete efforts will be made to redesign the economy and society through the three transitions to a "decarbonized society," a "circular economy," and a "decentralized society." In this regard, the regional perspective, which is conscious of social	・Based on the 2050 Carbon Neutrality Declaration, we implemented concrete measures for the redesign of the economy and society through the transition to a decarbonized society, a circular economy, and a decentralized society, as well as measures for the creation of a Circular and Ecological Economy（local SDGs). ・In addition to promoting research and development	・Based on the 2050 Carbon Neutrality Declaration, we will accelerate the three transitions to a decarbonized society, a circular economy, and a decentralized society, and will strongly promote redesign toward a sustainable and resilient economic society. In addition, we have evolved the creation of local SDGs, a Circular and Ecological Economy that embodies the three

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
implementation, as well as a global perspective, is also important. Therefore, the government will promote cross-sectoral R&D to support regional decarbonization efforts, and aim to create local SDGs that will realize the three transitions in an integrated manner. [MEXT, METI, MOE]	for decarbonization in the regions, the Council for National and Local Decarbonization, which began in December 2020, decided on the regional decarbonization roadmap in key areas closely related to regional efforts and people's lifestyles (June 2021).	transitions, by leveraging social changes and needs. [MEXT, METI, MOE] ・Based on the regional decarbonization roadmap" (June 2021) decided by the Council for National and Local Decarbonization, the government will intensively support decarbonization efforts in regions that contribute to regional revitalization by creating new industries and jobs in the region and improving the attractiveness of the region, particularly over the next five years. By FY2025, the government will set a course for implementing proactive measures toward decarbonization in at least 100 decarbonization leading area in accordance with regional characteristics and other factors. By FY2030, the government will work to reduce greenhouse gas in areas closely related to the fields of local communities and livelihood. The government will achieve net zero CO_2 emissions from electricity consumption in the civil sector (household sector and other operationssectors). It will also achieve reductions consistent with the targets for the entire country for FY2030, including transport and heat use. [OPDVLE, MIC, MAFF, METI, MLIT, MOE] ・In addition to promoting R&D across fields from humanities and social sciences to natural sciences in order to promote regional reforms toward decarbonization, a network of universities will be established and operated to strengthen the functions of universities as centers of knowledge in each region. [MEXT, METI, MOE]
○In preparation for COP26 in November 2021, the	・A joint meeting of the Central Environment	・The government will support the introduction of CO_2-

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
government will boldly implement global warming countermeasures such as further acceleration of technology development, implementation in society, and reform of lifestyles and work styles, based on the Plan for Global Warming Countermeasures under review. [METI, MOE]	Council and the Industrial Structure Council is currently discussing our country's climate change measures, including a review of the Climate Change Policy Programme.	saving demand-side equipment capable of controlling the operation of the demand-side in order to convert variable renewable energy sources such as solar and wind power into mainstay power sources, and the introduction of renewable energy and storage batteries by new methods such as on-site PPA models. [MOE] ・In addition to promoting the spread and expansion of floating offshore wind power generation facilities, which have the highest potential of renewable energies to be introduced, Japan will support decarbonization business centering on offshore wind power generation in regions aiming at local production and local consumption of energy as part of regional development measures. [MOE] ・We will promote the spread of regional decarbonized hydrogen supply chains throughout Japan, while promoting efforts to reduce the cost of hydrogen derived from renewable energy and to realize environmental value. [MOE] ・We will conduct CCUS carbon recycling trials and R&D for full-scale social implementation from 2030 onward, and promote efforts to establish the first commercial-scale CCU technology by 2023. [METI, MOE] ・I In order to aim for the formation of a decarbonized society while responding to COVID-19, we will promote social optimization by DX (Green By Digital) through the use of AI technologies, etc., the formation of green data centers, and the technology development, demonstration, and social implementation of energy-

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
		conserving technologies such as achieving high-efficiency in various devices incorporated in a wide variety of electrical equipment (servers, LEDs, etc.) through next-generation semiconductors, such as high-quality gallium nitride (GaN) semiconductors, to realize a thorough reduction of energy consumption, in order to realize new lifestyles in the post-corona era and decarbonization of digital fields.. [MIC, MEXT, MOE]
○In order to promote the spread of technologies for decarbonization of lifestyles, the government will promote lifestyle changes and expand the prosumer of decarbonization by taking into account the discussions at the "National and Local Decarbonization Realization Conference," etc., by working on total management of housing and transportation (practical application of a combination ofZEH[88] and ZEB[89], appliances on the demand side (home electric appliances, hot water supply, etc.), local renewable energies, and EV[90] and FCV[91] as mobile batteries cells), action modification through nudge[92] and sharing, technology development and demonstration to encourage crediting of CO2 reduction using digital technologies, support for introduction, and establishment of systems.[93] for CO2 reduction through digital technology [MOE,	・The first meeting of the Council for National and Local Decarbonization was held on December 25, 2020, the second meeting was held on April 20, 2021, and the third meeting was held on June 9. In order to realize a 2050 decarbonized society in the regions, discussions were held on the road map toward the realization of a decarbonized society in 2050 from the perspective of the people and consumers, focusing on the areas of living and society, which are closely related to the efforts of the regions, and how the related ministries, ministries and local governments should work together to realize the roadmap. ・Utilizing the interdisciplinary nature (convergence of knowledge) of behavioral sciences encompassing all fields of nature, humanities, and social sciences, we are conducting a demonstration	・Utilizing the knowledge of Nudge and other behavioral sciences, the government will encourage people to change their attitudes and behavior in response to their interest in decarbonization, and encourage them to shift to a decarbonized lifestyle. Since FY2021, we have started demonstration experiments on changes in behavior and consumer preferences by visualizing the history of environmentally conscious behavior and the environmental impact of products and services. [MOE] ・Promote decarbonization in the household and business sectors by improving energy efficiency in homes and buildings and supporting net zero energy (ZEH and ZEB). [MOE]

[88] Net zero energy house

[89] Net zero energy building

[90] Electronic vehicle

[91] Fuel cell vehicle

[92] Nudge: gently push

[93] Prosumer: a concept introduced by futurist Alvin Toffler in his book released in 1980, The Third Wave. It is a portmanteau combining the words “producer” and “consumer,” meaning a consumer who conducts production activities.

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
relevant ministries and agencies]	project to collect and analyze data on the actual state of energy use and the implementation status of environmentally-friendly actions through integration with cutting-edge technologies such as AI/IoT (BI-Tech), and to promote reasonable behavior changes toward decarbonization through approaches that match individual attribute information and values. ・Regarding transactions of individuals or companies with environmental value using blockchain technology, we are conducting demonstrations of how purchasing behavior of sellers and buyers changes according to fixed or fluctuating transaction prices and whether or not attribute information is displayed.	
○The government will accelerate the transition to a circular economy by promoting resource recycling through such means as reducing waste emissions, improving the sophistication and efficiency of recycling processes, and turning products into biomass. At the same time, the government will aim to recover energy from waste that must be incinerated, and to separate, store, and effectively use greenhouse gases generated by processing. [METI, MOE]	・We are supporting the conversion to plastic alternative materials, construction and CO2 reduction of recycling processes, construction of recycling processes.	・The government will conduct demonstrations of the applicability of digital technology for the promotion of resource circulation and advance initiatives for the creation of innovative businesses, as well as support the conversion to and social implementation of plastic alternative materials, the introduction of CO_2-saving facilities, and the development of heat recovery facilities from waste treatment facilities to promote effective utilization of energy from waste. [MOE] ・The government will formulate guidelines for the introduction of biomass plastic and other materials into designated garbage bags by local governments, and promote conversion to biomass. [MOE] ・In order to solve the problem of marine plastic litter, we will promote research and study on the actual distribution of marine plastic litter, gathering

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
		global data for around 2023, and the impact on organisms and ecosystems . [MOE]
○With regard to responses to biodiversity, which forms part of a distributed society, the government will promote research and development on technologies for the protection of endangered species and the control of invasive alien species, technologies for the monitoring, maintenance, and restoration of ecosystems including secondary nature, technologies for the assessment of economic and social values of ecosystem services including genetic resources and natural capital, and technologies for sustainable management and utilization to realize "coexistence with nature.". [MOE]	・In addition to promoting studies on technologies for the protection and propagation of nationally endangered species of wild fauna and flora, we conducted surveys on the inhabitation and growth of endangered species in preparation for the publication of the Fifth Red List, and developed technologies to control invasive alien species. ・At the Monitoring Sites 1000 project, approximately 1,000 sites were established nationwide, and the status of various ecosystem types (alpine zones, forests and grasslands, satoyama, lakes/ and /wetlands, sandy beaches, tidaland, coral reefs, small islets) was steadily monitored quantitatively and over the long term. As the quantitative and long-term data have been enriched, they have been used for planning and evaluation of biodiversity conservation measures, such as those cited in the Report on Assessment of Impacts of Climate Change in Japan. ・In order to contribute to the conservation of marine biodiversity, the Offshore Seabed Nature Conservation Area based on the Nature Conservation Act was established. Environmental surveys were conducted in some protected areas to obtain basic data for adaptive management. ・Research and development policies are being developed for the assessment of the economic and social value of Japan's natural capital and for sustainable management and utilization technologies.	・In addition to continuing studies on technologies for the protection and propagation of nationally endangered species of wild fauna and flora, the government will promote surveys on the inhabitation and growth of endangered species in preparation for the publication of the Fifth Red List. [MOE] ・In order to prevent the unintentional invasion of invasive alien species such as fire ants, Japan will strengthen border control and control measures by developing and utilizing new technologies. Japan will also promote enhanced international cooperation at the 15th meeting of the Conference of the Parties to the Convention on Biological Diversity (COP 15) to take place in 2021. [MOE] ・Based on the contents of the next National Biodiversity Strategy, which is scheduled to be formulated at the end of FY2021, the government will conduct quantitative, long-term surveys and monitoring to appropriately grasp ecosystems nationwide. [MOE] ・We will develop methods for quantitatively evaluating the impact of corporate activities on natural capital, and establish policies for research and development on technologies for sustainable management and use of natural capital. [MOE] ・We will continue basic surveys to properly designate and manage Offshore Seabed Nature Conservation Areas, and continue monitoring surveys to understand environmental changes in protected areas. [MOE]

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
	・Research and development was carried out for the construction of a co-creation type management model for the cyclical conservation of national parks.	・We will construct and propose a co-creation management model for the cyclical conservation of national parks. [MOE]

④ Evocation of changes in public behavior

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○The government will promote the creation of a public understanding of the importance of individual efforts to realize carbon neutrality and the transformation of behavior to decarbonizing by utilizing the convergence of knowledge through the fusion of humanities, social sciences, and natural sciences. In particular, the government will aim to expand the market for products, services and lifestyles utilizing BI-Tech (the fusion of the knowledge of behavioral science and advanced technology)[94] by the end of FY2022. It will also aim to build a platform using blockchain technology that can freely trade individual CO2 reduction credits at low cost. At the same time, the government will actively communicate Japan's efforts to both in Japan and overseas. [STI, METI, MOE]	・We are conducting a demonstration project to collect and analyze data on actual energy use and the implementation status of environmentally conscious actions through the integration of AI/IoT and other cutting-edge technologies (BI-Tech), and to promote reasonable behavior changes toward decarbonization. ・With regard to enery-conserving nudges, we confirmed statistically significant and sustained energy-saving and CO_2-saving effects with an average of 2% by sending an energy-saving report for two years. In addition, by verifying the sustainability of the effects, it was confirmed that the energy-saving and CO_2-saving effects continued even after six months had passed since the suspension of sending reports. ・With regard to eco-driving nudges, a statistically significant energy-saving and CO_2-saving effect of up to 14.5% was confirmed due	・We will aim to expand the market for products, services, and lifestyles through the use of the convergence of knowledge and BI-Tech practices by the end of FY2022, compile the results, and report and publish them at the Behavioral Sciences Team's Liaison Council, etc. In addition, the government will share information and cooperate with nudge units in other countries to promote changes in attitudes and behavior of the people of our country toward solving social issues arising from their actions under international cooperation. [MOE] ・In FY2021, we will verify the energy-saving and CO_2-saving effects of sending energy-saving nudges through smart speakers to save energy, such as reduced electricity consumption. [MOE] ・With the aim of starting operation by the end of FY2022 at the earliest, we will continue to study the computerization of the J-Credit System and promote the construction of the next registry system. [MOE]

[94] BI-Tech: Behavioral Insights x Technology. Based on behavioral insights such as nudge, big data on the situation of energy usage by individuals / households and attribute information is collected using IoT technology and analyzed using AI technology to encourage behavioral change through personalized messages.

	to different messages, and the demonstration was completed. ・The social implementation of the outcomes of BI-Tech, such as the energy-conserving nudges, being incorporated into the products and services of companies participating in the demonstration project, is underway. ・Demonstrations are under way to demonstrate how purchasing behavior between buyers and sellers changes for transactions involving individuals or companies with environmental value using blockchain technology. ・Based on the results of intereviews and questionnaires to companies, providers, regional financial institutions, and local governments, a meeting of a working group consisting of companies with expertise in digital technology was held, and the results of discussions on the issues of the current J-Credit system were published.	

(3)Building a resilient, safe and secure society

[Ideal vision and direction toward its realization]

In response to increasingly frequent and severe natural disasters, we will build a resilient society that minimizes damage caused by delays in escaping through appropriate evacuation actions, etc., as well as the early restoration and reconstruction of citizens' lives and the economy, by making full use of comprehensive disaster prevention capabilities utilizing advanced ICT as well as expertise in the humanities and social sciences. In addition, Japan will promote comprehensive initiatives utilizing science, technology, and innovation related to national resilience, such as ensuring functions and soundness and reducing the risk of accidents and disasters, by efficiently implementing the construction, maintenance, management, renewal and improvement of necessary infrastructure.

Furthermore, the government will ensure the safety and security of people's lives, the economy and society from attacks in new areas such as cyberspace, which continue to change with diversification and sophistication, and from new biological threats.

Under the current situation in which geopolitical changes are taking place on a global scale, and in which the core of the struggle for supremacy is science, technology, and innovation, the impact of science, technology, and innovation on the state will continue to increase. Based on this recognition, industry, academia, and government will work together to promote research and development of cutting-edge technologies across fields, contribute to the construction of a safe, secure, and resilient society, and protect important information that is the root of national power.

With the aim of creating such a resilient, safe and secure society, it is important for the relevant ministries and agencies, industry, academia, and government to work together to mobilize Japan's emerging technological capabilities and to "know," "develop," "utilize," and "protect" in order to maintain peace in our country and ensure the safety and security of the country and its people through the realization of comprehensive security against various threats. In other words, based on the Direction of Science, Technology, and Innovation for Realization of “Safety and Security[95]” the government will "know" what threats exist, or what technologies are available to respond to threats, and will consider how to "develop" the necessary technologies and how to "utilize" the developed technologies in social implementation. The government will also promote measures to “protect” and prevent the leakage of these technologies. Specifically, the government will clarify the critical technology fields that Japan needs to cultivate and allocate priority resources to critical technologies. At the same time, the government will steadily implement appropriate countermeasures to prevent the technology leakages from the viewpoint of securing and maintaining technological superiority of Japan and preventing the diversion of research and development results to weapons of mass destruction. In this way, Japan will protect its critical technologies, secure our country's research security, and realize comprehensive security.

[Target]

・ The government will reduce and eliminate social concerns about various threats to the lives of the

[95] Decision made by the Integrated Innovation Strategy Promotion Council on January 21, 2020

people and the economy and society, such as frequent and intensified natural disasters and new biological threats, and ensure the safety and security of the people.

[Key targets in science, technology, and innovation policies] (Key indicators)

- Number of prefectures that can respond to disasters using the basic disaster prevention information distribution network SIP4D (Shared Information Platform for Disaster Management): All prefectures (2023)
- Number of local governments operating disaster prevention chatbots[96]: more than 100 local governments (2023)
- Complete coordination among infrastructure data platforms of ministries and agencies, major local governments, and private companies, and data linkage with other major sectors by around FY2025
- Construct a system foundation for collecting, generating, and providing cyber security information domestically, and open the system to industry and academia in FY2021.
- Strengthen the ability to respond to biological threats: strengthen systems for gathering, analyzing, and providing information on infectious diseases in FY2021, and conduct information-gathering as needed. Provide information for risk communication based on researchers' analysis from FY2022.
- New think tank functions: establish in FY 2021 and establish an organization by FY 2023

[Current data] (Reference index)

- Number of fatalities and missing persons due to natural disasters: 107 persons (2020) [97]
- Amount of damage to facilities due to natural disasters: approximately 900 billion yen (2019) [98]
- Number of occurrences of short time heavy rain (over 50 mm/h) per year: about 334 times/year (average for 2011 to 2020) [99]
- Percentage of infrastructure built more than 50 years ago (e.g., road bridges): approximately 63% (2033) [100]
- Number of cases of cyber attacks (e.g., ransomware): approximately 61.13 million (2019) [101]
- Number of reported cases of infection in the Infectious Diseases Report (e.g., tuberculosis): 21,672 cases (2019) [102]

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[96] A system that uses AI to automatically communicates with disaster victims on social media on behalf of people in the event of a disaster. R&D conducted on the SIP (Phase 2) R&D theme Enhancement of National Resilience against Natural Disasters (FY2018 to FY2022).

[97] Cabinet Office, White Paper on Disaster Management 2021

[98] Cabinet Office, White Paper on Disaster Management 2021

[99] Japan Meteorological Agency, Climate Change Monitoring Report 2020 (2021),
URL: https://www.jma.go.jp/jma/en/NMHS/indexe_ccmr.html

[100] Ministry of Land, Infrastructure, Transport and Tourism, White Paper on Land, Infrastructure, Transport and Tourism in Japan 2020

[101] IPA, Information Security White Paper 2020

[102] National Institute of Infectious Diseases, Infectious Disease Report, 2019;
URL: https://www.niid.go.jp/niid/ja/ydata/10064-ydata2019.html

① Responding to increasing frequency and severity of natural disasters

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○In each process of prevention, observation and prediction, emergency response, and restoration and reconstruction against natural disasters, including efforts related to earthquakes and tsunamis based on international frameworks, the government will promote research and development to enhance the level of countermeasures taking climate change into consideration, as well as advance the strengthening of the observation systems and development of research facilities necessary for such research and development, and will particularly focus on strengthening resilience by utilizing advanced ICT. In addition to developing an information sharing system centered on SIP4D, which is responsible for the cross-organizational exchange of disaster prevention information, to prefectures and municipalities, the government will work to strengthen regional disaster prevention capabilities, and will promote support for decision-making in various scenes related to disaster response through the use of global environment big data utilizing the DIAS and the construction of an integrated G-space disaster prevention and disaster mitigation system that links efforts that make advanced use of geospatial information among relevant ministries and agencies. In addition, the government will promote the DX of disaster response by further supporting the optimization of disaster response by industry, government, academia, and citizens, and enhancing information systems for risk communication with individual citizens that contribute to self-help, mutual assistance, and public assistance. For this purpose, the government will sequentially link SIP4D with prefectural disaster information systems from FY2021. With regard to disaster prevention chatbots, part of a system for information sharing with municipalities and residents will start	・In order to automatically connect SIP4D to prefectural disaster information systems and swiftly share regional disaster information through SIP4D, we are conducting technology development and demonstrations of automatic connection between systems. ・A prototype disaster prevention chatbot has been constructed and demonstration experiments have been conducted in municipalities. ・Through the construction and operation of the DIAS, which accumulates and analyzes global environmental data, we have been undertaking flood forecasting and the construction of a real-time flood forecasting system, etc. to contribute to the resolution of global challenges in disaster prevention and mitigation. ・G-Spatial Action Plan 2020, an action plan for the promotion of the utilization of geospatial information, presents the policy for the establishment of an integrated geospatial disaster prevention and mitigation system which was decided by the Council for the Advancement of Utilizing Geospatial Information. ・Regarding the next-generation	・With regard to the automatic connection between SIP4D and disaster information systems in each prefecture, promotion activities, the establishment of consultation desks, and the provision of information on support measures will be promoted in cooperation with relevant ministries and agencies. [STI, Disaster] ・Regarding disaster prevention chatbots, we will work to improve the functions of the system so that a part of the system for sharing information with municipalities and residents will be put into operation in FY2023. [STI, Disaster, IT, MIC] ・While improving the accuracy of climate change weather-forecasting data, which serves as evidence data for disaster prevention measures, with respect to the DIAS, based on the results and achievements so far, we will further expand and develop the utilization of big data for the global environment using the DIAS under long-term and stable operation, and implement initiatives to realize a data platform (hub) for the global environment, including disaster prevention and mitigation measures. [MEXT, MLIT] ・We will steadily implement the project of establishing an integrated G-space disaster prevention and mitigation system in line with the policy for its establishment as set out in the G- Spatial Action Plan 2020. [G-Space. Relevant ministries and agencies] ・We will construct an observation network centered on the next-generation meteorological satellite

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
operating from FY2023, and efforts will be made to further enhance the system.[STI, Disaster, relevant ministries and agencies, relevant local governments]	meteorological satellite, we conducted research on technological trends in Japan and overseas, and started technological development utilizing the Strategic Program for Accelerating Research, Development and Utilization of Space Technology.	(commencing its manufacture in and around FY2023) that incorporates the latest technologies such as high-density observation. In addition, under the Strategic Program for Accelerating Research, Development and Utilization of Space Technology, we will promote the development of space environment monitoring technology using the next-generation meteorological satellite in cooperation with relevant ministries and agencies. [MLIT] ・Through co-creation between industry, government, academia, and the private sector, we will combine Information integrated through DX with disaster response knowledge and experience analyzed through social science methods and utilize them as the convergence of knowledge to consider issues in research and development that will contribute to disaster response support. [MEXT]

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○In addition to building a research base for information sharing systems, the government will implement efficient and effective R&D investment and social implementation based on the overall perspective of disaster prevention research, taking into account the evaluation of the level of disaster prevention measures, behavioral psychology analysis of evacuees, analysis of social needs and issues in disaster prevention , benchmarking of disaster prevention technologies, etc., utilizing knowledge from the humanities and social sciences. [STI, Disaster, relevant ministries and agencies, relevant local governments]	・As a result of the survey of disaster risk prevention research from an overall perspective, we recognized the necessity of establishing systematic and strategic research and development investment from a medium- to long-term perspective and a management system with a control tower function in disaster risk prevention research. We have started discussions with related ministries and agencies.	・Based on the overall survey of disaster risk prevention research, study groups consisting of government related departments and experts were established respectively to start R&D and development of management systems related to social implementation, and to examine the direction of future disaster risk reduction research and new R&D issues in the field of disaster risk reduction. Specifically, new R&D issues will be considered by FY2022 based on the evaluation of the current level of disaster prevention measures, problem analysis, and examination of the possibility of developing technology seeds. [STI, Disaster, relevant ministries and agencies]

② Efficient infrastructure management through digitalization, etc.

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○In order to realize efficient infrastructure management for national land strengthening, the implementation of leading-edge technologies in public works will be promoted. At the same time, the digitalization and 3-D conversion of infrastructure data by each administrator will be sequentially implemented, and rules and platforms for utilizing such data will be established. [STI, MLIT, relevant ministries and agencies]	・Through the PRISM public offering, a total of 38 leading-edge technologies for public works are being tested in FY2020. ・The DX Promotion Headquarters for infrastructure in the Ministry of Land, Infrastructure, Transport and Tourism held a total of three meetings and announced DX measures including a roadmap in February 2021. ・The terms of service for the Land, Infrastructure, Transport and Tourism Data Platform were announced in March	・By FY2022, the government will build a platform that links data on national land, economic activities, and natural phenomena held by the national government, local governments, and the private sector. [MLIT]

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
	2020.	
○In order to construct collaborative data platforms in the infrastructure field, by FY2021, the government will develop an environment for collaboration between data platforms of ministries and agencies, major local governments, and private companies. From then on, the government will promote collaboration between infrastructure administrators, and will implement data collaboration with disaster prevention, urban areas, and industrial areas in order to strengthen national land and create other added value. [STI, related ministries and agencies]	・Up to FY2020, data linkage review meetings were held six times, and basic concepts, frameworks for linkage, and process charts were developed with a view to building a linked-infrastructure data platform.	・We will considerthe basic framework for building a collaborative infrastructure data platform and implementation of model projects by the end of FY2021. [STI, relevant ministries and agenciens] ・We will make preparations to establish an operation system for a collaborative infrastructure data platform with participation by relevant organizations by the end of FY2021. [STI, relevant ministries and agencies]

③ Ensuring security in cyberspace, where attacks are becoming increasingly diverse and sophisticated

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○As cyber attacks diversify and become more sophisticated, there are discontinuous changes in the situation, and the ability to follow and adapt to such changes is required. Based on this perspective, R&D and system construction will be carried out for observing, forecasting, analyzing, responding to, and sharing information on attacks. Specifically, by FY2021, the government will establish a system infrastructure for collecting, generating, and providing cyber security information in Japan, and open the system to industry and academia. In addition, the government will promote the development of advanced cryptographic technologies for the quantum computer era, and technical verification for detecting vulnerabilities and illegal functions in response to supply chain risks. [Cabinet Secretariat, STI, MIC, METI, relevant ministries and agencies]	・With the expansion of cyberspace and the advancement of integration with real space, threats are becoming more complex and sophisticated, such as cyber attacks using new technologies and methods, and attacks suspected of being committed by organized crime groups and states. In fact, attacks on critical infrastructure and supply chains are being recognized overseas.	・In FY2021, the construction and operation of integrated intellectual and human resource development infrastructure of cybersecurity (commonly known as CYNEX) will be launched. [MIC] ・In FY2021, we began research and development on a new-generation encryption technology for secure wireless communication services. [MIC] ・With regard to technical verification, etc., to respond to supply chain risks, relevant ministries and agencies will establish verification systems, conduct technical surveys on verification of hardware chips, etc., and promote the establishment of a verification base (Proven in Japan). They also started verification tests in FY2020 in order to establish a foundation for cyber physical security measures under the Strategic

		Innovation Promotion Program (SIP). [Cabinet Secretariat, STI, MIC, METI, relevant ministries and agencies]

④ Response to new biological threats

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○In response to new biological threats, the government will promote research and development related to early detection of outbreaks, understanding and forecasting of epidemics, prevention and control, and risk communication with the public. Specifically, from FY2021, the government will strengthen systems for collecting, analyzing, and providing information on infectious diseases, and will implement information collection as needed. In addition, from FY2022, the government will provide information for risk communication based on the analysis by researchers. [Cabinet Secretariat, STI, MHLW, relevant ministries and agencies]	・The recent global outbreak of COVID-19 has exposed the vulnerability of social systems to infectious diseases. ・In an increasingly globalized society, there is a risk that infectious diseases will spread beyond national borders in a short period of time due to the transborder movement of people and goods. There is also a risk that new biological threats will occur in the future, and that this will seriously damage the lives of the people, the economy and society.	・From FY2021, the government will strengthen systems for the aggregation, analysis, and provision of information on infectious diseases, and will consolidate information as needed. We also promote research that contributes to the analysis of infectious diseases for effective risk communication. [MHLW]

⑤ Responding to threats to the safety and security of space, marine, and other fields

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○In response to other threats to safety and security, including those in the space and maritime fields, the government will conduct R&D on leading-edge basic technologies, and R&D and social implementation in response to respective issues, while ensuring an international cooperation system. [Cabinet Secretariat, STI, Space, Ocean, MOFA, MEXT, METI, Disaster, relevant ministries and agencies]	・Regarding ocean observation, we are developing observation using research vessels, floats, buoys, etc., and promoting the development of unmanned observation technologies such as AUV[103]. ・Outer space plays an important role as the foundation of people's	・In order to strengthen the capacity of MDA and to make maximum use of Japan's vast exclusive economic zone, it is essential to upgrade and improve the efficiency of ocean observation technologies. In addition to manned observation by ships and other vessels, we will develop technology that makes it possible to observe the ocean more widely, in detail and efficiently by

[103] AUV: Autonomous Underwater Vehicle.

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
	lives, economic and social activities, and security. As international competition in space intensifies, threats and risks to space systems such as anti-satellite weapons and cyber attacks are becoming more apparent, and the role of space in national security is becoming increasingly important, such as responding to new threats such as hypersonic glide missiles. In addition, further congestion in outer space is expected due to an increase in debris, etc., and it is an urgent issue to deal with the risk of hindering the sustainable and stable use of outer space.	unmanned observation using AUV and submarine optical fiber cables. [MEXT] (Restated) ・In addition to promoting the steady development of space systems such as the quasi-zenith satellite system, information-gathering satellites, and SSA satellites, the government will also consider satellite constellations for missile defense, establish rules for orbital use, and strengthen the mission assurance of the entire space system, including cyber security measures. [Space, related ministries and agencies]

⑥ Efforts to "know," "develop," "utilize," and "protect" safety and security

Implement cross-cutting efforts to strengthen science and technology capabilities as the basis for comprehensive security, taking into account the homonymy of science and technology. With regard to urgent issues, implement necessary measures, while sequentially establishing a response policy and coordinating with existing projects.

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○In order to enhance efforts to monitor, observe, predict, and analyze trends in threats to the lives of the citizenry and the social economy, to grasp trends in R&D at home and abroad, and to analyze issues based on knowledge from the humanities and social sciences, a new system of think tank functions related to safety and security will be established, and policy recommendations will be made on	・On March 9, 2020, the working group on the think tank function s was established under the Safety and Security Advisory Council for strengthening and promoting innovation policy and discussed the structure of the think tank functions. ・On April 27, 2021, the report on "the results	・Based on the report of the results of study published at the Integrated Innovation Strategy Promotion Council, a think tank function will be launched this fiscal year to conduct. and analyses based on advanced knowledge of science and technology, and makes proposals that contribute to policies on important technologies that should be intensively developed. ・Collaborate with relevant

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
future science and technology strategies related to safety and security and on important technologies that should be developed intensively. For this purpose, a new think tank function will be established in FY2021, and an organization will be established around FY2023 to implement policy recommendations. [Cabinet Secretariat, STI, relevant ministries and agencies]	of the study on the think tank functions necessary for utilizing science and technology to ensure the safety and security of Japan and its people was published at the Integrated Innovation Strategy Promotion Council.	government ministries and agencies to establish an organization by FY2023 based on the knowledge gained in establishing a new think tank function.
○Based on policy recommendations from new think tank functions, establish a mechanism to link with R&D programs and funding as necessary, and implement management of R&D programs, including setting clear targets for social implementation. [Cabinet Secretariat, STI, relevant ministries and agencies]	・Recognized that the necessity of early establishment of think tank functions, as recommendations from new think tank functions will play an important role in clarifying critical and technical fields.	・In order to strengthen and promote economic security, a new project will be launched to provide strong support for practical application of emerging and critical technologies in the fields such as space, quantum, AI, supercomputers and semiconductors, nuclear energy, advanced materials, biotechnology, and oceans by mobilizing the power of the public and private sectors in close cooperation with relevant ministries and agencies, research institutes, companies, and experts, while also utilizing think tank functions. At the same time, consider and develop a mechanism for sharing and utilizing critical and technical information while preserving it. ・Promote research and development effectively and efficiently by allocating budget and human resources to critical and technical fields, including those mentioned above, to ensure safety and security..
○In light of the situation in which concerns such as conflicts of interest, conflicts of commitment, and leakage of scientific and technological information are becoming more and more apparent as research activities become more international and open, the government will consider its response policy while paying attention to the difference between basic research and applied development, while also taking into account the importance of international joint research, and	・As part of the research projects commissioned by the Cabinet Office, the Research Integrity Investigation Committee was held to identify research integrity that should be secured by Japanese researchers and research organizations, etc. and the state of efforts to achieve it, through research and analysis of trends in	・Based on the Policy on Measures to Ensure Research Integrity decided by the Integrated Innovation Strategy Promotion Council, the Cabinet Office and each ministry will steadily promote initiatives, which will be disseminated and coummunicated to researchers, universities, research institutes, etc. In addition, common guidelines for competitive research funds projects will be revised as early as possible in 2021.

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
develop necessary guidelines such as guidelines for public invitation of competitive research funds and cooperation with foreign companies in 2021. In order to support independent assurance of the soundness and fairness of research activities(research integrity) that should be held by researchers, the government will establish the direction of its response in early 2021 in cooperation with research communities in Japan and overseas. These guidelines will be reviewed as necessary in light of the status of efforts by each research institute, research funding agency, etc. [STI, MEXT, METI, and relevant ministries and agencies]	Japan and overseas, interviews with experts, and discussions at the Investigation Committee, etc., in light of the growing concerns about conflicts of interest and commitment and the leakage of science and technology information, etc., with the internationalization and openness of research activities.	
○In order to ensure and maintain Japan's technological superiority, the government will clarify important technologies, allocate resources intensively to important technology fields, and implement appropriate measures against technology outflow. In light of the situation in which international technology outflow problems have emerged, the government will promote information gathering and consider the construction of frameworks and systems, including institutional aspects, in order to take appropriate measures against technology outflow in a phased manner according to the actual situation of various technology outflows, while promoting information exchange globally, strengthening research and innovation capabilities, and ensuring comprehensive security. [Cabinet Secretariat, STI, and relevantministries and agencies]	・As the security environment in our country becomes increasingly severe, competition for supremacy in science, technology and innovation intensifies. ・Under these circumstances, the relevant ministries and agencies will consider clarifying the underlying technologies, prioritizing the allocation of resources to priority technology fields, and taking appropriate countermeasures against prevention of technology leakages. ・The Ministry of Economy, Trade and Industry and other relevant ministries and agencies studied a way to manage security trade. ・Strengthened systems necessary to collect, analyze, aggregate, and share information	・In order to strengthen and promote economic security, a new project will be launched to provide strong support for the practical application of emerging and critical technologies in fields such as space, quantum, AI, supercomputers and semiconductors, nuclear energy, advanced materials, biotechnology, and oceans by mobilizing the power of the public and private sectors in close cooperation with relevant ministries and agencies, research institutes, companies, and experts, while also utilizing think tank functions. At the same time, consider and develop a mechanism for sharing and utilizing critical and technical information while preserving it. (Repeat). ・In addition to maintaining science, technology, and industrial competitiveness at the most advanced level, a mechanism will be established for sharing and utilizing critical and technical information, from the viewpoint of smoothly promoting international joint research and securing and maintaining technological

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
	on economic security, including countermeasures against technology leakage. ・Creating a highly reliable research and business environment on a voluntary basis is a prerequisite for continuing to participate in international leading-edge research network and to create innovation through diverse human resources. It is important that universities, research institutes, and enterprises, including SMEs, comply with laws and regulations, and take countermeasures to prevent the leakage of technology due to the acceptance of international students, foreign researchers, and joint research, and to reduce risks.	superiority of Japan. ・With regard to the handling of patents among R&D results, taking into consideration “the consistency and balance with measures to deal with technology leaks through other media” and “the patent systems in other countries”, the Government will consider taking necessary measures concerning the patent publication system from the viewpoint of prevention of technology leakages while simultaneously promoting innovation. ・In order to achieve more effective border control to prevent the leakage of technology, efforts will be made to strengthen the screening for the acceptance of foreign students, researchers, etc., including the examination of immigration control and visa issuance in cooperation with the relevant ministries and agencies, and the development of systems including IT environment for this purpose. ・Promote efforts by industry, academia, and the government to further strengthen internal control systems such as access control of sensitive technical information, enhancement of management departments, and formulation of internal control regulations in universities, research institutes, companies, and others. The government will implement measures to reduce the burden on universities, research institutes, and companies, while further enhancing the awareness raising and institutional measures necessary to achieve this, and improving their effectiveness. ・Closely examine government research and development projects for which technology should be appropriately managed from the viewpoint of security trade control, etc., select projects subject to security trade control

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
		requirements based on the characteristics of the projects, and request the establishment of a security trade control system to which funds should be allocated, and continuously expand the target projects to prevent technology leakages. Also, in order to ensure that R&D entities carry out the necessary technology management, the executive bodies executing the target projects will appropriately manage the target projects. ・With regard to the investment screening and ex post monitoring under the Foreign Exchange and Foreign Trade Act, the government will strengthen the enforcement system of the Foreign Exchange and Foreign Trade Control Law, while strengthening cooperation among relevant ministries and agencies, and will also consider the desirable situation of designated industries. The aim is to realize a new security trade control framework that will complement the existing international export control regimes at an early date. We will strengthen controls on "deemed exports" under the Foreign Exchange Act by FY2022. ・Strengthen the system necessary for collection, analyzing, aggregation, and sharing of information related to economic security in order to understand the actual situation and concerns about technology leakages and prevent it from occurring, as well as expand systems for clarifying and regulating the circumstances of cases involving technology theft and cyber attacks. It also aims to establish a framework to strengthen public-private partnerships in order to foster an environment where economic security is positioned as an important element in corporate governance.

(4)Formation of innovation ecosystem as a foundation for creating new industries based on value co-creation

[Ideal vision and direction toward its realization]

We aim to create a society in which a new industrial base has been built in which companies, universities, national research institutes, and other entities work together to create value while ensuring diversity by creating a succession of startups that use social needs as the driving force to solve problems.

For this reason, R&D results from universities, national research and development agencies, etc. that meet the needs of cities, regions, and society will be commercialized through open innovation with startups and operating companies, forming a cycle (virtuous cycle) that continuously creates new added value. This cycle works actively with social needs as a driving force to create world-class products and services. In addition, the funds gained through business success and the knowledge gained through experience will accelerate human resource development and joint research among operating companies, universities, national research and development agencies, etc. In this way, universities, national research and development agencies, operating companies, and local governments become closely connected, and startups that create innovation are created one after another, forming an ecosystem that can grow big.

By creating a system in which these flows are seamlessly connected, with cities and regions at its core, innovation leading to the resolution of social issues and social transformation can be created in a continuous and interlinked manner. In addition, it will help startups expand globally and attract more investment from around the world.

In order to realize such an ecosystem, we will strongly promote the creation of need-pull innovation, and develop institutional and policy environments to promote innovation activities of startups and business companies. Furthermore, we will promote the co-creation of new values by industry-academia-government collaboration and the formation of startup cities so that the knowledge of universities, national research and development agencies, etc. can be utilized for society's needs, and we will work on fostering human resources that supports the ecosystem.

[Target]

- Universities, R&D corporations, operating companies, and local governments are closely linked to form an ecosystem that generates a succession of startups that are trying to solve social issues and reform society, thereby continuously creating new value.

[Key targets in science, technology, and innovation policies] (Key indicators)

- SBIR[104] expenditure targets for start-up: 57 billion yen (FY2025) [105]
- Contract target for new business operators founded less than 10 years ago based on Act on Ensuring the Receipt of Orders from the Government and Other Public Agencies by Small and Medium-sized

[104] SBIR (Small Business Innovation Research) is a cross-agency system that aims to increase the opportunities for SMEs to receive R&D subsidies and to support the commercialization of the outcomes.

[105] FY2020 Target: approximately 46.3 billion yen

Enterprise: 3% (FY2025) [106]

- Number of participating in practical entrepreneurship education programs: 1,200 (FY2025) [107]
- Acceptance of joint research from private companies by universities and national research and development agencies: increased by approximately 70% over FY 2018 by FY 2025 (FY 2025) [108]
- Percentage of startup/ecosystem hub cities with cases where data is linked/connected between sectors: 100% (2025)
- Unlisted startup companies (unicorns) or listed startup companies with a corporate value or market capitalization of $1 billion or more[109]: 50 companies (FY2025) [110]

[Current data] (Reference index)

- Number of start-ups established by universities: 204 (established in FY2019) established by universities, etc. and 13 (established in FY2018) established by R&D-oriented corporations[111]
- Amount and number of investment by VC, etc.: annual investment amount of VC, etc., 289.1 billion yen/1,824 cases (FY2019) [112]
- Cross-border trademark and patent applications: Japan is the only major country with a relatively larger number of patent applications than trademark applications per unit population. [113]
- Mobility researchers between departments: 1,150 researchers transferred from companies to universities, etc., and 218 researchers transferred from universities, etc. to companies (FY2019) [114]

① Support for startup creation and growth based on social needs

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○In order to promote the creation of needs-pull innovation by the government, the government will promote the new Japanese version of SBIR to be enforced in April 2021 in cooperation with the relevant ministries and agencies. The government will introduce a research and development system based on this system from FY2021, set	・In the Sixth Basic Plan, the expenditure target (57 billion yen) to be achieved in FY2025 was set. ・In June 2021, the Cabinet approved the Policy on the Target of Expenditure, etc. for Specified New Technology Subsidies, etc. for FY2021 in relation to the setting of the	・The government will work with related ministries and agencies to achieve the FY2021 spending targets. In doing so, appropriate KPIs will be established for the new system based on the issues raised for the old system, and the Cabinet Office will take the initiative in accurately assessing and

[106] FY2019 results: 1.06%

[107] 2020 forecast: about 600 persons

[108] 2018 forecast: about 88.2 billion yen. Based on the situation of the amount of joint research accepted during the first half of the Sixth Basic Plan period (including the state of recovery from the effects of COVID-19), the government will consider revising numerical targets as necessary.

[109] Enterprises that have not been in business or have been in business for less than ten years as of the beginning of FY2018.

[110] Set as targets from FY2018 to FY2025 in the action plan for innovative business activities in FY2020 (July 17, 2020). As of the end of FY2019: 16 companies.

[111] Investigation by the Ministry of Education, Culture, Sports, Science and Technology and the Cabinet Office

[112] Venture Enterprise Center (VEC), Venture White Paper 2020

[113] Ministry of Education, Culture, Sports, Science and Technology, National Institute for Science and Technology Policy, Science and Technology Indicators 2020 (Research Materials 295, August 2020)

[114] Ministry of Internal Affairs and Communications, 2020 Results of the Survey of Research and Development (December 2020)

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
government expenditure targets, and provide strong support for the creation and growth of start-ups by creating initial demand by procuring products developed using this system. [STI, relevant ministries and agencies]	expenditure target, etc. for FY2021 (approximately 53.7 billion yen). ・In June 2021, the Cabinet approved the Guidelines for Granting Designated Subsidies, etc., which provide for necessary matters concerning the implementation of designated subsidies, etc. ・Discussions were held on the coordination of ministries and agencies for the effective and efficient operation of the new system.	evaluating the implementation status of related projects. [STI, relevant ministries and agencies] ・With regard to designated subsidies, etc. to be implemented based on the Guidelines for Granting Designated Subsidies, etc., specific research and development issues based on policy issues and public procurement needs will be presented, and related research and development supported. In addition, when research and development is successful, a mechanism that leads to trial introduction and government procurement, etc. will be established through cooperation among ministries, and measures will be implemented to increase government procurement. [STI, relevant ministries and agencies] ・Support for startup hub cities, promotion of the new Japanese version of SBIR, support in Plus, promotion of entrepreneurship education, etc. will be integrated into the innovation ecosystem formation package. [STI, relevant ministries and agencies]
○In order to realize the creation and effective support of startups that solve social issues and bring about game changes in the market, the government will develop an environment to promote the creation of startups originating from universities, national research and development agencies, etc., support the formation of venture capital funds, and provide large-scale financial support (Gap Fund supply) by research fund. [MEXT, METI]	・Support for R&D-oriented startups with growth potential, including R&D costs related to practical application development, is provided on the condition that they gain cooperation from support personnel, venture capital, research institutions, business companies, etc. ・In order to strengthen the ability to create high-growth startups originating from universities, etc., innovative new technology will provide integrated support for R&D and commercialization at universities and public	・In order to create startups that bring about solutions to social issues and game changes in the market, and to provide effective support, the government will develop an environment to promote the creation of venture companies from universities and national research and development agencies, support the formation of venture capital funds, and implement large-scale financial support (gap fund supply) by research funding agencies, etc. [MEXT, METI] ・In order to strengthen the ability to create high-growth startups originating from

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
	research institutes while utilizing the know-how of the private sector for commercialization. In addition, in cooperation with local governments and industries in the startup ecosystem hub cities, support for the comprehensive environmental improvement of practical entrepreneurship education at universities, etc. and the creation of startups by universities, etc. have started in March 2021.	universities, etc., innovative new technology will provide integrated support for R&D and commercialization of universities with high potential, while utilizing know-how on commercialization from the private sector. In addition, support will be provided for practical entrepreneurship education at universities, etc., gap funds, and establishment of startup support systems in cooperation with local governments and industry in startup hub cities. [MEXT, METI] ・Along with the relevant institutions, we will examine the establishment of an environment for large-scale fundraising in the late stage of R&D-type startups. [STI, FSA, METI]
○In order to ensure that appropriate contracts are made from the perspective of promoting open innovation and ensuring a fair and free competitive environment when startups collaborate with large enterprises through joint research, etc., guidelines will be formulated that summarize problem cases in each contract, directions for concrete improvement thereof, and views under the Antimonopoly Act. [JFTC, METI]	・In November 2020, the Japan Fair Trade Commission released its final report regarding trade practices of start-ups. ・In March 2021, the Guidelines on Business Partnership Contracts concerning Business Alliance with Start-ups was published.	・The Guideline Partnership Contracts with Startups that has been formulated to ensure appropriate contracts will be known. [JFTC, METI]
○The government will continue to ascertain whether appropriate cooperative relationships have been established between university-based start-ups and related companies. [STI, METI]	・The working group of Startup Ecosystem hub City Promotion Council grasps and examines the actual situation.	・We will conduct investigations into the atcual state of cooperative relationships between university-originated startups and their partner companies. [STI, METI]
○We will create an environment in which candidates for managerial positions can easily change jobs at promising start-ups whose growth has been hampered by a shortage of managerial positions by, for example, arranging requirements for managerial positions in light of startup	・In January 2021, we conducted interviews and questionnaires on startup management personnel.	・By supporting the creation of good partnerships that efficiently and effectively match human resources who contribute to the growth of startups, and by summarizing and publicizing the findings and examples obtained through such partnerships as

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
management issues. [METI]		results, we aim to have the results widely utilized in the private market and to expand and accelerate the flow of human resources to startups.
○In cooperation with government-related organizations providing startup support, the government will continue to support startups that engage in commercialization, etc. by utilizing technological seeds, and researchers and entrepreneurs who aim to start businesses. [METI, relevant ministries and agencies]	・In order to provide efficient and effective support to startups, in July 2020, 9 government agencies established the "Startup Support Agency Partnership Agreement (commonly known as Plus) " and in November 2020, established a one-stop window.	・In Plus, we will provide efficient and effective support to startups that use technology seeds to develop their businesses and human resources, such as researchers and entrepreneurs who are aiming to start their businesses. [METI, relevant ministries and agencies]

② Promotion of corporate innovation activities

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○In order to ensure that companies that take on innovation management[115] are evaluated by the capital market, etc., the government will design a system to issue stocks based on ISO56002:2019[116], the Action Guidelines for Japanese Companies' Management for Value Creation[117], etc. In addition, in funding research and development, the government will sequentially conduct examinations taking into account the status of efforts by companies based on the Action Guidelines, the Guideline for Enhancing Industry-Academia-Government Collaboration Activities , etc.[118]. [METI]	・We conducted interviews with enterprises to sort out the requirements required for innovation management and to select excellent enterprises. ・The implementation status of the Guideline for Enhancing Industry-Academia-Government Collaboration Activities was used as a reference in the selection of the Next University-Society Open Innovation Initiative Program in March 2021.	・In funding research and development, reviews will be made to take into account the state of corporate efforts based on the Action Guidelines and the Industry-Academia-Government Collaboration Guidelines. [METI]
○Based on the diversity situation in which external human resources re active in European and North American companies, the efforts of countries and companies around the world, and the results of analyses of past R&D projects	・Discussions were held on the state of R&D projects in the future by the R&D and Innovation Subcommittee of the Committee on Industrial Science and Technology	・Based on the opinions of the R&D and Innovation Subcommittee of the Committee on Industrial Science and Technology Policy and Environment under the Industrial Structure

[115] Management to transform organizations, processes, corporate culture and climate and to facilitate innovation; provided, however, that it is assumed that a system has been established to allocate necessary resources (budget, personnel, etc.) for innovation creation activities and to commercialize them.

[116] International standard for innovation management systems (July 2019)

[117] October 4, 2019, Ministry of Economy, Trade and Industry and Innovation 100 Committee

[118] Guideline for Enhancing Industry-Academia-Government Collaboration Activities [Supplement] (June 2020)

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
conducted in FY2020, the government will establish new policy methods for promoting R&D in R&D projects in a flexible manner in accordance with new social issues, rather than in a linear manner. [METI]	Policy and Environment under the Industrial Structure Council in November 2020 and April 2021. ・Research and analysis of past R&D projects were completed in March 2021 as a commissioned project.	Council, we will implement concrete measures. [METI]
○We will promote understanding of the management importance (value and risk) of open source software (OSS)[119] , which is essential for creating open and agile innovation, and conduct dissemination and awareness raising to raise awareness of the use of OSS.[120]. [SIPSH]	・Promotion materials to show the necessity, value, and risk of OSS are distributed at events where managers and intellectual property parties gather (e.g., a traveling patent office held by the Japan Patent Office). Efforts have also been made to promote understanding and raise awareness of OSS, including explanation and panel discussions at a workshop (held in March 2021) hosted by the Japan Intellectual Property Association, which was attended by business people.	・Regarding OSS, we will continue to promote understanding of the importance of management (value and risk) and promote and enlighten people to raise awareness of OSS utilization. [SIPSH]
○By FY2024, the government will consider and draw up a conclusion on methods for compiling statistics to grasp detailed R&D trends in enterprises, such as R&D periods. [STI, MIC, METI]	・Reviews were held with external experts and relevant ministries and agencies on methods for compiling statistics to understand detailed R&D trends, such as R&D periods at companies.	・We will review methods for compiling statistics to grasp detailed R&D trends such as R&D periods in enterprises. [STI, MIC, METI]

③ Promotion of new value co-creation by industry-academia-government collaboration

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○In order to accelerate the matching of knowledge, which is the source of innovation owned by universities and national research and development agencies, with social needs, the promotion of industry-academia-government joint research and	・In June 2020, the Intensive support for young promising researchers launched. ・The Adaptable and Seamless Technology Transfer Program through Target-driven R&D (A-	・In the public-private support project for discovering young researchers etc., the government will continue to promote industry-academia-government joint research and strengthen matching between young researchers and

[119] OSS: Open Source Software. Software that the creator of the software has published the source code free of charge and is users are permitted to use, modify, or redistribute it under prescribed conditions.

[120] Utilizing the results of the "Survey and Research on Intellectual Property Risks Related to Open Source Software in the Age of Digitalization and IoT" (April 2020, Japan Patent Office)

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
the strengthening of young researchers and industry will be strengthened. [STI, MEXT, METI]	STEP) will determine the themes for adoption for FY2020 in the fall, and will support researchers engaged in industry-university cooperation. ・In March 2021, the third amendment for FY2020 adopted and supported research and development that is expected to contribute to social change in the With/Post corona era.	industry, thereby accelerating matching between society's needs and knowledge owned by universities, national research and development agencies, etc., which is the source of innovation [STI, MEXT, METI]
○The government will promote the creation of new value through industry-academia-government collaboration by disseminating to universities and industries the issues and prescriptions in universities and industries that were compiled in the Guideline for Enhancing Industry-Academia-Government Collaboration Activities in June 2020. In addition, the government will promote the examination of research and development projects for promoting industry-academia-government collaboration that brings about a virtuous cycle of human resources, knowledge, and funds, taking into account the status of efforts by universities and enterprises based on the Industry-Academia-Government Collaboration Guidelines. [STI, MEXT, METI]	・The implementation status of the Guideline for Enhancing Industry-Academia-Government Collaboration Activities was used as a reference in the selection of the private support project for discovering young researchers (November 2020), Industry-Academia Fusion Leading Model Base Creation Program (March 2021), and Program on open innovation platform for industry academia co-creation（COI-NEXT） was launched in FY2020,	・We will consider necessary measures to promote examinations that take into account the state of efforts by universities, companies, etc. based on the Guideline for Enhancing Industry-Academia-Government Collaboration Activities in R&D projects to promote industry-academia-government collaboration that brings about a virtuous cycle of human resources, knowledge, and funds. [STI, MEXT, and METI]
○The government will promote cooperation among universities, national research and development agencies, research institutes, companies, etc. by promoting the establishment of a management system that supports the formation of sustainable industry-academia-government cooperation projects and the advancement of projects, and the development of open innovation centers that serve as venues for co-creation by various stakeholders. [STI, MEXT, METI]	・In September 2020, we selected and supported five F/S research projects in areas under the Next University-Society Open Innovation Initiative Program. ・Program on open innovation platform for industry academia co-creation（COI-NEXT） was launched in FY2020, and 18 bases were selected and supported in December of the same year.	・The government will promote the establishment of a management system to support the formulation of sustainable industry-academia-government collaboration projects and the advancement of businesses, as well as the establishment of open innovation hubs that serve as a platform for co-creation by diverse stakeholders, and collaboration among universities, national research and development agencies, research institutes, and companies. [STI, MEXT,

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
		METI] ・In FY2021, the community co-creation field was newly established under Program on open innovation platform for industry academia co-creation （COI-NEXT） to support the construction of a sustainable community-industry-academia-government co-creation system. [MEXT]

④ Creating a start-up ecosystem hub comparable to that of the world

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○To support the unique efforts of the startup ecosystem hub cities to form an autonomous startup ecosystem comparable to that of the world, the government will provide intensive support to the hub cities by the public and private sectors, such as vitalizing the creation of startups at universities, strengthening accelerator functions and the Gap Fund with a view to enter foreign markets as well, raising awareness of the connection of data between sectors to the foundation, and cooperating with smart city projects. [STI, MEXT, METI.]	・We held an acceleration program implemented by top overseas accelerators for startups in startup cities. ・In cooperation with local governments and industries in startup cities, support for the comprehensive environmental improvement of practical entrepreneurship education at universities, etc. and the creation of startups by universities, etc. started in March 2021.	・The government will continue to provide cities with intensive support from the public and private sectors, including the revitalization of startup creation at universities, strengthening of accelerator functions and gap funds with a view to entering overseas markets, the raising of public awareness about the connection to the infrastructure for data linkage between fields, and the collaboration with smart city businesses. [STI, MEXT, METI.] ・A working group of the Council for Promotion of Startup Ecosystem Hub Cities was established to activate discussions on support measures for hubs, cooperation among hubs, and strengthening cooperation with universities, etc. [STI, MEXT, METI.] ・In cooperation with local governments and industries in startup cities, support will be provided for the establishment of a startup support system, such as the promotion of practical entrepreneurship education and the strengthening of gap funds at universities and other institutions. [STI, MEXT, METI]

⑤ Cultivation of human resources who take on challenges

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○In order to develop human resources who are motivated to take on the challenge, by FY2025, all universities participating in the consortium of startup city will implement an online and other entrepreneurship programs. By the same fiscal year, these examples will be collected and deployed nationwide. [MEXT]	・In cooperation with local governments and industries in startup cities, support for the comprehensive environmental improvement of practical entrepreneurship education at universities, etc. and the creation of startups by universities, etc. started in March 2021.	・In cooperation with local governments and industries in startup cities, support will be provided for the promotion of practical entrepreneurship education and support for gap funds and establishment of a startup support system at universities and other institutions. [MEXT]
○The government will create opportunities for the development and active participation of innovative human resources in order to increase the depth of a diverse range of innovative human resources, including management human resources involved in the creation of innovation, and to improve the quality of human resources by increasing their mobility. To this end, the government will, by FY2023, engage in conducting a fact-finding survey on the development of an environment for developing innovative human resources and disseminate best practices, taking into account the accumulation of discussions on human resource development. FY2023. [METI]	・From July 2020 to March 2021, the Industry-Academia Innovation HR Circulation Training Study Group was established to carry out discussions on the improvement of the environment to foster innovation human resources.	・We will conduct a fact-finding survey on the development of an environment for fostering innovation human resources and disseminate best practices. [METI]
○From the perspective of promoting human resource exchanges between universities, national research and development agencies, and corporations, allowing innovative human resources to work in the right place, and enhancing the efficiency of innovation creation, the Basic Framework of the Cross-appointment System and Points to Note (Supplementary Version) will be widely disseminated to industry and academia by FY2023, and efforts will be made to match industry and	・In June 2020, the Ministry of Economy, Trade and Industry and Ministry of Education, Culture, Sports, Science and Technology jointly compiled the Basic Framework for the Cross-Appointment System and Points to Note (Supplemental Version) [Supplementary Edition]. ・Along with the Guidelines for Fortifying Joint Research Through Industry-Academia-Government Collaboration [Supplementary Edition]	・The government will promote the Basic Framework for the Cross-Appointment System and Points to Note (Supplemental Version) to industry and academia. ・We will match human resources of industry and academia by utilizing the public-private support project for discovering young researchers, etc. [METI]

academia human resources by utilizing the "Public and Private Support Project for Discovering Young Researchers.".. [METI]	prepared by the two ministries at the same time, the materials were distributed to the business world, universities, etc. ・In February 2021, as part of a promotion to promote the Guidelines, the government held a seminar on the application of the Guidelines, titled "A virtuous cycle of human resources," in which the contents of this supplement were taken up and publicized to relevant parties.	

⑥ Continuation of research and development related to important technologies that need to be maintained in Japan and succession of technologies

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○In the event that it becomes difficult for operating companies to continue or succeed R&D or technologies due to environmental changes such as COVID-19, with regard to important technologies that are highly necessary to be retained in Japan, efforts will be made to establish a framework, such as national research and development agencies to take over such technologies, including research resources, with a view to bridging the future. [METI]	・In the event that a problem arises, such as that it becomes difficult for a company to continue research on important technologies that are highly necessary to be retained in Japan, it has been confirmed that AIST will utilize various acceptance systems to the extent possible to support the temporary employment of relevant researchers and the succession/continuation of relevant research for a certain period of time, assuming that the relevant technology will be bridged to domestic enterprises in the future.	・In the event that it becomes difficult for operating companies to continue or succeed R&D or technology due to environmental changes such as COVID-19, with regard to important technologies that are highly necessary to be retained in Japan, it has confirmed that AIST will utilize various acceptance systems to the extent possible to support the temporary employment of relevant researchers and the succession/continuation of relevant research for a certain period of time, assuming that the relevant technology will be bridged to domestic enterprises in the future. [METI]

(5)Urban and regional development that will take over the foundation for the next generation (development of smart cities)

[Ideal vision and direction toward its realization]

By creating diverse and sustainable cities and regions throughout the country that can resolve issues in cities and regions and continue to create new value while making full use of local potential, we aim to create a society with a sustainable livelihood foundation that enables all stakeholders, including residents, workers, and tourists, to maximize their vitality as human beings, by providing new places to live and work in remote reality in the new normal, eliminating regional disparities, and realizing safety and security by responding to various threats such as natural disasters and infectious diseases.

For this purpose, we will create an environment in which it is easy to start a business by strongly developing and developing smart cities, which are the core of wide-area cooperation and multi-core cooperation, starting from the the development of data linkage platform in Super Cities, and by introducing a common system that enables data linkage across fields and enterprises, and development and cooperation to other cities and regions, and ensuring security. In addition to government initiatives, initiatives led by local governments and the private sector will make use of reference architectures for smart cities and knowledge gained through the smart city public-private partnership platform, promote the introduction of infrastructure management methods utilizing new technologies and next-generation mobility services, and realize the overall optimization of urban activities utilizing open data in various fields.

Through the promotion of community development with the participation of citizens and the revitalization of activities rooted in the local community in cooperation with human resources who lead the initiatives, many industries will be created, successful experiences will incite the next challenge one after another, and initiatives will be activated in which the knowledge of the local community is returned to society through industry-academia-government collaboration and other means. In addition, the government will work to concretize a variety of urban and regional images that address social, economic, and environmental issues, while making the most of the characteristics and activities of each city and region, such as compact urban development with a people-centered mind and regional development aiming at smart local development. As a result, diverse and sustainable cities and regions will be formed in each region to enhance social, economic, and environmental values, such as improving the satisfaction of residents, revitalizing industries, greening, optimizing the use of resources, and realizing coexistence with nature. Furthermore, smart cities that are realized in various ways according to the social and natural resources of each city and region, such as cities that provide advanced services and regions that live in harmony with nature, such as *satoyama*, *satoumi*, etc., will form a network of mutual cooperation and support, and will become a dynamic mechanism that generates a virtuous cycle, leading to the realization of Society 5.0.

In addition, byJapan's initiatives and concepts of smart cities as an advanced country in the field of problem solving becoming widely recognized as a global norm, it will promote the sharing of smart cities and values around the world and contribute to the realization of a decarbonized society and Regional Circular and Ecological Sphere that should be passed on to the next generation, and the achievement of the SDGs.

At Expo 2025 Osaka, Kansai, Japan will present to the world the vision of Society 5.0, which embodies "Designing Future Society for Our Lives," which will present the way society should be after overcoming COVID-19.

[Target]

- Diverse and sustainable cities and regions are formed across Japan in which various stakeholders, including citizens, participate to solve local issues, as smart cities that embody Society 5.0, which are being developed nationwide, and Japan's concept is disseminated to the world.

[Key targets in science, technology, and innovation policies] (Key Indicators)

- The number of smart cities implemented (the number of local governments and regional groups implementing technology and linking and connecting data between fields): approximately 100 (2025)
- Number of local governments, private companies, and community groups implementing smart cities (number of members and observers of smart city public-private partnership platform): more than 1,000 (2025)
- Number of overseas projects supporting acquisition and utilization of advanced digital technologies and systems (Information infrastructure, advanced ICT, AI, etc. spanning multiple fields including smart cities) 26 projects (2025) [121]

[Current data] (Reference index)

- Number of types of services developed on urban OS (data linkage platform): (Efforts will be made to measure from FY2021)
- Number of users providing services utilizing urban OS (data linkage platform): (Efforts will be made to measure from FY2021)
- Regions where technology is implemented based on government smart city projects: 23
- Number of smart city collaboration cases
- Number of dissemination and promotion activities for community contribution and social issues at universities, etc.
- Number of human resources leading the construction of smart cities

① Development of infrastructure to facilitate data utilization and development of urban OS that can coordinate data

[121] Under the framework of the ASEAN Smart City Network (ASCN), Japan aims to provide assistance for project formulation, etc. to 26 cities in the ten ASEAN countries which aim to promote projects through partnerships with private companies and other countries.

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○In the smart city-related projects in which government funds are involved, in the development and service development of urban OS (data linkage platform) by local governments, etc., the introduction and service development of urban OSs (data linkage platform) capable of data collaboration referring to the smart city reference architecture shall be promoted. In addition, the connection with urban OS (data linkage platform), etc. established in other regions shall be promoted, and disclosure of APIs for data collaboration shall be requested. [OPDVLE, STI, MIC, METI, MLIT]	・We created and published a catalog site for public APIs in smart cities built through government projects.	・We will advance the introduction and service development of urban OS (data linkage platform) capable of data linkage. (100 regions by FY2025) [OPDVLE, STI, MIC, METI, MLIT] ・We will collect API information that contributes to developing smart city and Super Cities. (FY2021) [STI, OPDVLE, MIC, METI, MLIT]
○Through the implementation of smart city-related projects by ministries and agencies, the development of interoperable services that can be deployed across regions will be carried out by 2025, and the relationship between infrastructure and services will be organized so that services developed in leading regions can be deployed in other regions. [OPDVLE, STI, MIC, METI, MLIT]	・Interoperability is ensured by referring to the reference architecture, which is a common policy of the government for implementing the smart city-related projects of each ministry and agency. ・The Study Group on Data Linkage in Super Cities and Smart Cities was held to clarify the data linkage policy for smart cities and super cities.	・We will consolidate and centralize information on services in regions that have been selected as smart city-related projects by ministries and agencies. (as needed) [OPDVLE, STI, MIC, METI, MLIT] ・We will share leading examples in a timely manner by adding new smart city sart local case studies to the Smart City Guidebook. (as needed) [STI, OPDVLE, MIC, METI, MLIT]
○The government will revise the Smart City Security Guidelines created in 2020 as needed, promote domestic deployment, and support security in the construction of smart cities. [MIC, METI]	・Revision for the Smart City Security Guidelines (Version 2.0) and preparation of a guidebook for its dissemination and awareness-raising are in progress.	・In addition to formulating the Smart City Security Guideline (version 2.0), the government will disseminate and raise awareness of the guideline through forums such as the Subcommittee on Security and Safety of Smart Cities under the Smart City Public-Private Partnership Platform. [MIC]

② Development of smart city creation cases nationwide with Super Cities as the core of cooperation

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○Based on the amendment of the National Strategic Special Zones Act of 2020 and the revision of the Basic Policy on National Strategic Special Zones, zones will be designated in 2021. The designated Super Cities will be positioned as "a future city " that solve regional problems with cutting edge technologies, and advanced services will be implemented. [OPDVLE]	・We accepted a wide range of proposals from local governments concerning areas to be designated as special zones, advanced services to be implemented, regulatory reforms, etc. (deadline: April 16, 2021).	・Through bold regulatory reforms and the provision of cutting edge services through the data linkage in multiple fields, the government will vigorously promote Super City Initiative that will advance the realization of future lifestyles. After deliberation by the Expert Committee on the Designation of Super City Zones and the Council on National Strategic Special Zones, the areas will be designated with fairness and transparency. [OPDVLE]
○By FY2025, cases of super cities and smart cities will be collected, cases and progress status of initiatives will be grasped and shared through smart city public-private partnership platforms, etc., and collaboration of smart city-related projects across the country will be advanced, and regional and private initiatives will be promoted. Particularly in ordinance-designated cities and core cities, etc., implementation will be promoted referring to precedent cases, and multilateral collaboration among cities and wide-area collaboration with surrounding areas will be promoted. [OPDVLE, STI, MIC, METI, MLIT]	・A working group was established to promote smart city initiatives in local governments nationwide, mainly in ordinance-designated cities and core cities.	・Local governments across the country are considering measures to accelerate smart city initiatives. [OPDVLE, STI, MIC, METI, MLIT]
○Based on the Smart City Guidebook, which is a guide for promoting smart cities in local governments and regions, prepared by the end of FY2020, the government will promote reference architectures, APIs, and services, share examples of smart cities, and disseminate and develop the significance, promotion methods, and definitions of smart cities. [OPDVLE, STI, MIC, METI, MLIT]	We will promote of smart city initiatives based on the Smart City Guidebook.	・By collecting examples of smart cities, smart local initiatives across the country and publishing new leading examples in the Smart City Guidebook, we will promote their further spread nationwide. [OPDVLE, STI, MIC, METI, MLIT]
○In order to implement and disseminate smart cities in a planned manner, the promotion system within the government shall be strengthened, and projects by each ministry and agency shall be carried out in an integrated manner based on a	・In the Data Strategy TF First Summary released in December 2020, the utilization policy of the reference architecture was specified in the	・We will create examples of application of cross-sectional data linkage technology in the smart city field. ・We will create new initiatives related to smart cities in open innovation challenges, etc.

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
common policy. In addition, efforts shall be made for further cooperation with the government-wide efforts to realize a digital government and to develop a data cooperation infrastructure. This will lead to public-private cooperation efforts such as promoting the creation of local start-ups using open data of the national and local governments and solving local problems, on the assumption that administrative organs, which are the largest platforms of the whole country, will build open systems that can be linked to the private sector through open and standardized APIs, by utilizing base registries built on data strategies. [STI, relevant ministries and agencies]	development of the data linkage platform. ・We will consider a standard data model for Super Cities at the Study Group on Data Linkagein Super Cities and Smart Cities.	[STI, relevant ministries and agencies]
○With regard to the formation of diverse and sustainable cities and regions that enhance social, economic, and environmental values through the use of smart cities, including the improvement of residents' satisfaction, the revitalization of industry, the optimization of greening and resource utilization, and the realization of symbiosis with nature, the addition of assessment indicators will be considered by 2021. At the same time, they will be reviewed as necessary and their survey analysis methods evaluated. Utilizing knowledge in various fields such as research and development of a total optimum model using mathematical applications and the examination of analytical evaluation methods, the future vision of smart cities that should be aimed for in the future will be materialized toward the realization of Society5.0, such as cities that provide cutting-edge services and areas that coexist with nature such as satoyama. [Social System, OPDVLE, STI, MIC, METI, MLIT]	・We have started collecting information on smart city evaluation indicators.	・In order to promote smart city initiatives in each city in Japan, issues related to the examination and introduction of smart city evaluation indicators will be identified. [EFSS, OPDVLE, STI, MIC, METI, MLIT]

③ International development

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○At the G20 Global Smart City Alliance, we will promote cooperation with cities around the world through dissemination and public relations activities under the concept of "free and open smart cities." [STI, METI]	・Discussions were held among the major cities participating in the G20 Global Smart Cities Alliance to develop five policies to be shared, achieve technology governance, and close governance gaps among cities.	・We will promote further participation of cities in the G20 Global Smart Cities Alliance and enhance information disclosure and development to other cities. [STI, METI]
○By 2021, the government and the private sector will establish a system to transmit information in cooperation with the international framework. In addition to transmitting the concept of Japan's smart cities, the government and the private sector will develop Japan's experience in urban infrastructure development and data management know-how overseas, mainly in Asia. [Cabinet Secretariat, STI, MIC, MOFA, METI, MLIT]	・We created and published the Smart City Catalog (October 2020). Explanations were carried out using the catalog in international conferences and training, etc.. ・The Smart JAMP (Smart City supported by Japan ASEAN Mutual Partnership) was announced in December 2020 as a support measure for the development of smart cities in ASEAN and the formation of concrete smart city projects were started.	・We will continue to share the concept and examples of Japan's smart cities through international conferences and training using the Smart City Catalog. [Cabinet Secretariat] ・Based on Smart JAMP, the following will be implemented: acceleration of smart city project formation surveys in the 10 ASEAN countries, promotion of investment and financing, enhancement of smart city measures by ministries and agencies and related organizations, and smooth information sharing and mutual cooperation among relevant parties including the private sector. [Cabinet Secretariat , STI, MIC, MOFA, METI, MLIT]
○In FY2021 and beyond, the government will continue to promote the use of international standardization related to smart cities in cooperation with experts on standards in Japan and overseas, targeting reference architectures and security guidelines. [Cabinet Secretariat, OPDVLE, SIPSH, STI, MIC, MOFA, METI, MLIT]	・Smart Cities were established as a priority area for promoting standards utilization across ministries and agencies under the Task Force for the Promotion of Standards Utilization.	・We will continue to implement initiatives for the strategic use of standards, centering on the special team under the Task Force for the Promotion of Standards Utilization. [SIPSH, STI]
○With regard to the Expo 2025 Osaka, Kansai, Japan to be held in 2025, by implementing projects that also contribute to smart cities based on the Basic Policy on the Promotion of Preparation and Implementation Measures for World Expo 2025 (Expo 2025 Osaka, Kansai)and will actively promote Society 5.0, which embodies "Designing Future Society	・In cooperation with related ministries and agencies, efforts are being considered based on the basic policy, etc.	・We will promote studies on the ideal way of efforts based on the basic policy, etc. [Expo, STI, relevant ministries and agencies]

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
for Our Lives." [Expo, STI, relevantministries and agencies]		

④ Development of next-generation human resources for sustainable activities

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○The basic knowledge and specialized knowledge necessary for the realization of smart cities will be collected. By the end of FY2021, the requirements for human resources engaged in planning, construction, and operation will be sorted out, and a human resources development system will be established in accordance with their roles and levels. Based on this, information on human resources will be provided to reduce anxiety and distrust in technology. At the same time, a place for joint creation of industry-academia-government collaboration centered on universities will be formed. [STI, MEXT]	・A Smart City Guidebook has been prepared to serve as a reference for local governments and regional organizations, and measures related to smart cities have been clarified. ・In addition to efforts related to the formation of smart cities under the COI Program, the government will promote the formation of a platform for co-creation under Program on open innovation platform for industry academia co-creation（COI-NEXT）(18 hubs), which will contribute to fostering human resources, the next-generation leaders in smart cities.	・Seminars on smart city guidebooks will be held to raise public awareness and interest in smart cities. [STI] ・We will form a forum for co-creation for industry-academia-government collaboration centered on universities. [MEXT] ・In FY2021, the government will form a platform for co-creation for industry-academia-government collaboration that contributes to the resolution of regional issues, centering on local universities. [MEXT]
○By the end of FY2021, the government will gather information on leading personnel (architects) who can coordinate the overall design of smart cities, and support their development, deployment, and activities in local communities. [STI]	・As one of the criteria for the designation of Super City Zones, we defined the existence of an architect who plans the entire Super City Initiative. ・Private organizations and universities began to consider programs to develop smart city architects.	・By the end of FY2021, the government will consider programs to deepen ties with smart city, super city architects in various regions, support activities, and develop leading human resources. Furthermore, we are considering the registration of human resources. [STI]

(6)Promoting R&D and social implementation to resolve various social issues and utilizing convergence of knowledge

[Ideal vision and direction toward its realization]

While utilizing the convergence of knowledge, which is a fusion of the humanities, social sciences and natural sciences, and in collaboration with countries, regions, and international organizations (EU, G7, OECD, etc.) that share values with Japan, the government will engage in R&D and the social implementation of the results thereof, with a view to solving global social issues such as climate change and domestic issues such as a social security system that can respond to the declining birthrate, aging population, and economic and social changes. By doing so, we aim to create a society in which structural changes in the economy and society can be achieved, and in which the creation of future industries and economic growth are compatible with the resolution of social issues.

In order to solve a wide range of complex social issues, it is necessary to promote the improvement of various social systems and response to ELSI from the initial stage of research and development by socially implementing diverse and outstanding research results that open up the frontier of knowledge in social implementation and linking them to innovation. To this end, the government will formulate strategies at the national government, ministry and agency, and implementing agency levels in a systematic and consistent manner based on evidence, promote mission oriented R&D programs and institutional reforms, and develop a system that can flexibly review strategies as needed.

In addition, the publicand private sectors will thoroughly promote the strategic and international application of standards as an important means of accelerating the social implementation of cutting-edge technologies to resolve social issues, promoting overseas expansion by Japanese companies under international competition, and acquiring international markets. To this end, in addition to the development of a public-private system, the government will reform the public and private awareness of social implementation of science, technology, and innovation and related research and development by utilizing public-private projects, so that strategic and international application of standards will be built in and deployed widely in government policies and corporate management strategies.

Furthermore, from the perspective of international responsibility and comprehensive security, we will develop science and technology diplomacy such as by strategically building an international network with countries and regions that share Japan’s issues and values. In this way, Society 5.0 will be transmitted to the world while incorporating and developing the knowledge and diversity of the world, and that common understanding and Japan’s international competitiveness will be maintained and strengthened. Japan will continue to produce researchers from our country who can play a key role in international research activities. Japan will demonstrate its presence as a country with advanced science and technology to the research community in Japan and overseas, attract talented people from various backgrounds in Japan and overseas to our country, and support the autonomous securing of soundness and fairness of research (research integrity) in harmony with other countries.

[Target]

- In addition to promoting research and development aimed at resolving social issues in Japan, such as the declining birthrate and aging population, urban and local issues, and resource issues such as

food, Japan will contribute to the world as a leading country in the field of problem solving, and improve the well-being of each and every individual.

[Key Targets in Science, Technology, and Innovation Policies] (Key Indicators)

- Promoting the resolution of social issues: build in a mechanism to promote the participation of researchers and research institutions with expertise in the humanities and social sciences in all issues of the next SIP and an implementation system to effectively utilize the convergence of knowledge, and promote the social implementation of results
- Strategic construction of an international cooperation network in science and technology to maximize national interests: strategically promote science and technology diplomacy, and steadily increase the number of international cooperation arrangements and the number of international joint papers in the Top 1% highly-cited papers in advanced key fields.
- Japan's presence in the formation of international agreements, frameworks and rules: while increasing Japan's involvement in the development of guidelines in international organizations, we will steadily advance efforts related to the international and strategic use of intellectual property and standards (including the number of initiatives and support for the formation and use of international standards) aimed at resolving social issues and gain international markets.

[Current data] (Reference index)

- R&D expenditure in strategic fields (AI, biotechnology, quantum technology, materials, etc.): (Efforts will be made to measure from FY2021 results)
- Ranking among the top 100 global companies by market capitalization: 47 in the U.S., 24 in China, and 3 in Japan
- IMD World Competitiveness Ranking: 34th out of 63 countries (2020)
- State of implementation of innovation in government projects
- Ratio of research and development issues utilizing the convergence of knowledge (Efforts will be made to measure from FY2021 results)
- Indicators related to social issues, such as the rate of food self-sufficiency and amount of exports, the amount of food loss, the diffusion rate of autonomous vehicles, and the number of traffic accidents
- Research papers, intellectual property, and standardization by issue and field
- Published metadata of publicly funded research data included in the Research Data Infrastructure System (by organization, program, etc.)
- Public opinion survey on science and technology

① Formulation and promotion of national strategies based on a vision of future society and evidence utilizing the convergence of knowledge

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○In relation to the convergence of knowledge which contributes to comprehensive understanding and problem solving of humans and society through the fusion of	・The NISTEP survey 2020 (published in April 2021) investigated the state of cooperation between natural sciences and the	・The basic concept of the convergence of knowledge that contributes to social change and strategic promotion measures will be

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
knowledge in the humanities and social sciences and knowledge in the natural sciences, the basic concept and strategic promotion measures will be compiled by the end of FY2021. In addition, indicators related to the humanities and social sciences and the convergence of knowledge will be examined by the end of FY2022, and monitoring will be carried out from FY2023. [STI, MEXT.]	humanities/social sciences.	studied. [STI] ・ After a pilot study of the indicators, relevant data will be collected. [STI] ・ In the NISTEP TEITEN survey, in which the questions will be newly designed with reference to the Sixth Basic Plan, questions on the convergence of knowledge will be added and the situation continuously investigated. [STI, MEXT]
○The government will steadily promote R&D based on the national strategy [122] in fields that should be promoted across ministries and agencies, such as AI, biotechnology, quantum technology, materials, space, ocean, environmental energy[123], health and medical care, food, agriculture, forestry and fisheries, etc. In addition, the government will review existing strategies and formulate new strategies based on evidence, while looking at the image of the future society that Japan should realize, and will concretely include clear targets, division of roles among industry, academia, and government, and ideal ways of international cooperation. In particular, the government will promote themes that are cross-sectoral and directly linked to the resolution of social issues as issues for the next SIP. [Health, STI, Space, Ocean, relevant ministries and agencies]	・ In the first phase of SIP, Japan realized the social implementation of outcomes that contribute to resolving Japan's social issues and strengthening industrial competitiveness, in areas such as disaster prevention and mitigation, longevity of infrastructure, autmated driving, and promotion of next-generation agriculture. ・ In SIP Phase 2, we are working on 12 issues to resolve Japan's social issues and to strengthen industrial competitiveness, including optical quantum technology and an advanced diagnosis and treatment system based on AI hospitals, and promoting R&D with the aim of achieving social implementation.	・ In the next SIP, we will build an effective collaborative system between industry, academia, and government to address issues that are important to the Japanese economy and industrial competitiveness and that involve multiple ministries, and we will promote comprehensive research and development, including institutional reforms, toward the realization of social implementation while utilizing the convergence of knowledge. [STI]
○With regard to the formulation of evidence-based strategies, quantitative analysis of papers, research funds, etc. and expert knowledge (expert judges) will be used to extract and analyze important science and technology areas, while utilizing the results of analyses by e-CSTI and policy research institutes, etc. These will be used for the formulation of Integrated	・ In addition to visualizing the relationship between research and development investment and the status of the number of papers in each field, we are constructing a Science Map that can analyze the relationship with funding data and a Science Map that can analyze the relationship with patent data after taking	・ After initiating an expert judgment starting with an overall overview and two specific fields, we will expand the work to cover multiple fields (about ten fields), extract and analyze important science and technology areas, and reviewing strategies for each field. [STI, related ministries and agencies] ・ In order to ensure the

[122] Chapter 3.2. Reference

[123] Chapter 2, 1. (2) Reference

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
Strategies, the review of sectoral strategies, etc. and the formulation of new national strategies, etc. In the FY2021 Integrated Strategy, analysis will be used on a trial basis, and future utilization methods will be determined based on the results. [STI, relevant ministries and agencies]	in data on Japanese papers.	effective and efficient allocation of competitive research funds among various projects and to lead to the review of projects, the Cabinet Office and other organizations will use e-CSTI and other means to analyze competitive research funds and other inputs and outputs for each project. [STI]
○When embodying the vision of a future society and formulating and promoting policies, it is necessary to utilize the convergence of knowledge based on the fusion of the humanities, social sciences, and natural sciences. Instead of deciding on a single direction, it is necessary to have options for double-line scenarios and new technologies and advance while continuously conducting verification. Researchers and research institutions with knowledge in the humanities and social sciences will participate from the examination and formulation stages of science, technology, and innovation policies, including the system design of public research projects, to the verification. In addition, each research and development agency will position in the targets that the convergence of knowledge will be actively utilized in the revision of the medium- and long-term objectives, taking into account the respective missions and characteristics. [STI, relevant ministries and agencies]	・To promote the examination of strategic promotion measures of the convergence of knowledge including the system design of public research projects will be the challenge going forward. ・In revising the medium- and long-term objectives of each research and development agency, it is necessary to establish cooperative relationships with the relevant ministries and agencies so that the convergence of knowledge will be actively utilized and included in the objectives.	・Relevant ministries and agencies will work together to discuss the design of systems for public research projects and the revision of medium- and long-term targets for research and development agencies. [STI , relevant ministries and agencies] ・With regard to national and local technological innovations and social change in countries and regions for climate change countermeasures, etc., the government will promote R&D and social implementation thereof to generate knowledge on the path backcasted from the vision of future society. [MEXT]
○With regard to semiconductors, which are a strategic basic technology that supports the digital society, in order to respond to economic security, promote the digital revolution, and reduce power consumption, the government will formulate strategies and promote various domestic and international measures to strengthen the foundation of Japan's semiconductor industry. [METI]	・The Semiconductor and Digital Industry Strategy Review Conference was established with the participation of corporate parties in the semiconductor and digital industries, experts, and relevant ministry and agencies, with the aim of enhancing the competitiveness of the semiconductor and digital industries, which are closely	・Based on the Semiconductor and Digital Industry Strategy Review Conference, the Strategy for Semiconductors and the Digital Industry has been compiled and various measures, including international cooperation, will be implemented to strengthen the foundations of Japan's semiconductor industry. [METI]

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
	related to all social and economic activities, by accurately grasping the changes of the times. ・At the meeting, participants shared information on environmental changes in the semiconductor and digital industries, and exchanged views on the direction of industrial policies to achieve sustainable economic and social growth.	
○With regard to the robots that will take on the role of connecting cyberspace and physical space in the Society 5.0 era, based on the Plan for Promoting Social Change Taking Advantage of Robots[124], industry, government, and academia will cooperate to promote efforts for building a robot-friendly environment that makes implementation easy, building a human resources development framework, building a R&D system that responds to mid- to long-term issues, and open innovation that accelerates social implementation. [MIC, MEXT, MAFF, MHLW, METI, MLIT]	・Research and development is being conducted in the areas of facility management, retail, and food production to introduce robots into areas where labor shortages are significant in order to build a robot-friendly environment. ・The Consortium of Human Education for Future Robot System Integration was established in June 2020 with the participation of robot manufacturers, educational institutions, and human resources development organizations. Lecturers from the industry are dispatched to technical colleges, etc. and implementation of training is being implemented for teachers, etc. ・Basic and applied research is being conducted through industry-academia collaboration to establish elemental technologies for the realization of next-generation industrial robots from a medium- to long-term perspective. ・A manual was published for the delivery of 3D deliverables using robot inspection support technology for public works projects.	・In order to build a robot-friendly environment, we will advance R&D in areas such as facility management, retail, and food manufacturing. We will also promote the development of user-oriented robots and the standardization and standardization of data linkage, communications, and facility design. [MAFF, METI] ・The Consortium of Human Education for Future Robot System Integration will support the development of practical training and educational curricula for teachers and students. [MEXT, MHLW, METI] ・ In order to realize next-generation industrial robots from a medium- to long-term perspective, we will conduct basic and applied research that revisits the field of science, including incorporating technology seeds from different fields. [METI] ・An industry-academia-government conference is held to prepare a road map for the introduction of robots into the infrastructure field. [MLIT]
○In order to develop an	・A draftof the next Basic	・By the end of FY2021, the

[124] Report by the Council for Promoting Social Change Taking Advantage of Robots (July 2019)

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
environment where industry, academia, and the public and private sectors can jointly use high-precision and high-value geospatial information, and to realize a G-space society in which these are highly utilized, the next Basic Plan for the Advancement of Utilizing Geospatial Information will be formulated by the end of FY2021. [G-Space]	Plan for the Advancement of Utilizing Geospatial Information is being adjusted decided at the Committee for Advancing the Utilization of Geospatial Information to be held in the summer of 2021.	government will formulate the next Basic Plan for the Advancement of Utilizing Geospatial Information, develop an environment in which geospatial information with high accuracy and high utility value can be used, and realize a G-space society that makes advanced use of this information. [G-Space]

② Promotion of mission oriented research and development for solving social issues

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○With regard to social issues such as infectious disease countermeasures, low birth rate and aging population, global environmental problems, disaster prevention, regional revitalization, reduction of food waste, resources, and energy that Japan and the rest of the world are facing, the government will take into account the needs of Japan and overseas, and based on the analysis of various data that are continuously observed and collected, the government will establish a specific mission to resolve the issues with the participation of various sectors including citizens, and will promote R&D in various frameworks including the next SIP. [STI, relevant ministries and agencies]	・We began studying the ideal form of the next SIP. ・In the first phase of the SIP, Japan realized the social implementation of outcomes that contribute to resolving Japan's social issues and strengthening industrial competitiveness, in areas such as disaster prevention and mitigation, longevity of infrastructure, autmated driving, and promotion of next-generation agriculture. ・In the SIP Phase 2, we are working on 12 issues to resolve Japan's social issues and to strengthen industrial competitiveness, including optical quantum technology and an advanced diagnosis and treatment system based on AI hospitals, and promoting R&D with the aim of achieving a social implementation.	・In the next SIP, we will build an effective collaborative system between industry, academia, and government to address issues that are important to the Japanese economy and industrial competitiveness and that involve multiple ministries, and we will promote comprehensive research and development, including institutional reforms, toward the realization of social implementation while utilizing the convergence of knowledge. [STI]
○With regard to the Moonshot Research and Development Program established in 2018, the government will take advantage of the knowledge acquired through Funding Program for World-Leading Innovative R&D on Science and Technology (FIRST) and the Impulsing Paradigm Change through disruptive Technologies (Impact), which the government has been engaged in until now.	・For the Moonshot Research and Development Program, project managers have been selected for all of Moonshot Goals, and we will promote R&D to achieve our targets for 2040 and 2050. ・In January 2021, a new goal team centered on young players was decided, and new goals set around autumn this year.	・Research and development will be drastically strengthened for the achievement of Moonshot Goals under the promotion system in which the related ministries and agencies work together. [Healthcare, AMED, STI, MEXT, MHLW, MAFF, METI] ・In order to respond to the changes in the socioeconomic situation caused by COVID-19, new targets will be set in

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
The program aims to attract people by setting ambitious goals and concepts for social issues that are difficult to achieve but are expected to have a major impact. Under the direction of top researchers who lead the cutting-edge research, the government gather the knowledge of researchers from around the world and steadily engage in R&D to achieve these goals. The government will also actively promote challenging R&D to draw out basic research capabilities to the maximum extent, and will seek to discover and develop innovative research results while allowing for failure. Furthermore, the government will also renew the management methods to a form that enables flexible review of the program and contents by looking at the whole relevant R&D while always keeping in mind the evolving world R&D trends. The government will also thoroughly implement an open and closed strategy with a view to commercialization in the future. This new research method will realize disruptive innovation. If necessary, the government will also enhance efforts by setting new goals. [Health, STI, MEXT, MHLW, MAFF, METI]		the fall of 2021, incorporating the ideas of young researchers and other countries, and research and development will begin in the spring of 2022. [STI, MEXT] ・We will strengthen outreach and public relations activities for research results to promote understanding among citizens at all levels and promote social implementation areas. [Healthcare, AMED, STI, MEXT, MHLW, MAFF, METI] ・We will strengthen international collaboration with European countries, the United States, and other countries (in fields in which such countries have interest, such as the environment, agriculture, AI/robots, quantum technology, and healthcare) and promote international joint research. [Healthcare, AMED, STI, MEXT, MHLW, MAFF, METI] ・We will promote research and development based on ELSI for the smooth social implementation of research results by the time the goals are achieved, and promote cross-sectional support for effective research and development through the use of mathematical scientific methods. [Healthcare, AMED, STI, MEXT, MHLW, MAFF, METI] ・We will vigorously promote projects in priority areas (such as the realization of a carbon-neutral society) and areas that require stronger international cooperation (environment, agriculture, AI/robotics, quantum, healthcare, etc.). [STI, relevant ministries and agencies]
○In order to solve social problems in Japan and the world and create new value through science, technology, and innovation, from FY2021, the government will	・In April 2021, Japan Science & Technology Agency began inviting applications for the Responsible Innovation	・We will contribute to solving social problems in Japan and the world by strengthening related funding. [MEXT] ・Along with the steady

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
strengthen funding for R&D targeting issues that require responses using the convergence of knowledge through the fusion of humanities, social sciences, and natural sciences, such as citizen participation in ELSI responses from the initial stage of R&D. [MEXT]	with Conscience and Agility (RInCA) program on ethical, legal, and social issues (ELSI) in science and technology (second fiscal year) and a collaborative R&D program to achieve the SDGs (SOLVE for SDGs) (third fiscal year). After the selection process, R&D is scheduled to begin around October. In May 2021, open recruitement for a new slot for SOLVE for SDGs, Preventing Social Isolation & Loneliness and Creating Diversified Social Networks, was launched. After the selection process, research and development is scheduled to begin in early November.	implementation of publicly-invited programs, we will examine measures to improve related funding, including the further utilization of the convergence of knowledge.
○A new corporation shall be established under the responsibility of the national government with regard to the International Education and Research Center, which will play a central role in research and development and human resource development indispensable for the creative reconstruction of Fukushima. The existing facilities shall be reorganized, the organizational form shall be on the national research and development agencies, and the basic concept of the new center shall be formulated in FY2021. [Reconstruction, relevant ministries and agencies]	・Based on the Development of an International Education and Research Center (decided by the Reconstruction Promotion Council on December 18, 2020), a meeting of relevant ministries and agencies was held to discuss the organizational form of the international education and research center.	・Discussions will be held at a meeting of relevant ministries and agencies, and the form of the new entity will be decided by autumn 2021, and the basic concept for the new base will be formulated in FY2021. [Reconstruction, relevant ministries and agencies]

③ Social implementation of advanced science and technology for solving social problems

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○With regard to issues that are important for Japan's economic and industrial competitiveness and are related to multiple ministries and agencies, a large-scale industry-academia-government collaboration system will continue to be established,	・In the first phase of SIP, social implementation, which has achieved R&D results such as SIP4D, forging simulator, dynamic map, and road surface condition grasping system by smartphone, were	・The government will promote comprehensive research and development, including institutional reform, toward the realization of social implementation by building a large-scale collaboration system between industry,

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
and comprehensive R&D will be promoted, including institutional reforms, to realize social implementation while utilizing the convergence of knowledge. For this purpose, the ideal state of national projects such as the next SIP and how to deploy SIP-type management in projects by other ministries and agencies will be examined in 2021, and will be reflected in future projects. Some issues such as self-driving in the second phase of SIP have already been studied in the field of humanities and social sciences, and such efforts will be developed in FY2021 onwards. In addition, in order to improve the feasibility of solving social issues, the next SIP will require the incorporation of a mechanism to promote the participation of researchers and research institutes with expertise in humanities and social sciences and an implementation system to effectively utilize the convergence of knowledge in all issues, and its activities will be evaluated. [STI]	realized. In SIP Phase 2 as well, our country is tackling 12 issues to resolve social issues that Japan faces and to strengthen industrial competitiveness, including auotmated driving, optical quantum technology, strengthening national resilience, and advanced diagnosis and treatment systems through AI hospitals, while conducting R&D aimed at achieving social implementation. ・In order to enhance the SIP system, a mid-term evaluation of the system was conducted in FY2020 based on the operation guidelines, and recommendations were made for clarifying the definition of social implementation and ensuring a sufficient period for formulating a research and development plan. On the other hand, accelerating social reform by utilizing the results of advanced research and development has become an issue. ・With the participation and knowledge of researchers in the humanities and social sciences, we are making efforts toward the practical application of autmated driving with regard to effective educational methods for the safe use of autmated vehicles, effective information transmission methods and effect measurement methods for the purpose of fostering public acceptance, and methods for estimating the social and economic impact of autmated driving and autonomous driving..	academia, and government, and utilizing the convergence of knowledge. [STI] ・In order to improve the feasibility of solving social issues, the next SIP will require that mechanisms to promote the participation of researchers and research institutions with expertise in the humanities and social sciences and implementation systems to effectively utilize the convergence of knowledge be incorporated into all issues, and its activities will be evaluated. [STI] ・For the next SIP, in order to ensure more effective and efficient operation, verification will be conducted on the operation of the second phase, including the final evaluation and other matters, including how the public and private sectors should bear the burden. [STI] ・In SIP Phase 2, research in the humanities and social sciences will be strengthened from FY2021 onwards. [STI]
○Candidates for the next SIP will be examined toward the end of 2021 in order to strengthen the control function of CSTI. Specifically, CSTI will identify	・Explanations were given to CSTI regarding the schedule for examining the next SIP issue candidates. In May, we asked relevant	・The government will consider the candidates for the next SIP issue by the end of 2021 based on the Sixth Basic Plan, the Integrated Innovation

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
social issues to be addressed in the medium term based on the Sixth Basic Plan, the Integration Strategy, and various sectoral strategies formulated by the Integrated Innovation Strategy Promotion Council . Among these social issues, research and examination will be conducted on technology development themes to be addressed across ministries and agencies utilizing the convergence of knowledge. [STI]	ministries and industries to propose candidates for the next SIP task.	Strategy, and various sectoral strategies formulated by the Integrated Innovation Strategy Promotion Council, We will identify social issues that CSTI needs to address in the medium term, and conduct surveys and studies on technology development themes within these social issues that need to be addressed across ministries and agencies, utilizing the convergence of knowledge. [STI]
○For the respective issues of the second phase of SIP, the government will advance R&D including on building a system for social implementation towards the social implementation of the outcomes as well as conduct follow-up investigation and follow-up evaluation after the end of the project and confirm the realization status of the social implementation of the outcomes. [STI]	・With regard to the SIP Phase 2 issues, we will promote R&D, including the building of a framework for the social implementation of the project results. ・Follow-up surveys were conducted in order to understand the status of research results of SIP Phase 1 in social implementation and the status of efforts by SIP Phase 1 participating agencies after the completion of SIP.	・With regard to the SIP Phase 2 issues, we will promote R&D, including the building of a framework for social implementation, for the social implementation of the project results, and conduct follow-up surveys and follow-up evaluations after the completion of the projects to confirm the achievement of social implementation. [STI]
○With regard to Public/Private R&D Investment Strategic Expansion PrograM (PRISM), CSTI will continue to promote the expansion of public and private R&D investment and the implementation of PRISM in society by guiding the measures of each ministry and agency and accelerating projects based on the integration strategy and various strategies for each field formulated by the Integrated Innovation Strategy Promotion Council. [STI]	・In PRISM, each budget allocation project is followed up on the progress of the projects and its positioning toward the realization of various strategies, and the results of the project are evaluated every year. ・In addition to verifying the effects every year, follow-up evaluations are conducted after the end of the projects. ・In addition, the PRISM Review Board evaluates the results of projects requiring continuous budget allocations over multiple fiscal years.	・With regard to PRISM, based on the Integrated Innovation Strategy and the sectoral strategies formulated by the Integrated Innovation Strategy Promotion Council, CSTI will guide the policies of the ministries and agencies, accelerate projects, and continue to promote the expansion of research and development investment and the promotion of social implementation in both the public and private sectors. [STI]
○In each project implemented by the national government, the government will continue to actively introduce advanced technologies, encourage the use of advanced technologies in the	・Efforts were made to innovate government projects in FY2020, such as encouraging innovation in projects by ministries and agencies.	・With the cooperation of the Cabinet Office and other ministries and agencies, we will continue to gather and analyze information on innovation and promote the

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
real world, implement projects more efficiently and effectively, and promote social change. [STI, all ministries and agencies]	・Information on the promotion of innovation in Official Development Assistance (ODA) was collected and analyzed.	social implementation of cutting-edge technologies both in Japan and overseas. [STI, all ministries] ・We will further promote of efforts for innovation in government projects and cooperation with CSTI. [All ministries]

④ Promoting the resolution of social issues and acquistion of international markets through the international and strategic use of intellectual property and standards

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○In order to grasp the trends in the use of intellectual property and standards in foreign countries and to promote the strategic and international use of standards in Japan, the government as a whole will develop a control tower function and system, and strengthen and accelerate measures for the use of standards, including international standardization. From FY2021, the government will promote the strategic and international use of standards, including the appropriate use of forum standards, de facto standards, and de jure standards, through research and development projects, in important fields such as solving social issues and acquiring international markets. [SIPSH, STI, MIC, METI, relevant ministries and agencies]	・The Task Force for the Promotion of Standards Utilization was established under the Integrated Innovation Strategy Promotion Council to promote standards utilization across ministries and agencies. ・We are implementing the necessary systems to support the acceleration of important measures by each ministry and agency. ・We have selected smart cities, Beyond 5G, green growth (hydrogen and ammonia fuel), smart agriculture and smart food chains as areas where the strategic use of standards should be prioritized across ministries and agencies.	・A special team under the Task Force for the Promotion of the Utilization of Standards will play a central role in promoting support for accelerating the development of standards and technical demonstrations in areas that should be prioritized across ministries and agencies, as well as support for activities necessary for the formation of international standards, such as research and analysis and dispatching experts. At the same time, consideration will be given to the addition of international commerce and logistics in these areas. [SIPSH, STI, MIC, MAFF, METI, MLIT, relevant ministries and agencies]
○With regard to the strategic and international application of standards, from FY2020, the government will establish a public-private partnership system, promote public-private awareness reform, broad-based enhancement of activities in the industrial sector, and enhancement of human resources, and develop an environment that promotes changes in corporate behavior related to the application of standards through cooperation with government research and	・We are coordinating with the private sector and other related parties for the development of a public-private partnership system. ・With the National Institute of Advanced Industrial Science and Technology as the contact point for the support platform, a support system has been established in which the Information-technology Promotion Agency, the National Institute of Information and Communications	・We will establish a public-private partnership system and hold meetings to serve as the body for promoting public-private partnerships. In promoting the use of standards as a management strategy, the government will promote the reform of corporate awareness and the strengthening of human resources through the sharing of success and failure cases. [SIPSH] ・As support for standard strategic activities in the private sector through the

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
development projects, regulations, and systems. In addition, the government will establish a platform system that supports practical activities by private companies in cooperation with governmental organizations. [SIPSH, STI, MIC,METI, relevant ministries and agencies]	Technology, and the Japan Standards Association participate.	support platform, the provision of a test bed for demonstration purposes and dispatch of experts will begin. [SIPSH, STI, METI, and relevant ministries and agencies and Agencies]
○The government will promote the development and platform of intellectual infrastructure, etc., which will be the source of Japan's high-quality manufacturing and services by FY2025, and broadly support socio-economic activities aimed at solving the people's lives and social issues.. [METI]	・The Industrial Structure Council discussed the draft of the Third Intellectual Infrastructure Development Plan and issued public comments. ・The Second Intellectual Infrastructure Development Plan was reviewed to confirm achievement of the targets.	・A new Intellectual Infrastructure Development Plan will be established to support a wide range of socioeconomic activities in peoples' lives and those aimed at resolving social issues. [METI] ・After the formulation of the Third Intellectual Infrastructure Development Plan, the development of intellectual infrastructure will be implemented toward the interim follow-up in FY2025. [METI]

⑤ Strategic promotion of science and technology diplomacy

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
○The government will promote the strategic development of science and technology diplomacy through the promotion of strategic bilateral and multilateral win-win cooperation and collaboration in important cutting-edge fields, the fundamental strengthening of support for international industry-academia joint research with a view to implementing the results in society, and the international development of the STI for SDGs activities. [STI, MOFA, MEXT]	・Japan held joint committees with the United States, Finland, and India, respectively, based on science and technology cooperation agreements, and discussed the promotion of cooperation in the fields of science and technology, including key cutting-edge fields. ・At bilateral joint committees on science and technology cooperation and other fora, quantum technology is discuessed and international research and development cooperation promoted. An international workshop is scheduled to be held by the quantum technology innovation hubs within FY2021. In addition, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the U.S. Department of Energy (DOE)	・We will steadily advance the Strategic and International Joint Research Program (SICORP), including cooperation in strategic fields with countries that share common values and efforts for international industry-academia collaboration. [MEXT] ・We will discuss and implement concrete policies on how to utilize Japan's strengths in science and technology in foreign policy, while utilizing the Advisory Board for the Promotion of Science and Technology Diplomacy, with the cooperation of relevant ministries and agencies. [MOFA, relevant ministries and agencies] ・We will strengthen Japan-U.S. cooperation in

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
	are scheduled to conclude a project arrangement regarding quantum information science. ・Eight "quantum technology innovation hubs were launched in Japan (February 2021). By positioning RIKEN as the core organization and undertaking cross-site activities, the relevant organizations will gather all their strength to advance a wide range of activities from basic research to technology validation and fostering human resources, and will also develop them for international collaboration. ・We will promote international research collaboration in fields related to the Moonshot Research and Development Program. ・With regard to the STI for SDGs, Japan began to support the formulation of a road map for the STI for SDGs in Kenya, with contributions to the World Bank. In addition, through contributions to the United Nations Development Programme, we launched a project to utilize Japan's STI knowledge in social issues related to the SDGs in India, Turkey, the Philippines, Vietnam, and Malawi. In addition, a pilot project in Kenya is ongoing to examine a platform for the international expansion of STI. ・The Advisory Board for Promoting Science and Technology Diplomacy, which was established under the Science and Technology Advisor to the Minister for Foreign Affairs to collect specialized knowledge in various fields of science and technology and utilize it for the planning and drafting of foreign policy, discussed ways to promote science and technology diplomacy in Japan. ・Under the Strategic International Collaborative Research Program (SICORP),	important fields such as quantum technology, AI, space exploration, and environmental energy. [STI, Space, MOFA, MEXT, relevant ministries and agencies] ・In important fields such as quantum technology, environmental energy, and sustainable agriculture, we will accelerate collaboration between our research hubs in both countries, while making strategic use of programs such as the Strategic and International Collaborative Research Program (SICORP) and the Moonshot Research and Development Program. [STI, MEXT, MAFF, and relevant ministries and agencies] ・We will promote collaboration between the EU's Horizon Europe mission program and the Moonshot Research and Development Program. [STI, MEXT, MAFF, METI] ・Through its contribution to the World Bank, Japan will develop a roadmap for the STI for SDGs in Kenya in cooperation with India. Through its contribution to the United Nations Development Programme, Japan will consider solutions to local social issues in India and other countries, utilizing Japan's STI. [STI] ・Based on the survey and research on the platform for matching needs and business creation with seeds for problem solving, we will secure cases that contribute to the study of business models and diplomacy. [STI] ・As for the Science and Technology Research

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
	in FY2020, the government will promote international collaborative research with developed and developing countries, including the launch of public applications for research on COVID-19 in non-medical fields. The Science and Technology Research Partnership for Sustainable Development (SATREPS) program promotes international collaborative research in the fields of environment and energy, bio resources, disaster prevention and mitigation, and infectious diseases control through collaboration between ODA and Japan's outstanding science and technology.	Partnership for Sustainable Development (SATREPS) program, Japan will strategically implement cooperation with emerging and developing countries based on its achievements to date, and clarifying the achievement of the SDGs and targets for social implementation. [MOFA, MEXT]
○In light of the situation in which concerns such as conflicts of interest and commitment, and leakage of scientific and technological information are becoming more and more apparent as research activities become more international and open, the government will consider its response policy while paying attention to the difference between basic research and applied development, while also taking into account the importance of international joint research, and develop necessary guidelines such as guidelines for public invitation of competitive research funds and cooperation with foreign companies in 2021. In order to support independent assurance of the soundness and fairness of research activities (research integrity) that should be held by researchers, the government will establish the direction of its response in early 2021 in cooperation with research communities in Japan and overseas. These guidelines will be reviewed as necessary in light of the status of efforts by each research institute, research funding agency, etc. (Restated) [STI, MEXT, METI,	・As part of the research projects commissioned by the Cabinet Office, the Research Integrity Investigation Committee was held to identify research integrity that should be secured by Japanese researchers and research organizations, etc. and the state of efforts to achieve it, through research and analysis of trends in Japan and overseas, interviews with experts, and discussions at the Investigation Committee, etc., in light of the growing concerns about conflicts of interest and commitment and the leakage of science and technology information, etc., with the internationalization and openness of research activities.	・Based on the Policy on Measures to Ensure Research Integrity decided by the Integrated Innovation Strategy Promotion Council, the Cabinet Office and each ministry will steadily promote initiatives which will be disseminated and coummunicated, universities, research institutes, etc. In addition, common guidelines for competitive research funds projects will be revised as early as possible in 2021. [STI, MEXT, METI, relevant ministries and agencies]

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
relevant ministries and agencies]		
○In order to play a leading role while Japan is actively involved in the formation of international agreements on science, technology, and innovation as well as the formation of frameworks and rules, the government will secure and expand the positions of Japanese staff and the chairmanship of international conferences of relevant international organizations, strategically develop candidates, and actively dispatch staff and experts from relevant ministries and agencies. [STI, MOFA, MEXT, METI, relevant ministries and agencies]	・The Liaison Conference of Relevant Ministries and Agencies for Strategic Efforts to Acquire Senior Official Posts at International Organizations was held to strategically engage the government as a whole in the acquisition of top posts and senior official posts at international organizations and the dispatch of Japanese nationals from the public and private sectors to international organizations. ・Japan is promoting initiatives to play a leading role in the formation of international agreements and frameworks and rules, including participation in the OECD-Global Science Forum expert group.	・Utilizing the Liaison Conference of Relevant Ministries and Agencies for Strategic Efforts to Acquire Senior Official Posts at International Organizations, the government as a whole will develop a system to carry out comprehensive coordination across ministries and agencies concerning the nomination of candidates, etc., dispatch of Japanese nationals from the public and private sectors, and foster human resources effectively, from a long-term perspective, so that Japanese nationals can obtain important executive positions, including top positions, in international organizations, and be capable of actively fostering excellent human resources. [STI , MOFA, MEXT, METI, relevant ministries and agencies] ・The Ministry of Foreign Affairs and relevant ministries and agencies will work together to strategically respond while strengthening the collection and aggregation of information on the posts of Japanese staff at international organizations, chair international conferences, and dispatching experts. [STI, MOFA, relevant ministries and agencies]
○Under the Japanese strategy for science and technology diplomacy, the government will strengthen the foundation that supports the strategic development of science and technology diplomacy by strengthening cooperation systems across ministries and agencies, strengthening information collection and	・When responding to international issues in the field of science, technology, and innovation bilaterally with major countries such as the United States and EU member countries, as well as multilaterally with the G7 and G 20, the relevant ministries and agencies will work closely together.	・We will discuss and implement concrete policies on how to utilize Japan's strengths in science and technology in foreign policy, while utilizing the Advisory Board for the Promotion of Science and Technology Diplomacy, with the cooperation of relevant ministries and

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
dissemination systems centered on science and technology offices of diplomatic missions abroad and overseas offices of national research and development agencies, etc., and actively disseminating information on efforts toward the realization of Society 5.0 in international fora such as the G7. [STI , MOFA, MEXT, METI, relevant ministries and agencies]	・The Advisory Board for the Promotion of Science and Technology Diplomacy, which was established under the Science and Technology Advisor to the Minister for Foreign Affairs to collect specialized knowledge in various fields of science and technology and utilize it for the planning and drafting of foreign policy, discussed ways to promote science and technology diplomacy in Japan.	agencies.. [MOFA, relevant ministries agencies] (Restated) ・In addition to vitalizing the Science and Technology Diplomacy Network (STDN), we will enhance dissemination of Japan's science and technology policies and activities through international conferences, etc. [MOFA, STI, relevant ministries and agencies] ・In anticipation of assuming the G7 Presidency Year 2023, Japan aims to lead concrete initiatives in the discussions in open science that Japan has led with the EU, and to accelerate research cooperation among fellow countries through the establishment of an common international infrastructure. [STI, relevant ministries and agencies]
○Through strategic promotion of international joint research through collaboration with overseas research fund allocation organizations, etc., formation of attractive research centers, international exchange of students and researchers, realization of world-class treatment and research environment, internationalization of universities, research institutes, research fund allocation organizations, etc., the government will build an international research network with Japan positioned at the core, and attract excellent human resources from around the world. [Health, STI, MIC, MEXT, MHLW, MAFF, METI]	・Priority support will be given to universities that are engaged in thorough internationalization, including new initiatives to realize and accelerate exchanges and collaboration with world-class universities, structural improvements such as personnel and educational system reforms, and the strengthening of systems to develop students' global capabilities. ・We will support universities that develop and implement educational exchange programs that go beyond regional differences in higher education systems, such as cross-recognition of credits, performance management, and degree awarding. Such programs that assure quality facilitate the overseas dispatch of Japanese students and the acceptance of foreign students in Japan. ・In the World Premier International Research Center	・In addition to deepening cooperation with overseas research funding agencies and strengthening the perspectives of interdisciplinary fusion (including the humanities and social sciences) and international industry-academia collaboration, we will promote international joint research in light of the changes in the With/Post COVID-19 situation. [MEXT] ・In order to contribute to the promotion of international brain circulation, we will examine a framework for long-term research and personnel exchange between organizations, high-level universities, and research institutes in strategic fields such as AI and quantum technology, and promote the formation of a network of researchers centered on Europe and the

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
	Initiative(WPI), the FY2021 budget appropriation includes the budget to form one new base under a new mission. Japan will continue to support efforts to create international fusion research centers that contribute to the international brain circulation by realizing world-class treatment and research environments. ・Even under the influence of COVID-19, we are steadily implementing efforts related to international expansion of science, technology, and academia, such as international joint research and exchange of researchers, not only through face-to-face meetings but also through online meetings. ・Under the Strategic International Collaborative Research Program (SICORP), in FY2020, the government will promote international collaborative research with developed and developing countries, including the launch of public applications for research on COVID-19 in non-medical fields. The Science and Technology Research Partnership for Sustainable Development (SATREPS) program promotes international collaborative research in the fields of environment and energy, bio resources, disaster prevention and mitigation, and infectious diseases control through collaboration between ODA and Japan's outstanding science and technology. ・Based on the Future Earth (FE) concept, we promote international collaborative research that will lead to solutions to climate change, disaster risk reduction and other global challenges, asa multilateral joint research utilizing an transdisciplinary approach. ・We are steadily promotingof international brain circulation through the dispatch of	United States. [MEXT] ・We will promote international exchange projects, including the strategic dispatch and acceptance of researchers and youth, while paying attention to the characteristics of research fields, the state of research capabilities in countries around the world, including the rapidly growing Asia-Pacific region, and the needs of partner countries. At the same time, we will consider a review of the structure of existing international exchange projects from the viewpoint of the effective and efficient construction of international academic networks. [MEXT] ・In order to steadily implement international academic exchanges even under conditions such as COVID-19, in which it is difficult to travel between countries, we will promote the use of online initiatives. [MEXT] ・Japan will strengthen its support for international joint research in areas of global interest through grants-in-aid for scientific research. [MEXT] ・We will promote the introduction of funding methods related to international joint research, such as joint public offerings, in publicly offered research projects such as the Strategic Creative Research Promotion Project. [MEXT] ・In the World Premier International Research Center Initiative(WPI), we will systematically and continuously promote the formation of international

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
	Japanese researchers overseas and the invitation of foreign researchers to Japan through the Overseas Fellowship Program and the Invitation Program for Foreign Researchers. ・An international conference (RD20) was held with the participation of the leaders of the leading research institutions in the clean energy technology field of the G20. Japan's national research and development agencies and other organizations are conducting international joint research and development of innovative clean energy technologies by collaborating with cutting-edge technologies and research resources possessed by research institutes in other countries. ・We are promoting joint research with the EU and the United States. We launch an international joint research project on the creation of a smart living environment for the elderly using digital technology under the Strategic Information and Communications R&D Promotion Program (SCOPE) in collaboration with Horizon 2020, and conducting an international joint research project with the United States related to maintaining and controlling social infrastructure using IoT.	fusion research hubs including new hubs scheduled to be established in in FY2021 based on new missions established with an eye to the enhancing opportunities for doctoral students and other young researchers to gain international experience and overseas training. At the same time, we will advance the lateral deployment of know-how and promote international brain circulation even in the with/post COVID-19 era.. [MEXT] ・In order to promote the internationalization of universities, the government will provide priority support to universities that are striving to achieve thorough internationalization, and disseminate the results of such efforts within their organizations and to other universities. [MEXT] ・In order to promote the incorporation of international research trends and improve the metabolism of research in Japan, we will promote the internationalization of the management of research funding agencies, such as through the participation of overseas researchers in the review process, while giving due consideration to ensuring research integrity. [STI, MEXT] ・In order to enhance opportunities for students to study abroad, we will promote even higher quality student exchanges by utilizing joint degree programs and establishing educational exchange programs with overseas partner universities. [MEXT]

Specific measures under the Basic Plan	Implementation status and analysis of current situation	Future action policy
		・RD20 will be held continuously. We will also continue to conduct international joint research and development on innovative clean energy technologies. [METI] ・In order to accelerate the practical application of R&D results in international standardization in the ICT field and to contribute to the creation of innovation and strengthening of international competitiveness, we will further promote international joint research with our strategic partners. [MIC]
○We will consider the method of tabulation of indicators such as the number of international cooperation agreements and international joint papers among the Top 1% papers in essential advanced fields by FY2021. [STI, relevant ministries and agencies]	・The Cabinet Office and Council for Science, Technology and Innovation are considering measures based on the Basic Plan.	・We will evaluated the method of aggregation of indicators and conduct a trial aggregation. [STI, relevant ministries and agencies]

2. Expanding the frontier of knowledge and strengthening research capabilities as a source of value creation

(1)Reconstruction of the environment that generates diverse and outstanding research

[Ideal vision and direction toward its realization]

We aim to create an environment in which researchers can fully utilize their abilities based on a diverse awareness of problems inherent in each individual, and continue to take on the challenge of solving problems in order to create diverse and outstanding research results that open up the frontier of knowledge.

In order to achieve this, first of all, we will enhance the career path for talented young people to advance to the doctoral courses as bearers of “knowledge” under circumstances in which they can envision their future activities. Specifically, we will reconstruct a career system in which outstanding young researchers can take pride as a global leader in "knowledge" that meets the needs of the times, find the value worth staking their own lives while securing enough time to devote to research, and take on the challenge of becoming an independent researcher. In the future, an environment will be created in which

all of the desired excellent doctorates can obtain regular positions in various fields, such as academia, industry, and government, and work as leaders.

Both academia and industry are required to make efforts to realize this. In other words, it is necessary for the industry to recognize that, if there is an environment in which PhD human resources with advanced problem-solving abilities, who set their own problems and achieve their solutions, can demonstrate their abilities, they can play an active role with a sense of satisfaction toward the creation of innovation in the industry. At the same time, academia needs to promote graduate school education reform, be responsible to society for nurturing PhD human resources suitable for supporting Society 5.0, and be welcomed with trust by society. In so doing, the custom of regarding doctoral students as cheap research labor shall be overhauled, and they will be treated appropriately as researchers and developed as human resources who will lead the next generation of society. At the same time, an environment will be created in which researchers' social advancement after completion of doctoral programs become the social evaluation of their teachers. Under this environment, excellent students and young people will choose the path of doctorates and improve the depth and excellence of human resources in both academia and industry.

Furthermore, in order to enhance research excellence, it is necessary to promote deep basic research and academic research, as well as to actively exchange diverse knowledge. The goal is to create an environment in which individual researchers can create outstanding and original research results by securing time to engage in research and engaging in intellectual exchange with various entities without being confined to their own specialized fields, and by being stimulated.

For this reason, we will make it so that many researchers will be able to study and gain experience under different research cultures and environments overseas in order to step up their careers as researchers and build an international research network with overseas researchers. At the same time, we will create attractive research centers including those online, that attract motivated and talented researchers from around the world, and attract top-level researchers. By promoting international joint research utilizing these networks, we will create an environment in which we can stimulate each other and generate new ideas one after another.

Furthermore, in order to secure diversity in research and to create gendered innovation[125], we will further promote the activities of female researchers, including in leadership positions, and increase potential knowledge providers in our country by overcoming the low rate of women advancing to doctoral programs in natural sciences.

In addition, the government will strongly promote basic research and academic research, which are the core of efforts to create knowledge. In doing so, the government will promote competitive research funds reforms to maximize the creation and utilization of knowledge, such as providing continuous support to researchers.

In addition, the government will promote the humanities and social sciences in a comprehensive and systematic manner, with the aim of exploring and presenting new values and the way society should be. At the same time, we will promote knowledge, cooperation and collaboration in natural sciences and

[125] Innovation created by incorporating gender perspectives into science and technology.

promote the creation of the convergence of knowledge that transcends boundaries of fields. The collective body of academia in Japan will continue to create superior knowledge while overcoming barriers in its fields, addressing social issues and working together globally.

[Target]

- In an environment in which talented young people can envision themselves to be active in various fields such as academia, industry, and government, they will be proud to enter Ph.D. programs and take on the challenge as something that is worth staking their lives on, without economic concerns.
- The creation and accumulation of diverse and outstanding research results from basic research and academic research will advance, and continuous support will be provided to researchers who can achieve these results.
- In an environment in which diversity is ensured, individual researchers are given time to sit down and engage in research. Instead of being confined to their own specialized fields, they engage in active intellectual exchanges with various entities, and through opportunities for overseas study and experience, they are stimulated to advance emergent research and produce research results with higher excellence.
- Research in the humanities and social sciences will progress with depth, and diverse knowledge will be created. At the same time, creating and utilizing the convergence of knowledge that is integrated with the knowledge of natural sciences in order to solve complex problems faced by domestic, foreign, and local communities, becomes established.

[Key targets in science, technology, and innovation policies] (Key indicators)

- PhD students receiving living expenses: to improve the treatment of outstanding PhD students, by FY2025, the number of PhD students receiving an amount equivalent to living expenses will increase by three times[126] (equivalent to approximately 70% of the number of students who have received master's degrees and moving on to doctoral programs). In addition, in the future, all outstanding doctoral students who wish to apply for this program will receive an amount equivalent to living expenses.
- Number of new hires by industry with doctoral degrees in science and engineering: the number of new hires per year will increase by approximately 1,000 by FY2025 (The actual figures for 2018

[126] According to the FY2019 Ministry of Education, Culture, Sports, Science and Technology pilot university reform promotion project Survey on the state of economic support for doctoral program students (March 2020), the actual figure for FY2018 was 10.1% of doctoral program students. Realization of the above numerical targets is equivalent to about 30% of all doctoral students receiving living expenses. Under this plan, the amount equivalent to the living expenses that doctoral course students receive is 1.8 million yen or more per year. However, in addition to efforts to utilize investment profits from University Endowment Fund and strengthen earlier support for doctoral students, as well as expenditures for research assistants (RA) from competitive research funds, etc.,the government will significantly expand the number of recipients equivalent to a JSPS postdoctoral fellow (DC) of about 2.4 million yen per year. The government will also review the amount equivalent to living expenses and examine a system to enable recipients to receive treatment equivalent to the world standard, from the viewpoint of making Japan's doctoral programs world-class and attracting talented students from overseas.

are 1,151 out of 4,570 persons with doctorate degrees in science and engineering[127].).

- Number of full-time university faculty under the age of 40: from the viewpoint of strengthening the research capability of Japan, increase by 10% during the Basic Plan period[128], and aim to increase the percentage of teachers under the age of 40 in full-time university faculty to 30% or more in the future.
- The ratio of tenured and tenure track teachers among 35-39 year-old full-time university faculty at research universities[129] (national universities in "key support (3)" that place world-class outstanding educational research throughout the university and social implementation as central to function strengthening, and on a par with overseas universities that have produced outstanding results): over 10% increase in the ratio in 2019 during the Basic Plan period[130]
- The percentage of new hires in female researchers at universities: in science 20%, engineering 15%, agriculture 30%, medical/dental/pharmaceutical 30%, humanities 45%, social sciences 30% by FY2025
- Percentage of female university teachers who are professors, etc. (president, vice president, professor)[131]: 20% as early as possible and 23% by FY2025 (17.7% as of FY2020[132])
- The ratio of office work, etc. at universities, etc. in teachers' duties: halved by FY2025 (18% as of FY2017[133])

[Current data] (Reference index)

- The number of adjusted top 10% papers's share of total papers cited: 8.3% (2016-2018) [134]

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[127] Calculated from the 2019 Ministry of Education, Culture, Sports, Science and Technology's pioneering university reform promotion project, Survey and research on grasping and analyzing the actual condition of educational reform in graduate schools (Libertas Consulting Co., Ltd., March 2020).

[128] According to the Ministry of Education, Culture, Sports, Science and Technology's FY2019 Statistical Survey of School Teachers, in FY2019, there were 41,072 teachers in full-time university faculty under the age of 40, and 22.1% of teachers in full-time university faculty were under the age of 40.

[129] It should be noted that each university and field has different situations and ratios of researchers, and it is important for each university to aim for the achievement of their targets based on each situation. In particular, in the field of health care, there is a tendency for graduates of medical and dental graduate schools, such as graduate students who are already in the workforce in the medical profession, to be older. In addition, teachers in the medical profession such as physicians and dentists belonging to affiliated hospitals, etc. are included. In the field of medical care and hospital management, etc., such teachers have high mobility, for example, they are transferred between university departments and hospitals or dispatched to partner hospitals and clinics. For this reason, it is necessary to take into consideration the fact that many cases are operated with a fixed term.
In addition, it is important to take into consideration that depending on the researcher, there is a period during which research is suspended due to childbirth, childcare, etc., and to aim at achieving the targets.

[130] According to a survey by Ministry of Education, Culture, Sports, Science and Technology, the percentage of tenured and tenure-track teachers in the among teachers aged 35-39 who are full-time university faculty at national universities under "key support (3)" in FY2019 was 44.8%. A 10% increase in this proportion corresponds to 49.3% overall.

[131] With regard to setting targets by field and position, each university and graduate school is required to strategically set, disclose and verify targets according to the characteristics of the field and institution.

[132] Calculated based on Ministry of Education, Culture, Sports, Science and Technology's FY2020 School Basic Survey.

[133] Ministry of Education, Culture, Sports, Science and Technology, Survey of Full-time Equivalency Data at Universities and Colleges"

[134] Calculated by integer count. The number of adjusted top 10% papers' share of the total number of citations in 2016–2018. Calculated

- Total number of papers and their international share: 81,095 papers, 5.3% (2016-2018 (3-year moving average)) [135]
- Number and percentage of participation in research areas in which research is attracting international attention (Science Map): 274 areas, 30% (2013-2018) [136]
- Number of doctorates per population: 119 per 1 million population (2017) [137]
- Young researchers (full-time university faculty under 40) and percentage of the total: 41,072 persons, 22.1% (FY2019) [138]
- Percentage of female researchers among all researchers, including those in the private sector: 16.9% (FY2019) [139]
- Percentage of female researchers among full-time university faculty: 25.9% (FY2020) [140]
- Percentage of women enrolled in doctoral programs (by field): science (20%), engineering (19%), agriculture (36%), medical/dental/pharmaceutical (31%), humanities (53%), social sciences (37%) (FY2020) [141]

① Improving the treatment of doctoral students and expanding their career paths

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○With regard to improving the treatment of doctoral students and expanding their career paths, the government will continue to analyze and follow up on students who require various forms of support, and will make concerted efforts by mobilizing all of various policy resources with the cooperation of the industrial sector. The government will also continue to provide support through the enhancement of the Research Fellowship Program (DC), the Japan Student Services Organization Scholarship (those who have achieved outstanding academic performance are	・In FY2019, a survey was conducted on the economic conditions of doctoral students and the status of scholarship programs at universities, and the results were made public ("Doctoral students receiving an amount equivalent to living expenses: 10.1%," etc.). ・We will enhance the budget for tuition reduction and exemption for graduate students of national universities in the FY2021 national university budget subsidies, and continue to support tuition reduction and exemption for graduate	・The government will continue to conduct regular surveys on the economic situation of doctoral program students and the status of scholarship programs at universities to ascertain the current situation, and will enhance related measures and promote the enhancement of efforts at universities as necessary. [MEXT] ・With a view to establishing a University Endowment Fund, the government will summarize an interim report by around the summer of 2021 on the requirements and necessary reforms required for

based on the Ministry of Education, Culture, Sports, Science and Technology, National Institute for Science and Technology Policy, Science and Technology Indicators 2020 (Research Materials 295, August 2020).

[135] Calculated by integer count. Calculated based on the Ministry of Education, Culture, Sports, Science and Technology, National Institute for Science and Technology Policy, Science and Technology Indicators 2020 (Research Materials 295, August 2020).

[136] Ministry of Education, Culture, Sports, Science and Technology, National Institute for Science and Technology Policy, Science Map 2018 (NISTEP REPORT 187, November 2020)

[137] Ministry of Education, Culture, Sports, Science and Technology, National Institute for Science and Technology Policy, Science and Technology Indicators 2020 (Research Materials 295, August 2020)

[138] Calculated from the FY2019 Statistical Survey of School Teachers.

[139] Ministry of Internal Affairs and Communications, 2020 Results of the Survey of Research and Development (December 2020)

[140] Calculated based on Ministry of Education, Culture, Sports, Science and Technology's FY2020 School Basic Survey.

[141] Calculated based on Ministry of Education, Culture, Sports, Science and Technology's FY2020 School Basic Survey.

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
exempt from returning the money) and tuition reduction for graduate students at universities, utilization of the investment profits from university funds, and efforts to strengthen support for doctoral students ahead of this. In addition, in order to promote the payment of salaries to doctoral students at an appropriate level as a research assistant (RA) from competitive research funds and joint research funds, the government will formulate rules for the payment of RA expenses relating to employment and remuneration for RAs at each business and university, and implement them sequentially from FY2021. FY2021. [STI, MEXT, relevant ministries and agencies]	students of private universities, etc., in the current expense subsidires for private universitites, etc. ・In order to establish the University Endowment Fund with a scale of 10 trillion yen, the Act on Japan Science and Technology Agency, National Research and Development Agency was revised at the 204th ordinary session of the Diet, and as part of the resources of this fund, government secured 500 billion yen as for investment (the third supplementary budget of FY2020) and 4 trillion yen (the initial plan amount of fiscal investment and loan program of FY2021) to Japan Science & Technology Agency (JST). In addition, as a measure to strengthen support for doctoral program students ahead of the University Endowment Fund, an additional 20 billion yen (the third supplementary budget for FY2020) was allocated to the emergent research promotion fund. ・In order to promote the payment of an appropriate level of remuneration to doctoral students employed under competitive research funding, the Promotion of Appropriate Expenditure of RA Expenses, etc. for Competitive Research Funding was formulated in March 2021 as an agreement between the relevant ministries and agencies.	research universities that are on a par with the world. The government will also compile a conclusion on a new legal framework by the end of 2021 and submit it to the next ordinary Diet session. [STI, MEXT] ・The Basic Approach to Investment Policy of University Endowment Fund toward Building World-class Research Universities will be formulated around the summer of 2021, and operation will be launched in FY2021. In addition, based on the system design of university reform, etc., University Endowment Fund to the will be expanded to the scale of 10 trillion yen by the end of FY2021. [STI, MEXT] ・Japan will steadily promote support for doctoral students, which was strengthened in FY2020. [STI, MEXT]
○In FY2021, the government will start a program to establish university fellowships, which will provide integrated support to excellent doctoral students, who are strategically secured by universities, from their lives as students to the acquisition of posts after graduation, and will promote economic support	・Under the project to create university fellowships for the creation of science and technology innovation, 47 universities were selected in February 2021, and support has been provided to a total of approximately 1,000 doctoral students since the beginning of FY2021.	・We will continue to support doctoral students through the project to create university fellowships for the creation of science and technology innovation. [MEXT]

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
through organizations to which they belong. [MEXT]		
○In addition to ensuring transparency and fairness in the examination of doctorate degrees, measures to ensure that the results of posts and social activities of doctoral students after completion are also used as the evaluation of universities and teachers in charge will be examined at the university support forum PEAKS[142] and other forums. We will encourage a fundamental change in awareness that it is the duty of the advisor to train doctoral students as next-generation researchers, and that this will be reflected in their own evaluation. [STI, MEXT]	・At the 50th Council for Science, Technology and Innovation, council members proposed that "the postings of doctoral students and the results of their social advancement should be reflected in teachers' evaluations."	・In the Leaders´ Forum on Promoting the Evolution of Academia for Knowledge Society PEAKS and other forums, measures will be examined to utilize the postings and social advancement of doctoral program students after their graduation in the evaluation of universities and teachers in charge. [STI, MEXT]
○In FY2021, the government will implement long-term paid internships at graduate schools in cooperation with industry and universities to develop practical skills backed up by research capabilities in doctoral programs. The government will also promote participation in industry-university collaboration activities, and increase opportunities for students in doctoral programs to explore the possibility of diverse participation in the industry. In addition, the government will expand career paths for doctoral students in the industry by establishing a system for discovering (matching) excellent young researchers by companies and universities and promoting the employment of doctoral graduates in companies. [MEXT, METI]	・The Ministry of Education, Culture, Sports, Science and Technology and Keidanren jointly run a committee to implement long-term paid internships in doctoral programs. ・Efforts by companies and universities have been conducted to identify outstanding young researchers, and discussions held on promoting the participation of PhD holders in industry.	・Based on deliberations by the job-based research internship promotion committee, a long-term paid internship program for doctoral programs has been implemented since FY2021 through the job-based research internship promotion project.". [MEXT] ・We will continue to promote efforts by companies and universities to discover outstanding young researchers. [METI] ・We will conduct a survey to understand the current status of the active role of PhD holders in industry and to identify issues. [STI, MEXT, METI]
○With regard to the employment, duties, and treatment of doctoral graduates both in Japan and overseas among national public officers and industries, the government will	・In July 2020, the Cabinet Bureau of Personnel Affairs, the Science, Technology, and Innovation Promotion Secretariat, and the Ministry of Education, Culture,	・In addition to developing the above results and good examples, relevant ministries and agencies should consider ways to improve the treatment of doctoral graduates

[142] A forum established in FY2019 by university officials, industry, and the government to discuss management issues and solutions at universities, horizontally develop good practices that lead to innovation, consider deregulation, and develop university management.

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
investigate the actual conditions and needs of such graduates and share good examples of from FY2021, and at the same time, advance the consideration of improving the treatment of doctoral graduates among national public officers based on their professional knowledge and research experience and come to a conclusion at an early stage. [CBPA, NPA, STI, MEXT, METI, all ministries and agencies]	Sports, Science and Technology conducted a survey of the Human Resources Division of each ministry and agency, with the aim of examining the utilization of PhD holders in the government and public offices. The results of the survey were compiled in February 2021.	employed as national public officers based on their expert knowledge and research experience. [CBPA, NPA, STI, MEXT, METI, all ministries and agencies]

② Development of an environment in which young researchers can play an active role at universities, etc.

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○The government will advance the provision of posts to young researchers using external funds and the utilization of a tenure track system and clarifying standards. Additionally, to promote efforts to secure posts for young researchers throughout the organization, encourage the development and active participation of young researchers, and build a sustainable research system through measures such as promoting the utilization of an annual salary system and cross-appointment system for senior researchers, and promoting the conversion to fixed-term employment using external funds. To this end, in FY2021, the government will prepare a supplementary edition of the Guidelines for Reform of Personnel Management and Remuneration Management, which includes excellent examples of such efforts. In addition, the government will promote efforts to reallocate the number of students (transfer of the number of students, reorganization of the educational research organization) so that	・For the preparation of the supplementary edition of the Guidelines for Reform of Personnel and Remuneration Management, we are studying methods for investigating good practices, etc. ・The government will provide intensive financial support for the ambitious development of educational and research organizations, including doctoral programs, through the national university management subsidy.	・In order to promote the securing of posts in young researchers and the development of young researchers throughout the organization, and to build a sustainable research system, in FY2021 a supplementary edition of the Guidelines for Reform of Personnel and Remuneration Management Reform will be prepared, taking into account good practices such as the utilization of annual salary systems and cross-appointment systems and the shift to fixed-term employment with external funding. [MEXT] ・In order to promote each university's efforts to reorganize its educational and research organizations based on its own strategies, the government will implement a focused allocation of funds to the national university budget subsidies. [MEXT]

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
universities will actively implement reforms to allow more students to advance to doctoral programs in academic fields that they believe should be intensively enhanced based on their own strategies. [MEXT]		
○From FY2021, the government will pay personnel expenses for researchers at universities and national research and development agencies from competitive research funds and corporate joint research funds, and will promote the creation of stable posts for young researchers through organizational management from the financial resources thus secured. In addition, the government will promote a scheme to raise the salary level by acquiring external funds (mixed salary) from FY2021 in order to achieve world-class treatment for excellent researchers. [STI, MEXT, relevant ministries and agencies]	・In October 2020, the ministries and agencies concerned agreed to enable the expenditure of personnel expenses for principal investigators (PIs) from competitive research funds, and to utilize the financial resources secured thereby for improving the treatment of PIs and improving the research environment. ・The FY2021 allocation of national university budget subsidies reflects the state of use of external funds (donations, joint research funds, competitive research funds, etc.) for personnel expenses.	・From FY2021, the government will expend personnel costs for persons engaged in research at universities and national research and development agencies, etc. from competitive research funds and joint research funds of companies, and promote the creation of stable posts for young researchers through organizational management from the financial resources secured thereby [STI, MEXT relevant ministries and agencies] ・In order to achieve world-class treatment for outstanding researchers, in FY2021, the government will promote the implementation of a salary system (mixed salary) that enables the payment of higher-than-standard salaries by utilizing external funds. [STI, MEXT, relevant ministries and agencies]
○In order to build a team-type research system in which management personnel from URA , etc., and highly skilled professional personnel such as engineers (including technical personnel who support research in all fields at universities, etc.), etc., work together to ensure the quality of their professional duties and improve their treatment will be implemented by the end of FY2021 so that they will become attractive positions. This will enable the enhancement of mobility and career paths of professional personnel, including doctoral personnel, as well as the	・For engineers (including technical staff who support research in all fields at universities, etc.), efforts to support quality assurance and improved treatment started in FY2021. ・With regard to URAs, in FY2021, the government began to provide opportunities for URAs to receive systematic specialized training on the knowledge required of them, and to support the management of accreditation bodies that provide objective quality assurance (accreditation) based on practical capabilities.	・A certification system will be established in accordance with the capabilities of URAs to improve quality and visualize capabilities. In addition, by collecting and disseminating good examples of the roles and treatment of URAs and other management personnel, we will promote better understanding of the effectiveness of the strategic allocation of URAs at universities and other institutions and improve treatment. [MEXT] ・We will build a nationwide network to improve the skills of engineers (including technical staff who support

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
development and securing of them. [MEXT]		research in all fields at universities, etc.) and realize diverse career paths. In addition, universities as a whole will strengthen their organizational structure for strategically introducing, updating, and sharing research facilities and equipment (Core Facility Construction Support Program) to train and secure excellent engineers. [MEXT]
○Follow-up surveys on the employment status and treatment of doctoral graduates will be conducted periodically during the Basic Plan period. Each university will also continue to monitor the employment and activity status of doctoral graduates even after completion, and publish details of employment status on the Internet, etc. [STI, MEXT]	・ A follow-up survey was conducted on the employment status and treatment of doctoral graduates, and the third report was published in November 2020. ・ A survey was conducted by the national government on the status of obtaining information on employment and career paths of doctoral graduates at universities, and the results were published.	・ We will conduct a follow-up survey on the employment status and treatment of doctoral graduates at each university, publish the latest results, and consider measures to promote efforts at each university. [MEXT] ・ We will continue to conduct follow-up surveys and bird's-eye analysis of the employment status and treatment of doctoral graduates. [MEXT]

③ Promoting the active participation of female researchers

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○The government will improve the environment and support systems for both male and female researchers to balance childcare and nursing care with research, including the establishment of on-campus childcare facilities, the promotion of work style reforms, the additional employment of post-doctoral researchers when there are researchers on maternity leave, and the establishment of items related to diversity in the performance evaluation of managers. As part of these efforts, the government will clearly state in FY2021 that the period of maternity leave and childcare leave will be taken into consideration in the age restrictions, etc. of guidelines for public recruitment of support projects for young	・ Implementation of projects such as the "Initiative for the Realization of a Diverse Research Environment to improve the environment and enhance support systems to balance research with life events such as childbirth and childcare. ・ In the guidelines for open recruitment, etc., for the Fusion Oriented Research for Disruptive Science and Technology and Grants-in-Aid for Scientific Research (KAKENHI), etc., it is clearly stated that the period of maternity leave and childcare leave will be considered.	・ We will continue to promote projects to improve the environment and support systems so that both male and female researchers can balance childcare and nursing care with research. [MEXT] ・ We will share and promote efforts among the ministries and agencies concerned to consider the period of maternity leave and childcare leave in the age limit, etc. in the guidelines for open recruitment of support projects for young researchers. [MEXT, STI, relevant ministries and agencies]

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
researchers.[143]Additionally, the government will promote consideration for researchers taking maternity leave and childcare leave such as by taking similar measures for age restriction for the recruitment of young teachers at universities, etc. [CCRA, MEXT, MHLW, METI, relevant ministries and agencies]		
○Universities and public research institutes will utilize the Act on Promotion of Female Participation and Carrer Advancement in the Workplace to set and publish strategic numerical targets for the percentage of women employed and the percentage of women promoted to leadership positions, etc. by each business operator in accordance with the characteristics of the organization and the percentage of women enrolled in doctoral programs in each field (science 20%; engineering 19%; agricultural 36%; medical, dental, and pharmaceutical 31%; humanities 53%; social science 37% (FY2020)). [Gender Equality, MEXT, relevant ministries and agencies]	・The following requests were issued to science, technology, and academic organizations. 1. To promote active efforts to expand and promote the participation and advancement of women by utilizing mechanisms such as the formulation of an employer's action plan based on the Act on the Promotion of Female Participation and Carrer Advancement in the Workplace, and in particular, for organizations, etc., newly subject to the obligation from 2022 to take appropriate measures based on the said Act. 2. To implement voluntary and effective positive improvement measures with reference to professional organizations that have implemented positive action, such as introducing a quota system for the appointment of officers. 3. In order to achieve the numerical targets for the recruitment and promotion of women in science, technology, and academia, each entity, such as universities, research institutes, academic organizations, and companies, shall independently set targets for recruitment and promotion, and shall disclose the targets and the status of their progress.	・We will call on universities and public research institutes to set and disclose strategic numerical targets for the percentage of women employed and the percentage of women appointed in leadership positions, in accordance with the ratio of women in doctoral programs in each field, the characteristics of the institution, and other factors. [Gender Equality, MEXT, relevant ministries and agencies] ・The Council for Gender Equality will deliberate on important issues every year. In 2023, the middle year of the Fifth Basic Plan for Gender Equality, the Council will follow up on the status of achievement of all achievement targets and conduct inspections and evaluations. At the same time, it will follow up on efforts related to achievement targets. [Gender Equality]

[143] For example, in the Fusion Oriented Research project, the application requirements will be within 15 years after obtaining a doctoral degree in principle, and within 20 years after obtaining a doctoral degree for those who could not devote themselves to research due to childbirth and childcare.

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○Efforts by national universities to build teacher organizations with diverse human resources, such as female researchers, and efforts to encourage female students to advance to science and engineering departments will be evaluated as management achievements of university presidents and reflected in the allocation of operating expense subsidies. In addition, efforts by private universities, etc. to support female researchers and researchers of the child-raising generation will be supported by the current expense subsidy for private universities, etc. in order to support efforts by private universities, etc. to support female researchers, such as building flexible working systems. [MEXT]	・In the priority support corresponding to the direction of the function enhancement of national university budget subsidies, evaluation of the achievement status of KPIs established by each university itself, including the efforts to enhance the science and mathematics orientation of female students, etc. is conducted.	・The government will draw a conclusion by the end of FY2021 on the allocation mechanism of the new national university corporation, national university budget subsidies, toward the 4th medium-term target period. [MEXT] ・With regard to subsidies for ordinary expenses for private universities, in order to promote the development of an environment for researchers in the child-rearing generation including female researchers, support will be provided to universities that promote the development of a childcare support system and the development of a research environment suited to the life cycle of a child. [MEXT]
○In order to communicate the appeal of science and engineering to junior high and high school students, parents, and teachers, and in order to increase the proportion of women in master's programs and doctoral programs, mainly in science and engineering, the government will promote the presentation of career paths and role models for female researchers. In order to promote the advancement of women in science and engineering, the government will further enhance the career paths and role models of female researchers from FY2021. [Gender Equality, MEXT]	・In the Support Program for Female Junior and Senior High School Students' Choice of Career in Science and Engineering, measures were implemented to promote female junior and senior high school students' advancement to science and engineering. ・In August 2020, we released a video seminar for female junior and high school students, their parents, and teachers to raise awareness about the future of science and engineering selection. ・In March 2020, we prepared an educational material for instructors of science and mathematics education for junior high school students titled Class-making in Science and Mathematical Subjects that Incorporate a Perspective of Gender Equality—with a Focus on Junior High Schools.	・We will implement programs such as the Support Program for Female Junior and Senior High School Students' Choice of Career in Science and Engineering to promote female junior and senior high school students' advancement to science and engineering. [MEXT] ・In order to promote women's choice of careers in science and technology, a symposium will be held in which career paths and role models for female researchers, etc. are displayed for female junior high and high school students, their guardians, and teachers [STI, Gender Equality, MEXT]. ・We will promote the dissemination of an educational material for instructors of science and mathematics education for junior high school students titled Class-making in Science and Mathematical Subjects that Incorporate a Perspective of Gender Equality—with a Focus on Junior High Schools [Gender Equality, MEXT]

④ Basic Research and promotion of academic research

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○In order to create and expand a variety of knowledge through academic research, the government will secure and enhance financial resources that can be used at the discretion of the organization, including basic costs. At the same time, the government will secure and enhance grants-in-aid for scientific research (scientific research funds) that support creative and challenging research subjects in accordance with the careers of researchers, aiming at a new adoption rate of 30%, while continuously promoting system improvements such as support for young researchers, further promotion of emerging and fusion research and internationalization, and review of examination categories. [MEXT]	・In the FY2021 budget as well, foundational expenses for national and private universities were expanded. ・In the FY2021 budget, Grants-in-Aid for Scientific Research (KAKENHI) were expanded. Budgets were allocated for the realization of support for diverse and continuous research activities aimed at the continuous creation of research results and for the enhancement of new and integrated research.	・For the creation and expansion of diverse knowledge by academic research, the government will secure financial resources that can be used as foundational and other expenses at the discretion of the organizations. [MEXT] ・With regard to Grants-in-Aid for Scientific Research (KAKENHI), the government will aim to support unceasing research funding based on active adoption of young researchers, and aims to achieve a 30% rate of new applications, while continuing to make improvements such as the improvement of young researchers in basic research and emerging/converged research, strengthening support for international joint research in areas of global concern, and expanding application opportunities that lead to the rapid growth of outstanding young researchers. [MEXT]
○With regard to the Strategic Basic Research Programs[144], from FY2021, the government will promote priority support for young researchers and seamless support for excellent researchers. At the same time, the government will promote basic research for the post-coronavirus era by bringing together and merging researchers from a wide range of fields, including the humanities and social sciences. The government will also enhance and improve the program in order to take on emerging and fusion fields, promote overseas challenges, and strengthen international joint research. [MEXT]	・While promoting priority support for young researchers, we are currently working on the grouping of strategic objectives for the participation of a wide range of researchers, including outstanding researchers and researchers in a wide range of fields, including the humanities and social sciences, who have been excluded from the target until now.	・In order to promote priority support for young researchers and continuous support for outstanding researchers, the government will promote the grouping of strategic objectives, and will make improvements with regard to taking on emerging and fusion fields, the promotion of overseas challenges, and the strengthening of international joint research. [MEXT]
○By providing researchers	・In FY2020, we held open	・The government will steadily

[144] A project to strategically promote basic research as a source of innovation by establishing a temporary research system (network-type research institute) that transcends organizational and sectoral boundaries under strategic objectives set by the national government.

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
around the time they become independent, mainly young researchers, with an environment in which they can boldly concentrate on their own ambitious ideas over the long term, the government will steadily promote Fusion Oriented Research for Disruptive Science and Technology projects with the aim of creating results that can lead to disruptive innovation, breaking away from short-term performance-based approaches, and will also enhance projects with a view to steady implementation. [MEXT]	recruitment and adoption of for research projects in the Fusion Oriented Research for Disuptive Science and Technology project, and research was launched in April 2021. In addition, in the third supplementary budget for FY2020, the budget necessary for the expansion of the number of adopted projects and the enhancement of RA support was appropriated.	implement support through the Fusion Oriented Research for Disuptive Science and Technology project, which provides continuous support for research funds related to emergent research for up to 10 years. The government will also verify the effects of the new system introduced into the program, and will deepen efforts to ensure an environment in which young researchers and others can concentrate on free and challenging research. [MEXT]
○In the evaluation of large-scale projects and competitive research funds, the government will more actively evaluate the generation of results and spin-outs that were not initially expected, and that research has continued to be challenged, and will also introduce a system in which young researchers participate in the examination to the extent that it does not impose an excessive burden, from the viewpoint of taking diverse viewpoints into consideration. on them. [MEXT]	・In the stage-gate evaluation of competitive research funds in some parts of Ministry of Education, Culture, Sports, Science and Technology, a viewpoint of screening was introduced in line with the purpose of the system to promote challenging efforts.	・Ministry of Education, Culture, Sports, Science and Technology has established evaluation criteria for the promotion of challenging initiatives in stage-gate evaluations of competitive research funding in some areas. Based on these criteria, we will continue to conduct evaluations and promote projects that support challenging initiatives. [MEXT]
○The government will promote the development and utilization of large-scale projects and advanced large-scale facilities and equipment leading the world's academic frontier. [MEXT]	・A road map to clarify priorities of large-scale project was drawn up by a council of the Ministry of Education, Culture, Sports, Science and Technology. ・The development of next-generation synchrotron radiation facilities started in FY2019 in accordance with the division of roles between the public-private regional partnership. As of the end of May 2021, the basic building construction progress rate was about 51%. ・SPring-8, SACLA, and J-PARC are widely used by researchers in industry, academia, and government as specific advanced large-scale	・We will strategically and systematically promote large-scale projects that lead the world's academic frontiers, while formulating an annual plan and conducting rigorous evaluation and progress management. [MEXT] ・We will make steady progress in the development of next-generation synchrotron radiation facilities, with the aim of starting operations in FY2023, in accordance with the division of roles between the public-private regional partership. [MEXT] ・We will steadily promote the sharing of quantum beam facilities such as SPring-8, SACLA, and J-PARC, as well

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
	research facilities.	as promoting inter-facility cooperation and efforts toward remote and smart facilities. [MEXT]
○With regard to joint use and joint research centers that effectively and efficiently promote joint use and joint research by making the most of the research potential of universities, national universities will promote activities that contribute to the fusion of different fields, creation of new fields, and resolution of social issues through flexible organization in response to academic development and research diversification during the fourth medium-term target period starting in FY2022, based on the system revision to promote networking.[145] [MEXT]	・In order to promote networking, the statute on the accreditation of joint use/research centers and international joint use/research centers (Ministry of Education, Culture, Sports, Science and Technology Notification No. 133 of July 31, 2015) was partially amended in December 2020.	・For national universities, studies will be conducted for the selection of new and continuing centers during the fourth medium-term target period. [MEXT]
○With regard to inter-university research institute corporations[146], which provide researchers nationwide with large-scale facilities and equipment, data, and valuable materials that are difficult to operate at individual universities, etc., and which support education and research at universities in Japan, the government will strengthen their functions by reflecting them in the establishment of the mid-term objectives and the organizational review toward the fourth mid-term objectives period starting in FY2022, based on the results of the assessment of education and research activities at each inter-university research institute. [MEXT]	・Assessment was conducted on whether education and research activities in inter-university research institutes during the third mid-term objectives period correspond to trends in academic research and contribute to the development of academic research at universities, and the results were published.	・From the perspective of strengthening research systems at each inter-university research institute and contributing to the development of academic research, we will review the organizations and operations, and consider the fourth mid-term objectives and plan , based on the results the assessment. [MEXT]
○In order to analyze and evaluate Japan's research capabilities from multiple perspectives,	・The ministries and agencies concerned have begun studying the development of	・We will ascertain and organize overseas trends in indicators for multifaceted

[145] On December 23, 2020, the MEXT Notification No. 133 (July 31, 2008) partially revised the "Regulations on Joint Use, Joint Research Sites, and Accreditation of International Joint Use, Joint Research Sites, etc

[146] Four corporations: National Institutes for the Humanities, National Institutes of Natural Sciences, High Energy Accelerator Research Organization, and Research Organization of Information and Systems.

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
researchmap [147], etc. will be utilized to efficiently gain and analyze diverse information related to researchers. Furthermore, taking into account overseas trends, new indicators such as innovation creation, development of new fields, and contribution to diversity will be developed in 2022 in addition to the existing number of papers and citation index, and their sophistication and continuous monitoring will be carried out. [STI, MEXT, METI.]	new indicators for the multifaceted analysis and evaluation of Japan's research capabilities.	analysis and evaluation of research capabilities, exchange opinions with experts, and consider the development of new indicators. [STI, MEXT, and METI]

⑤ Promotion of international joint research and international brain circulation

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○Conduct international joint research with developed countries with high levels of science and technology such as the United States and countries in the European Union, and promote science and technology cooperation with emerging and developing countries such as India and Kenya around the SDGs. Contribute to the development of science and technology, human resource development, and the resolution of global issues, including medium- and long-term perspectives. [STI, MEXT, relevant ministries and agencies]	・We are promoting international joint research with developed countries. ・We are promoting international joint research that leads to solutions to global challenges through collaboration between Japan's advanced science and technology and ODA. ・Under the Strategic International Collaborative Research Program (SICORP), international collaborative research is being promoted with developed and developing countries, including the public invitation for research on COVID-19 in the non-medical field in FY2020. The Science and Technology Research Partnership for Sustainable Development (SATREPS) program promotes international collaborative research that leads to solutions to global challenges in the fields of environment and energy, bio resources, disaster prevention and mitigation, and infectious diseases control through	・We will steadily advance the Strategic International Collaborative Research Program (SICORP), including cooperation in strategic fields with countries that share common values and efforts for international industry-university collaboration. [MEXT] ・As for the Science and Technology Research Partnership for Sustainable Development (SATREPS) program, Japan will strategically implement cooperation with emerging and developing countries based on its achievements to date, and clarifying the achievement of the SDGs and targets for social implementation. [MOFA, MEXT]

[147] A comprehensive database of Japanese researchers operated by the Japan Society for the Promotion of Science. Researchers register information on their own background, research results, etc. to disseminate information on researchers and encourage communication, as well as contribute to the unified management of research information and reduction of administrative burden. National Institute of Informatics conducts research and development on the system.

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
	collaboration between ODA and Japan's outstanding science and technology.	
○With a view to expanding opportunities for overseas research institutes and overseas experience for Japanese students and young researchers, inviting excellent researchers from foreign countries, and promoting the employment of foreign researchers, by FY2021, the government will formulate a strategy for the international development of science and technology, including support measures and environmental improvement (internationalization of methods for international public recruitment and employment of post-doctorates, measures for salaries and treatment at the international level, living support including family members, improvement of international administrative systems, formation of international research centers, etc.), and will work on measures in order to promote the employment of foreign researchers. The government will also consider numerical targets by FY2022 based on an understanding of the actual status of international brain circulation and an analysis of issues. [STI, MEXT]	・The 11th International Strategy Committee of the Council for Science, Technology, and Academia was held at Ministry of Education, Culture, Sports, Science and Technology. Based on the recognition of the current situation as pointed out in the Sixth Basic Plan, discussions and examinations were conducted toward the formulation of an international strategy. ・We conducted examination on numerical targets based on an understanding of the actual situation and analysis of issues related to international brain circulation. ・Even under the influence of COVID-19, efforts related to the international expansion of science, technology, and science, such as international joint research and exchange of researchers, are steadily being advanced not only through face-to-face meetings but also online. ・Under the Strategic International Collaborative Research Program (SICORP), international collaborative research is being promoted with developed and developing countries, including the public invitation for research on COVID-19 in the non-medical field in FY2020. The Science and Technology Research Partnership for Sustainable Development (SATREPS) program promotes international collaborative research that leads to solutions to global challenges in the fields of environment and energy, bio resources, disaster prevention and mitigation, and infectious diseases control through collaboration between ODA and Japan's outstanding science and technology. ・We are steadily promoting	・The 11th International Strategy Committee of the Council for Science, Technology, and Academia was held at Ministry of Education, Culture, Sports, Science and Technology. Based on the recognition of the current situation as pointed out in the Sixth Basic Plan, discussions and examinations were conducted toward the formulation of an international strategy. ・We will examine numerical targets based on an understanding of the actual situation and analysis of issues related to international brain circulation. [STI, MEXT] ・In implementing international joint research projects, the government will deepen cooperation with overseas research funding agencies, etc. strengthen the perspectives of interdisciplinary fusion (including the humanities and social sciences) and international industry-academia collaboration, and promote cooperation in light of changes in the With/Post COVID-19 situation. [MEXT] ・In order to contribute to the promotion of international brain circulation, we will examine a framework for inter-organizational long-term research and personnel exchange between high-level universities and research institutes in strategic fields such as AI and quantum technology, and promote the formation of a network of researchers centered on Europe and the United States. [MEXT] ・We will promote international exchange projects, including the strategic dispatch and

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
	international brain circulation through the dispatch of Japanese researchers overseas and the invitation of foreign researchers through the Overseas Fellowship Program and the Invitation Program for Foreign Researchers.	acceptance of researchers and youth, while paying attention to the characteristics of research fields, the state of research capabilities in countries around the world, including the rapidly growing Asia-Pacific region, and the needs of partner countries. [MEXT] ・In order to steadily implement international academic exchanges even under conditions such as COVID-19, in which it is difficult to travel between countries, we will promote initiatives including online initiatives. [MEXT]
○Through strategic promotion of international joint research through collaboration with overseas research fund allocation organizations, etc., formation of attractive research centers, international exchange of students and researchers, realization of world-class treatment and research environment, internationalization of universities, research institutes, research fund allocation organizations, etc., the government will build an international research network with Japan positioned at the core, and attract excellent human resources from around the world. (Restated)[Health, STI, MIC, MEXT, MHLW, MAFF, METI]	・Priority support will be given to universities that are engaged in thorough internationalization, including new initiatives to realize and accelerate exchanges and collaboration with world-class universities, structural improvements such as personnel and educational system reforms, and the strengthening of systems to develop students' global capabilities. ・We will support universities that develop and implement educational exchange programs that go beyond regional differences in higher education systems, such as cross-recognition of credits, performance management, and degree awarding. Such programs that assure quality facilitate the overseas dispatch of Japanese students and the acceptance of foreign students in Japan. ・In the World Premier International Research Center Initiative(WPI), the FY2021 budget appropriation includes the budget to form one new base under a new mission. Japan will continue to support efforts to create international fusion research centers that contribute to the international brain circulation by realizing	・In addition to deepening cooperation with overseas research funding agencies and strengthening the perspectives of interdisciplinary fusion (including the humanities and social sciences) and international industry-academia collaboration, we will promote international joint research in light of the changes in the With/Post COVID-19 situation. [MEXT] ・In order to contribute to the promotion of international brain circulation, we will examine a framework for long-term research and personnel exchange between organizations, high-level universities, and research institutes in strategic fields such as AI and quantum technology, and promote the formation of a network of researchers centered on Europe and the United States. [MEXT] ・We will promote international exchange projects, including the strategic dispatch and acceptance of researchers and youth, while paying attention to the characteristics of research fields, the state of research capabilities in countries around the world, including the rapidly growing

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
	world-class treatment and research environments. ・Even under the influence of COVID-19, we are steadily implementing efforts related to international expansion of science, technology, and academia, such as international joint research and exchange of researchers, not only through face-to-face meetings but also through online meetings. ・Under the Strategic International Collaborative Research Program (SICORP), in FY2020, the government will promote international collaborative research with developed and developing countries, including the launch of public applications for research on COVID-19 in non-medical fields. The Science and Technology Research Partnership for Sustainable Development (SATREPS) program promotes international collaborative research in the fields of environment and energy, bio resources, disaster prevention and mitigation, and infectious diseases control through collaboration between ODA and Japan's outstanding science and technology. ・Based on the Future Earth (FE) concept, we promote international collaborative research that will lead to solutions to climate change, disaster risk reduction and other global challenges, asa multilateral joint research utilizing an transdisciplinary approach. ・We are steadily promoting international brain circulation through the dispatch of Japanese researchers overseas and the invitation of foreign researchers to Japan through the Overseas Fellowship Program and the Invitation Program for Foreign Researchers. ・An international conference (RD20) was held with the	Asia-Pacific region, and the needs of partner countries. At the same time, we will consider a review of the structure of existing international exchange projects from the viewpoint of the effective and efficient construction of international academic networks. [MEXT] ・In order to steadily implement international academic exchanges even under conditions such as COVID-19, in which it is difficult to travel between countries, we will promote the use of online initiatives. [MEXT] ・Japan will strengthen its support for international joint research in areas of global interest through grants-in-aid for scientific research. [MEXT] ・We will promote the introduction of funding methods related to international joint research, such as joint public offerings, in publicly offered research projects such as the Strategic Creative Research Promotion Project. [MEXT] ・In the World Premier International Research Center Initiative(WPI), we will systematically and continuously promote the formation of international fusion research hubs including new hubs scheduled to be established in in FY2021 based on new missions established with an eye to the enhancing opportunities for doctoral students and other young researchers to gain international experience and overseas training. At the same time, we will advance the lateral deployment of know-how and promote international brain circulation even in the with/post COVID-19 era. [MEXT] ・In order to promote the

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
	participation of the leaders of the leading research institutions in the clean energy technology field of the G20. Japan's national research and development agencies and other organizations are conducting international joint research and development of innovative clean energy technologies by collaborating with cutting-edge technologies and research resources possessed by research institutes in other countries. ・In addition to launching an international joint research project on the creation of a smart living environment for the elderly using digital technology under the Strategic Information and Communications R&D Promotion Program (SCOPE) in cooperation with Horizon 2020, we are promoting joint research with the EU and the United States such as an international joint research project with the United States related to maintaining and controlling social infrastructure using IoT.	internationalization of universities, the government will provide priority support to universities that are striving to achieve thorough internationalization, and disseminate the results of such efforts within their organizations and to other universities. [MEXT] ・In order to promote the incorporation of international research trends and improve the metabolism of research in Japan, we will promote the internationalization of the management of research funding agencies, such as through the participation of overseas researchers in the review process, while giving due consideration to ensuring research integrity. [STI, MEXT] (Restated) ・In order to enhance opportunities for students to study abroad, we will promote even higher quality student exchanges by utilizing joint degree programs and establishing educational exchange programs with overseas partner universities. [MEXT] ・RD20 will be held continuously. We will also continue to conduct international joint research and development on innovative clean energy technologies. [METI] ・In order to accelerate the practical application of R&D results in international standardization in the ICT field and to contribute to the creation of innovation and strengthening of international competitiveness, we will further promote international joint research with our strategic partners in countries and regions. [MIC]

⑥ Securing research time

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○In order to build a team-type research system in which management personnel from URA, etc., and highly skilled professional personnel such as engineers (including technical personnel who support research in all fields at universities, etc.), etc., are united, efforts will be made by the end of FY2021 to improve the security of professional quality and treatment so that these will become attractive positions. Through this, the mobility and career paths of professional personnel, including doctoral personnel, will be enhanced, and at the same time, they will be fostered and secured. (Restated) [MEXT]	・For engineers (including technical staff who support research in all fields at universities, etc.), efforts to support quality assurance and improved treatment started in FY2021. (Restated) ・With regard to URAs, in FY2021, the government began to provide opportunities for URAs to receive systematic specialized training on the knowledge required of them, and to support the management of accreditation bodies that provide objective quality assurance (accreditation) based on practical capabilities. (Restated)	・A certification system will be established in accordance with the capabilities of URAs to improve quality and visualize capabilities. In addition, by collecting and disseminating good examples of the roles and treatment of URAs and other management personnel, we will promote better understanding of the effectiveness of the strategic allocation of URAs at universities and other institutions and improve treatment. (Restated) [MEXT] ・We will build a nationwide network to improve the skills of engineers (including technical staff who support research in all fields at universities, etc.) and realize diverse career paths. (Restated) [MEXT]
○From FY2021, the government will promote the adoption of smart laboratories at universities, the diffusion of services provided by private businesses that will contribute to securing research time, the lateral development of good practices for improving the efficiency of university management operations, the simplification of administrative processes at national universities, and digitalization. [MEXT]	・We compiled and publicized good practices on improving the efficiency of university operations. ・In FY2020, the government requested national university corporations, etc. to review the principles of written documents, seals, and face-to-face meetings in administrative procedures. ・A budget was implemented for smarter and remote research facilities and equipment. ・By FY2020, nine services provided by private companies that contribute to improving the research environment were certified.	・We will promote the dissemination of services provided by private enterprises that contribute to securing research time through the accreditation system. [MEXT] ・We will facilitate simplification and digitalization of administrative processes, with reference to good examples of improving the efficiency of university operations. [MEXT]
○With regard to competitive research funds, the government will unify, simplify, digitalize and speed up the rules pertaining to various administrative procedures, based on the opinions of the field, and implement them from FY2021. [STI, MEXT, relevant ministries and agencies]	・In March 2021, the ministries and agencies concerned agreed to unify, simplify, digitalize, and accelerate rules concerning various administrative procedures for competitive research funds.	・With regard to competitive research funds, based on the agreement of the relevant ministries and agencies on various administrative procedures, the government will promote efforts to unify, simplify, digitalize, and accelerate rules. [STI, MEXT, relevant ministries and agencies]

⑦ Promotion of humanities and social sciences and creation of the convergence of knowledge

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○The government will strengthen and enhance joint use and joint research systems beyond the boundaries of universities that support academic research in the fields of the humanities and social sciences, and will accumulate multilayered and multifaceted knowledge by promoting research in the humanities and social sciences based on intrinsic motives through scientific research funding, etc. [MEXT]	・In order to promote networking, the statute on the accreditation of joint use/research centers and international joint use/research centers (Ministry of Education, Culture, Sports, Science and Technology Notification No. 133 of July 31, 2015) was partially amended in December 2020. (Restated) ・External verification was conducted on whether education and research activities in inter-university research institutes during the third medium-term target period correspond to trends in academic research and contribute to the development of academic research at universities, and the results were published. (Restated) ・In the FY2021 budget, Grants-in-Aid for Scientific Research (KAKENHI) were expanded. Budgets were allocated for the realization of support for diverse and continuous research activities aimed at the continuous creation of research results and for the enhancement of new and integrated research. (Restated)	・For national universities, it will be considered on the selection of new and continuing research centers during the fourth mid-term objectives period. [MEXT] ・From the perspective of strengthening research systems at each inter-university research institute and contributing to the development of academic research, we will review the organizations and operations, and consider the fourth mid-term objectives and plan , based on the results the assessment. [MEXT] (Restated) ・For Grants-in-Aid for Scientific Research (KAKENHI), we will continue to support academic research in all fields, including the humanities and social sciences. [MEXT]
○With regard to the various issues that will be faced by the future society, by the end of FY2021, the government will establish and promote a research support system in which researchers in the humanities and social sciences take the lead in tackling research issues, and will also consider measures to promote the active participation of young researchers. [MEXT]	・From FY2013, the government will engage in programs that seek challenges that lead to unexpected breakthroughs in new research areas and continually improve methodologies with the participation of researchers from different academic fields; conduct joint research through interdisciplinary collaboration with the participation of people who can bridge research results and practical application, and aim for collaboration between researchers and practitioners from the promotion of research to the transmission of research results; and conduct international joint research with the aim of establishing international networks to engage in dialogue with	・We will promote a program in which humanities and social sciences researchers take the lead in tackling research issues related to the various problems that the future society will likely face. [MEXT]

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
	overseas researchers and disseminate global results, thereby contributing to the creation of knowledge in the humanities and social sciences. ・In FY2021, we began a program in which humanities and social sciences researchers take the lead in tackling research issues related to the various problems that the future society will likely face.	
○With regard to the data platform for promoting the sharing and utilization of research data in the humanities and social sciences in Japan, by FY2022, the government will develop the infrastructure such as a system that can search for research data in the humanities and social sciences in Japan in a unified manner. In addition, the government will determine the direction from FY2023 based on the progress made in these areas, and will further strengthen the data platform in the humanities and social sciences based on this policy. Furthermore, the government will determine the direction by FY2022 in order to strengthen support functions such as the management and utilization of research data through digital conversion of libraries. [MEXT]	・We formulated guidelines for data sharing, utilization, and rights in fields of the humanities and social sciences. ・A comprehensive data catalog equipped with automatic metadata collection and bulk search functions for data at five sites in the humanities and social sciences has been put into trial operation.	・Full-scale operation of the comprehensive data catalog will begin by FY2021. [MEXT] ・In order to promote data-driven research, the government will draw conclusions during 2021 on measures to further strengthen data platforms for the humanities and social sciences, and promote necessary measures. [MEXT]
○In order to promote the creation and utilization of the convergence of knowledge, from FY2021, the government will actively consider setting targets focusing on the utilization of the convergence of knowledge including the fields of humanities and social sciences, and will promote research in publicly offered strategic research projects. In order to actively	・In the open recruitment for new hubs for the FY2021 World Premier International Research Center Initiative (WPI), initiatives to create the convergence of knowledge fusing knowledge in the humanities and social sciences and knowledge in the natural sciences at a high level were included in the open recruitment. ・When formulating strategic objectives for the Strategic	・We will effectively promote efforts to promote science and technology, including those related only to the humanities and social sciences, and the creation of the convergence of knowledge. [MEXT]

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
promote the creation of the convergence of knowledge, the government will also include the creation of the convergence of knowledge through the fusion of high-level fields at the world's most advanced international research centers in its initiative. [STI, MEXT]	Basic Research Programs, the government considered setting targets related to the convergence of knowledge, and decided and announced them as strategic objectives in March 2021. In the future, basic research will be strategically promoted at Japan Science and Technology Agency by selecting research areas and research summaries that are optimal for achieving strategic objectives. ・ In order to create the convergence of knowledge through integration with the humanities and social sciences, the Act on Japan Science and Technology Agency, National Research and Development Agency (JST Act) and the Act on RIKEN, National Research and Development Institute (RIKEN Act) were amended in June 2020 and enforced in April 2021. In line with this, in the FY2021 budget, the government will focus on social issues and strengthen efforts to promote research that aims at the social implementation of science and technology to solve ELSI and increasingly complex social issues through the humanities and social sciences	
○Based on the policy issues of the relevant ministries and agencies, from FY2021, the government will further strengthen efforts by researchers in the field of the humanities and social sciences to cooperate with administrative officials to conduct policy research and analysis. In addition, with a view to the future society, the government will support efforts by researchers in the fields of the humanities and social sciences and various stakeholders in society to jointly create issues that should be addressed through the convergence of knowledge. Through such	・ In FY2021, a program was launched in which researchers in the humanities and social sciences and administrative officials collaborate. ・ In FY2020, with an eye on the future society, we launched a project to create issues that humanities and social science researchers should address with the convergence of knowledge together with various stakeholders in society.	・ We will steadily implement the initiatives described in the left column, and will work in tandem with various stakeholders to link the results obtained to specific research and development and to resolve social issues. [MEXT]

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
efforts, the government will strengthen human networks for solving social problems. [MEXT]		
○By the end of FY2021, the government will draw up basic concepts and strategic measures to promote the convergence of knowledge, which contributes to a comprehensive understanding of human beings and society and to solving problems through the fusion of knowledge in the humanities and social sciences and knowledge in the natural sciences. In addition, by the end of FY2022, the government will examine indicators related to the humanities and social sciences and the convergence of knowledge, and will monitor them from FY2023. [STI, MEXT.]	・We began studying the basic concept of the convergence of knowledge and measures to promote it strategically. ・The NISTEP TEITEN survey 2020 (published in April 2021) investigated the state of cooperation between natural sciences and the humanities/social sciences.	・The government will continue to consider the basic concept of the convergence of knowledge and measures to strategically promote it, and will draw a conclusion by the end of FY2021. [STI] ・n the NISTEP TEITEN survey, in which the questions will be newly designed with reference to the Sixth Basic Plan, questions on the convergence of knowledge will be added and the situation continuously investigated. [STI, MEXT] (Restated)
○Based on the above-mentioned measures concerning the convergence of knowledge, while developing career paths in line with the needs of society, the government will consider measures to promote human resource development in the humanities and social sciences through graduate school education reform, and will determine the direction of such measures by FY2022. [STI, MEXT]	・We will review deliberations on graduate school education reforms, including issues for graduate schools in the humanities and social sciences.	・Based on the above-mentioned measures regarding the convergence of knowledge, the government will consider measures to promote the fostering of human resources in the humanities and social sciences through graduate school education reforms, and will determine the direction of such measures by FY2022. [MEXT]

⑧ Integral reform of the competitive research funding system

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○From FY2021, the government will accelerate efforts to strengthen cooperation among institutions for allocating research funds, such as increasing communication through sharing project	・JST, JSPS and NEDO are coordinating efforts to strengthen cooperation.	・We will strengthen collaboration between research funding agencies by sharing information on researchers selected for projects, promoting personnel exchanges among institutions, and participating in project

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
evaluation results, establishing opportunities for people-to-people exchanges and information sharing, and establishing mechanisms for recommending researchers and research results. [STI, MEXT, METI, relevant ministries and agencies]		evaluations by other institutions [MEXT, METI]
○With regard to competitive research funds, the government will unify, simplify, digitalize and speed up the rules pertaining to various administrative procedures based on the opinions of the field, and implement them from FY2021. (Restated) [STI, MEXT, relevant ministries and agencies]	・In March 2021, the ministries and agencies concerned agreed to unify, simplify, digitalize, and accelerate rules concerning various administrative procedures for competitive research funds.	・With regard to competitive research funds, based on the agreement of the relevant ministries and agencies on various administrative procedures, the government will promote efforts to unify, simplify, digitalize, and accelerate rules. [STI, MEXT, relevant ministries and agencies]
○With regard to the treatment of indirect expenses in competitive research funds, unification of rules including the ratio to direct expenses, etc., and simplification of use reports and documentary evidence shall be examined, and implement them from FY2022. [STI, MEXT, relevant ministries and agencies]	・The ministry and the ministries concerned began studying how to handle indirect expenses in competitive research funds.	With regard to the treatment of indirect expenses in competitive research funds, the government will consider the unification of rules, including the ratio to direct cost expenditures, the reporting of usage, and the simplification of documentary evidence in cooperation with the ministries and agencies concerned, and will formulate an agreement by the end of FY2021. [STI, MEXT, and relevant ministries and agencies]
○From FY2021, the government will accelerate efforts to provide seamless support for research aimed at strengthening basic research capabilities, based on specific implementation plans. With regard to scientific research grants and strategic research promotion projects, the government will enhance support for young researchers, strengthen efforts to ensure that talented mid-and high-ranking researchers can secure research funding in a stable and sufficient manner (such as reviewing allocations and examinations), and promote	・In order to continuously create research results, the government will increase the budget for the optimal allocation of competitive research funds to support diverse and ongoing research activities and for the promotion of new and integrated research. ・In order to ensure that research funds are seamlessly linked to outstanding research results concluding in the creation of innovation, collaboration measures between institutions and corporations are being considered. ・In addition to the analysis of trends in research papers, the Ministry of Education, Culture, Sports, Science and Technology	・The government will continue to steadily promote support for outstanding basic research, enhance support for young researchers, including flexible step-ups for outstanding young researchers, and establish a system to enable outstanding researchers from young to mid-career and senior researchers to step up seamlessly. We will also strengthen support for emerging and integrated fields and international activities in Grants-in-Aid for Scientific Research (KAKENHI) and Strategic Basic Research Program projects. [MEXT]

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
new and integrated research. With regard to projects that link the results of basic research to industry, the government will strengthen systems for evaluating academic values and flexible support systems in accordance with research phases, including support for matching with industry. [MEXT]	conducts interviews with experts to discuss scientific values, economic and social impacts, and other issues from various perspectives, and then formulates strategic targets[148]. ・In formulating strategic objectives for the Strategic Basic Research Programs, with the cooperation of NISTEP, etc., the government will consider continuous support for research results, based on discussions on integrated reform of competitive research funds, such as understanding and analyzing the results generated from Grants-in-Aid for Scientific Research (KAKENHI) and holding interviews with the JSPS Research Center for Science Systems.	
○In addition to visualization and analysis of R&D results using e-CSTI, the government will attempt to set priority areas during FY2021, such as establishing a new policy cycle of identifying and conducting research on the following priority areas for the resolution of social issues. Additionally, in order to make consideration based on changes in global trends in research and development as well, the policy cycle will be established as a mechanism in which regular follow-up is possible. [STI, MEXT, relevant ministries and agencies]	・In addition to visualizing the relationship between research and development investment and the status of the number of papers in each field, we are constructing a Science Map that can analyze the relationship with funding data and a Science Map that can analyze the relationship with patent data after taking in data on Japanese papers. (Restated)	・After initiating an expert judgment starting with an overall overview and two specific fields, we will expand the work to cover multiple fields (about ten fields), extract and analyze important science and technology areas, and reviewing strategies for each field. [STI, relevant ministries and agencies] (Restated) ・In order to ensure the effective and efficient allocation of competitive research funds among various projects and to lead to the review of projects, the Cabinet Office and other organizations will use e-CSTI and other means to analyze competitive research funds and other inputs and outputs for each project. [STI] (Restated)

(2)Construction of a new research system (promotion of open science and data-driven research, etc.)

[Ideal vision and direction toward its realization]

[148] In FY2021, we established eight strategic targets that address the three pillars of realizing a green society, creating a digital society, and creating a new post-coronavirus society.

Through the digitalization of society as a whole and DX of research itself that captures the trends of open science worldwide, Japan aims to create research results with higher added value and demonstrate its presence. In particular, as the open access of papers and use of preprints further expand in the research on COVID-19, it is necessary to share and utilize data generated in the overall research process strategically and appropriately, and to realize a research foundation for generating high-impact research results.

For this reason, with regard to the sharing and utilization of data, the government will first establish an environment for promoting the management and utilization of research data based on open-and-close strategies, while respecting free research and diversity, under a platform that enables high-quality research data to be obtained at research sites and enables the cross-sectoral retrieval of such research data. In particular, a mechanism to ensure the reliability of data is essential. In addition, the government will promote the implementation of leading-edge data-driven and AI-driven research based on these, and promote research on information science and technology that supports these new research methods.

At the same time, we will build and maintain world-class research infrastructure for networks, data infrastructure, and computing resources, and promote the widespread use of these resources regardless of industry or academia. In addition, the government will promote the spread of smart labs, which realize remote research and automated experiments at large research facilities, universities, and common facilities and equipment at national research and development agencies. This is expected to greatly reduce the burden on researchers because they will be able to carry out research beyond time and distance constraints. With regard to these research infrastructures, the utilization of research facilities and equipment open to all researchers, including the development of data utilization mechanisms, will be realized, and an environment will be created in which researchers can freely devote themselves to cutting-edge research.

The appropriate management and utilization of high-quality research data, the active use of data science including AI, and the development of an advanced infrastructure environment will not only improve the efficiency of the research process, but will also revolutionize the process that goes beyond the intellectual activities of researchers themselves, such as the dramatic expansion of the scope of research and the discovery and presentation of new hypotheses, and will replace some activities that previously relied on individual intuition and experience. This will lead to the creation of high-impact research results using data, and will also allow researchers to devote their valuable time to intellectual activities with higher added value, such as planning research visions and setting hypotheses. At the same time, it will contribute to the development of open science from a global perspective.

Furthermore, such changes in research activities and changes in employment practices throughout Japan are changing the way researchers work. In Japan, an environment has been created in which various entities can participate in and play an active role in research activities, such as the participation of citizens in research as citizens cience and the freelancing of researchers, as already seen in other parts of the world. While fostering a sense of trust between researchers and others, the sharing and integration of knowledge will be promoted, and an environment will be created to realize new forms of value creation.

[Target]

・ The management and utilization of research data based on open-and-close strategies, the development of world-class networks and computing resources, and the sharing and smartening of facilities and equipment will enable researchers to effectively access the knowledge and research resources they need. This will accelerate high-value-added research such as data-driven research, and research activities will take place with the participation of diverse entities such as citizens.

[Key targets in science, technology, and innovation policies] (Key indicators)
By 2025, all of universities, inter-university research institutes, and national research and development agencies witch have their institutional repositories will have 100% of their data policies in place. By FY2023, 100% of new applications for open recruitment-type research funds[149] will have introduced a data management plan (DMP) and implemented a mechanism to assign metadata accompanying the DMP.

[Current data] (Reference index)

- Number of institutions among national research and development agencies that have formulated research data policies: 24 institutions (FY2020)
- Number of ministries and agencies/institutions that have introduced data management plans (DMP) for the competitive research funding system: 9 ministries and agencies/institutions (FY2020)
- Number of institutional repositories sites in Japan: 811 (FY2019)
- The percentage of researchers who have published research data: 51.9% (FY2018)
- The percentage of researchers who have published preprints: 20.4% (FY2020)
- Available HPCI resources: 27.6 petaflops per year (FY2020)
- Share of research facilities/equipment that are shared: among the ten equipment with a substantial market size (purchased between FY2012 and FY2016) at universities and public research institutes, 90% of those purchased using competitive research funds were only used by individual researchers or individual research laboratories. (FY2017)

① Development of an environment to promote appropriate management and utilization of reliable research data

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○The government will continue to disseminate and publicize the research data infrastructure system (NII Research Data Cloud), which started the entire operation in FY2020 as the core platform for the management and utilization of research data in Japan, and to make necessary improvements. In addition, in	・The entire operation of the research data infrastructure system started in FY2020. ・As a national-level data policy, the Integrated Innovation Strategy Promotion Council formulated the Basic Concept on the Management and Utilization of Publicly	・We will promote the management and utilization of research data by disseminating and publicizing the research data infrastructure system and carrying out the necessary improvements and development. [STI, MEXT, relevant ministries and agencies]

[149] Under the Cross-ministerial Research and Development Management System (e-Rad) (https://www.e-rad.go.jp/dl_file/particulars_e-rad.pdf), research funds are provided through public invitation.

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
order to make wide-ranging use of research data obtained through public funds by industry, academia, and government, the government will promote the provision of systematic metadata[150] by FY2023, and will establish a system that can search for such metadata on the research data infrastructure system from FY2023. In addition, in order to make use of metadata for EBPM, the government will ensure interoperability with the modification of e-Rad. Measures for securing a sustainable management system for research data infrastructure systems will be examined by FY2022. [STI, MEXT, relevant ministries and agencies]	Funded Research Data and established common metadata items.	・We will study measures to ensure a sustainable operation system for the research data infrastructure system by FY2022. [STI, MEXT relevant ministries and agencies] ・In order to utilize metadata for evidence-based policymaking, the content of data linkage will be examined in accordance with the overhaul of e-Rad. [STI]
○In order to manage and utilize research data obtained with public funds in institutions, research and development institutions such as universities, inter-university research institute corporations, and national research and development agencies will formulate data policies and promote the inclusion of research data in the institution repository. In addition, in order to make research data searchable on the research data infrastructure system, metadata will be added to research data. [STI, MEXT, relevant ministries and agencies]	・We are facilitating the development of a research data policy in national research and development agencies.	・We will promote the formulation of data policies by institutions that conduct research and development such as universities, inter-university research institutes, and national research and development agencies, and the inclusion of research data in institutional repositories. [STI, MEXT, relevant ministries and agencies] ・We will encourage researchers to determine the scope of research data to be managed and used in accordance with the data policy and to assign metadata. [STI, MEXT, relevant ministries and agencies]
○A data management plan (DMP) and a mechanism for providing metadata linked to the DMP will be introduced by FY2023 in order to manage and utilize research data for all new subscriptions of publicly offered research funds. Similarly, in the next SIP, DMP	・In order to promote advanced data management, including the utilization of research data generated through publicly funded research activities, we are promoting advanced data management, including the use of the research data	・We will promote the introduction of a mechanism to formulate DMPs and assign metadata linked to the DMPs to all new applications of open recruitment-type research funds by the end of FY2023, and explanations to realize the implementation of

[150] Systematic metadata refers to date that presents an overview of research data through a unified format and includes information such as the name and explanation of research data, the administrator, storage place, and whether the data is shared or released. Integrated Innovation Strategy 2020 (decided by the Cabinet on July 17, 2020) establishes the data policy at the national level.

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
will be formulated and metadata provided. [STI, MEXT, relevant ministries and agencies]	infrastructure system in the Moonshot Research and Development Program.	the scheme will be provided in the guidelines. [STI, MEXT, relevant ministries and agencies] ・In the next SIP as well, DMPs will be formulated and metadata assigned. [STI] ・Japan Agency for Medical Research and Development (AMED) is studying a mechanism to safely and efficiently utilize quality-controlled data in industry-academia research and development as a platform for the utilization of data obtained from AMED-supported R&D in order to extend healthy life expectancy for citizens and provide world-class medical care, and will aim for the early commencement of its operation. [Healthcare, MEXT, MHLW, METI] ・We will promote implementation of advanced data management in the Moonshot Research and Development Program. [STI]
○By the end of FY2023, the government will establish a system to mutually utilize data between the Research and Data Infrastructure System and the data collaboration infrastructure in each field to be established by the research and development themes (SIP, etc.) implemented by the Cabinet Office. [STI, MEXT]	・The research data infrastructure system and data linkage infrastructure for each field were examined.	・The items and specifications of cooperation between the research data infrastructure system and the data linkage infrastructure in each field will be examined. [STI, MEXT]
○In order to promote the management and utilization of research data by researchers, the direction of initiatives such as participation of data curators, library staff, URA, those who have retired from the front line of research, human resources who have engaged in research-related work at companies, post-docs when contributing to their own research activities, etc., and digital conversion of libraries will be determined by FY2022. [STI, MEXT, relevant ministries and agencies]	・In order to promote the management and utilization of research data, the government will organize a committee to discuss the direction of initiatives for a digital conversion in libraries, etc. within this fiscal year.	・At research and development organizations, cases related to the environment for researchers to implement research data management in accordance with the data policies, support systems, etc. will be gathered, collected, and horizontally deployed. [STI, MEXT, relevant ministries and agencies]

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○The government will respect free and open research activities and promote collaboration on the management and utilization of research data with countries, regions, international organizations, etc. (EU, G7, OECD, etc.) that share values with Japan. The government will aim to build a global platform during the period of this plan by promoting international collaboration between Japan's research data infrastructure systems and comparable initiatives and by enhancing international interoperability on the management and utilization of research data. [STI, MEXT]	・The G7 Open Science WG, co-chaired by Japan and the EU, will share best practices in each country. ・Japan and the EU are considering identifying policies and technological issues of both parties in order to promote cooperation among research data infrastructures.	・At the G7, we will consider pilot projects and other initiatives to promote the management and utilization of research data not only in terms of interoperability of infrastructure systems but also in terms of policies. [STI, MEXT] ・We will conduct a pilot project to verify interoperability between the EOSC in the EU and the NII Research Data Cloud in Japan, and pursue deeper collaboration step by step. [STI, MEXTs]
○From the perspective of further promoting efforts related to the management and utilization of research data, by 2022, the status of these efforts will be introduced into the evaluation system of researchers, programs, institutions, etc. [STI, relevant ministries and agencies]	・In the Moonshot Research and Development Program, we introduced the status of the storage, sharing, and disclosure of research data as a criterion for evaluation.	・In order to introduce the status of efforts related to the management and utilization of research data into the evaluation system of researchers, programs, institutions, etc., cases in the Moonshot Research and Development Program will be collected, and specific evaluation items for SIP and other publicly invited research funds will be examined. [STI, relevant ministries and agencies]

② Infrastructure development to support research DX and acceleration of high-value-added research

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○In FY2022, the government will strengthen the ultra-high speed and large capacity network that connects the entire country (SINET) as an academic information infrastructure for universities and research institutes in Japan. By operating SINET in an integrated manner with the Research and Data Infrastructure System, the	・Regarding SINET, in addition to strengthening the network infrastructure to further improve research environment, the government will promote to expand functions as a comprehensive platform integrated with the research data infrastructure system, while considering not only the management and	・In April 2022, in order to provide the most advanced research and educational environment as the next-generation academic research platform, the ultra high-speed, large-capacity network infrastructure (SINET) and research data infrastructure will be integrated for development and operation,

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
government will provide the most advanced research and educational environment. Also, the government will continue to promote research and development of technologies that support the academic information infrastructure. By FY2021, the government will also consider measures to develop an environment that can be used not only as an academic information infrastructure but also in cooperation with the private sector as a social infrastructure for universities and research institutes. [STI, MEXT]	utilization of research data generated in various phases of research activity but also mesures to develop an environment that can be utilized in collaboration with private sector as a social infrastructure of Japan where knowledge of universities, etc. can be utilized.	and we will continue to promote their advancement and the research and development of necessary technologies. [MEXT] ・The government will promote the dissemination and improvement of the research data infrastructure, and consider ways to utilize the knowledge of universities and other organizations as Japan's social infrastructure. [STI, MEXT]
○With regard to supercomputing resources from 2021, the government will advance full-scale use of the supercomputer Fugaku and will strengthen the supercomputing resources of domestic universities and national research and development agencies as a stable computing base to meet the diverse needs of researchers nationwide. In addition, with regard to next-generation computing resources, the government will examine them through industry, academia, and government cooperation, taking into account the technologies in which Japan possesses strength, and determine the direction of such next-generation computing resources by FY2021. Based on the results of such examination, the government will implement necessary measures. [MEXT, relevant ministries and agencies]	・In March 2021, we began the shared use of the supercomputer Fugaku, ahead of the original target of starting sharing in FY2021. ・In November 2020, discussions began on Japan's next-generation computing infrastructure.	・In addition to steadily operating the supercomputer Fugaku, for which shared use began in March 2021, the government will promote research and development to accelerate the creation of results and improve the usage environment so that the computer can respond flexibly to social and scientific challenges facing Japan. [MEXT, relevant ministries and agencies] ・By the end of FY2021, the government will examine how Japan's next-generation computing resources should be, and promptly implement necessary measures, such as surveys and research based on the future direction of computing resources. [MEXT, relevant ministries and agencies]
○With regard to research facilities and equipment, the national government will formulate guidelines for the common use of research facilities and equipment by FY2021. Research facilities and equipment that are versatile and of a certain size or larger will, in principle, be shared. In addition, from FY2022,	・Deliberations were held at the council to formulate guidelines and guidebooks for the development and sharing of research facilities and equipment at universities, etc. ・A project was launched to establish a one-stop system for responding to user needs and inquiries from all over	・We will promote the activities listed in the Basic Plan. [STI, MEXT, relevant ministries and agencies] ・In order to accelerate the sharing of research facilities and equipment, we will formulate guidelines for the development and sharing of research facilities and equipment, such as the

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
universities and public research institutes will formulate and publicize policies for the internal and external sharing of research facilities and equipment. In addition, when applying for research funds, research institutes will closely examine whether inefficient research facilities and equipment have been installed from the viewpoint of optimal management of the entire organization. Through these efforts, a framework for the introduction, renewal, and utilization of organizational research facilities (core facilities) will be established. With regard to major research facilities and equipment already installed in Japan, cooperation between facilities and equipment will be promoted. A framework for one-stop response to needs and inquiries from various parts of the country will be started during FY2021 and completed by FY2025. In addition, the government will promote the steady development and utilization of next-generation synchrotron radiation facilities, which are currently being constructed through a public-private framework, and will systematically develop shared facilities and equipment such as large-scale research facilities, universities, and national research and development agencies, including remote and smart facilities. [STI, MEXT, relevant ministries and agencies]e	Japan. ・A budget for smart and remote research facilities and equipment was allocated. ・The development of next-generation synchrotron radiation facilities started in FY2019 in accordance with the division of roles between the public-private regional partnership. As of the end of May 2021, the basic building construction progress rate was about 51%. ・SPring-8, SACLA, and J-PARC are widely used by researchers in industry, academia, and government as specific advanced large-scale research facilities. ・In February 2021, The Council for Science, Technology, and Academia formulated the “Future of Quantum Beam Facilities Taking a Panoramic Perspective of Japan (summary)" in February 2021 (sorting out issues surrounding quantum beam facilities taking a panoramic perspective of Japan based on domestic and overseas trends, and recommendations on strengthening cooperation among facilities, DX of facilities, necessity of medium- to long-term development plans, etc.) ・We are promoting remote and smart initiatives at RIBF, a large-scale research facility.	sharing of general purpose research facilities and equipment larger than a certain size in principle. [MEXT] ・We will promote the establishment of a framework for the introduction, renewal, and utilization of organizational research facilities (making them core facilities). [MEXT] ・By the end of FY2021, we will begin to establish a system to respond to inquiries and needs from all over Japan in a one-stop manner. [MEXT] ・Steady progress is being made in the development of next-generation synchrotron radiation facilities, with the aim of starting operations in FY2023, in accordance with the division of roles between the public-private regional partnership. [MEXT] ・We will steadily promote the sharing of quantum beam facilities such as SPring-8, SACLA, and J-PARC, as well as promoting inter-facility cooperation and efforts toward remote and smart facilities. [MEXT]
○In order to advance data-driven research, by FY2023, the government will develop a platform for the creation and sharing of high-quality data in the field of materials, and conduct trial operations. Similarly, in the field of life sciences, the government will promote the strategic and systematic development of	・We initiated the development of infrastructure for the creation, accumulation and utilization of high-quality material data. ・We are promoting efforts for the construction of genome/data infrastructures. ・We are promoting strategic and systematic development	・In a wide range of fields, including materials, life sciences, and the global environment, we will promote research DX by strengthening efforts to strategically collect, share, and utilize research data using advanced shared facilities and large-scale research facilities nationwide, promoting AI and data-driven

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
information infrastructure, including genome data, which is the basis of data-driven research, and biological genetic resources. In addition, the government will also develop an environment for the promotion of data-driven research in the fields of environment, energy, oceans, and disaster prevention. Additionally, the government will advance the development of an environment in which information related to research outcomes such as literature including preprints can be widely used, as well as accelerate research on mathematics and information science and technology, including the basic fields (OS, programming, security, databases, etc.) that support such research. [MEXT, METI]	of biological genetic resources. ・In order to promote data-driven research, we are creating the global environment big data (prediction information, etc.) and promoting the enhancement of the usage environment of the information infrastructure (the DIAS) that can utilize this data. ・In FY2021, we launched an initiative to promote the creation of ultra-energy-saving, high-performance power electronics devices that will support carbon neutrality in 2050. ・We are establishing and strengthening remote shared infrastructure for data and computing resources as DX infrastructure in the oceanic and disaster prevention fields.	research, and accelerating research in mathematical and information science and technology, including the fundamental fields that support them. [MEXT] ・With regard to the Material DX Platform to be developed, we plan to implement AI analysis functions and develop advanced shared facilities and equipment that can obtain high-quality data. We also plan to conduct materials informatics (MI) research and expand it nationwide. [MEXT] ・In order to promote data-driven research, we will continue to promote the strategic and systematic development of biological genetic resources. [MEXT] ・In order to further sophisticate the manufacturing processes, which are the source of Japan's competitive power in the materials industry as well as an important element for economic security, we will promote the development of fundamental technologies of process informatics using AI models and simulations that contribute to the improved performance of functional chemicals and ultra-reliable ceramics. At the same time, we will develop hubs where we can collect manufacturing process data end-to-end in a high-throughput manner, in order to support development at small and medium-sized companies. [METI] ・From the perspective of decarbonization and data-driven research promotion, we will promote research and development by specifying the technological issues that should be focused on among important technology and packaging areas. [MEXT, METI] ・In addition to developing unmanned technologies for

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
		observation in the vast oceans surrounding our country, the project also plans to collect big data's from sea surface, underwater, deep waters, seabed, etc., and to share them and collaborate with data from other fields. Through these efforts, Japan will accelerate efforts to realize DX in the maritime field, including the promotion of data-driven research that will contribute to the response to climate change, the safety and security of citizens, and the development of marine resources. [MEXT] ・To contribute to innovation utilizing mathematical science, we will promote international brain circulation with highly skilled mathematical human resources. [MEXT] ・In order to promote data-driven research, the government will draw conclusions by the end of 2021 on measures to further strengthen data platforms for the humanities and social sciences, and promote necessary measures. (Restated) [MEXT]
○New analytical methods and indicators for changes in research activities through DX will be developed on the basis of the experimental measures implemented in FY2020, and their upgrading and monitoring will be implemented from FY2021. [MEXT]	・A bird's-eye survey on preprint server usage was conducted and published in August 2020[151]. ・We conducted a questionnaire survey on the use of preprints and announced the results in February 2021[152]. ・We conducted surveys on open science, including disclosure and sharing of research data[153]. ・We conducted preprint analysis on COVID-19 twice	・We will continue to conduct surveys on the actual state of open science, including the disclosure and sharing of research data and the use of preprint servers. [MEXT] ・We will continue to collect and analyze data on major preprint servers and study indicators. [MEXT]

[151] National Institute for Science and Technology Policy, Analysis of Preprints on arXiv (Discussion Paper 187, August 2020)

[152] National Institute for Science and Technology Policy, Survey on Utilization and Perception of Preprints (Research Materials 301, February 2021)

[153] National Institute of Science, Technology, and Science Policy, A Survey on Open Research Data and Open Access 2018 (Research Materials 289, May 2020)

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
	in FY2020[154].	

③ Creation of a new research community and environment pioneered by research DX

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○The government will promote research activities such as the creation and fusion of knowledge by co-creating with various entities such as local governments, NPOs and NGOs, small and medium-sized enterprises and start-ups, freelance researchers, and citizen participation. In addition, the government will implement the development of an environment that encourages the participation of various entities as a new science, technology, and innovation policy formulation process as a bottom-up approach by industry, academia, and government, such as the launch of citizen science research projects that expect the participation of many citizens by collecting many samples and conducting scientific experiments that cannot be realized by researchers alone (on a scale of 10,000 people, with the assumption that it will start by FY2022). [STI, MEXT].	・Discussions are underway on how to co-create with diverse entities that contribute to the promotion of research activities such as the creation and fusion of knowledge.	・We will accelerate efforts for co-creation by diverse entities and promote research activities such as the creation and integration of knowledge through opportunities such as Science Agora[155]. [STI, MEXT]

(3)Promoting university reform and enhancing functions for strategic management

[Ideal vision and direction toward its realization]

In order to overcome the high level of uncertainty in society by utilizing a rich knowledge base, we will not aim for the same ideal for all universities in the future. Instead, we will aim for the formation of a diverse group of universities by developing individual strengths and clarifying the missions that are appropriate for each university. This will enable people to choose universities based on the added value they provide, such as the content of education and research and the environment. Universities will

[154] National Institute of Science and Technology Policy, Summary of research status on COVID-19 / SARS-CoV-2 through an international data around journals and preprints (Research Materials 181, May 2020) and National Institute of Science and Technology Policy, A Trial of early detection system for research trends through the preprints data — Research status around COVID-19 / SARS-CoV-2 (Discussion Paper 186, June 2020)

[155] An event sponsored by Japan Science and Technology Agency. An open forum aimed at deepening the relationship between science and society. (About Science Agora (Japan Science & Technology Agency) (https://www.jst.go.jp/sis/scienceagora/about/))

support individual self-realization based on diverse values and enrich people's lives and lifestyles. Universities will also create new social reforms by allowing human resources to flow freely in response to changes in the times and the needs of organizations and individuals. At the same time, in the midst of the diversification of universities, we aim to further promote the growth of research universities that rank among the world's leading research universities and to strengthen their outstanding research capabilities.

For this reason, in order to realize an environment where national universities, in particular, can exercise their individuality and potential more effectively, we will boldly shift from governance centered on the relationship with Japan from which national university budget subsides are allocated, to governance that fulfills accountability and outcome accountability not only to Japan but also to many stakeholders, including students, graduates, researchers, industry, and the region. We will also create an environment in which universities, as national partners, expand their discretion and engage in constant dialogue with society. By doing so, we will aim not only conduct advanced education and research as a foundation for national and regional knowledge, but will also expand its functions, such as providing new value creation services that make the most of its intellectual assets.

In doing so, the mission of research universities, which rank among the world's research universities, and those that become the hubs for regional revitalization[156], inevitably lead to differences in related stakeholders, financial structures, relationships with Japan, and optimal management systems, due to the differences in their missions. In particular, for the former, bold university reforms will be implemented to realize a robust governance system, and a solid financial foundation will be built through such measures as significantly expanding private funds to realize a world-class research environment and salary levels, supporting the establishment of a new University Endowment Fund, and enhancing universities' voluntary funds.

On the other hand, universities that are expected to play a role as hubs for regional revitalization will expand the acceptance of people in the workforce who support local industries, create innovation by utilizing the latest knowledge and technology and matching human resources in different fields, support the improvement of productivity in local industries, secure positions and develop an environment where young researchers can gain experience. Through these efforts, we will aim for the development of ecosystems that will attract investment from regions and companies and lead to the prosperity of regions and universities will be promoted. In addition, we will promote activities in which multiple national, public and private universities and research institutes collaborate.

National research and development agencies will fulfill their responsibilities in accordance with their respective missions and characteristics, secure a variety of financial resources, including private funds and donations, through active coordination and cooperation with external organizations, and steadily maximize of R&D results while strengthening their financial bases.

[Target]

- A diverse and unique group of universities will support individual self-realization, enrich people's

[156] Universities that are leading the way in solving regional problems such as population decline, job creation, and the development of digital human resources.

lives and lifestyles, and a knowledge base, including outstanding research capabilities, will drive new social changes.

[Key targets in science, technology, and innovation policies] (Key indicators)

・Acceptance of joint research from private companies by universities and national research and development agencies: increase by approximately 70% over FY2018 by FY2025 ()

・Increase rate of revenue from donations of national university corporations: annual average increase of 5% from FY2021 to FY2025

[Current data] (Reference index)

- Annual average rate of increase in revenue from donations of national university corporations between FY2007 and FY2018: 1.3%
- Acceptance of joint research from private companies by universities and national research and development agencies: 88.2 billion yen (FY2018)
- Current expenditure growth rates at major universities from FY2005 to FY2019 (excluding hospital expenses): University of Tokyo (1.7%), Kyoto University (2.0%), Osaka University (1.7%), Tohoku University (1.1%); Reference: Stanford University (6.4%)

① Transformation of national university corporations into truly corporate management

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○The government will review the ideal medium-term target in order to shift from a pre-management system based on regulations to a post-implementation check system to a true management system as a strategic organization that continues to grow as a driving force for social change for the fourth medium-term target period. In addition, the government will abolish the annual evaluation of corporations by the national government every fiscal year and review the system to evaluate business performance over a period of six years in principle. At the same time, the government will confirm reports on compliance with the National University	・In reviewing the modality of the mid-term targets, the government will coordinate the modality of the mid-term targets during the Fourth Medium-term Objectives Period with relevant organizations, based on the final report of the Study Group on the Realization of Strategic Management of National University Corporations. ・With regard to the evaluation of national university corporations, the National University Corporation Act was amended in the ordinary session of the Diet in 2021, and the annual evaluation was abolished and a system was introduced to evaluate business performance over six years. ・In February 2021, all national university corporations published reports on compliance with the National University Corporation	・With regard to the National University Corporation Governance Code, we will continue to confirm reports on the status of compliance, while obtaining opinions from the expert committee. We will also review the Governance Code as necessary. [MEXT]

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
Corporation Governance Code[157] published by each national university corporation, ensure transparency in the state of university management and decision-making mechanisms, and fulfill accountability to relevant parties. [MEXT]	Governance Code. In March 2021, the Ministry of Education, Culture, Sports, Science and Technology conducted a review of the published reports based on the opinion of an expert committee, and disseminated the results of the review and a collection of case studies that would serve as a reference in reporting the compliance status for the following fiscal year and beyond.	

② Deregulation to support strategic management

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○From the fourth medium-term target period, the government will eliminate the involvement of the president in the university president selection committee and clarify the check-and-balance function of the university president selection committee. At the same time, the government will implement changes in the student quota of national university corporations, simplification of organizational restructuring procedures, and flexible quota management and tuition fees to secure excellent foreign students. [MEXT]	・In the ordinary session of the Diet in 2021, the National University Corporation Act was amended with the following contents. The president may not be added to the members of the university president selection council. - Auditors are required to report to the university president selection council in addition to the Minister of Education, Culture, Sports, Science and Technology and the president him/herself when they find that the president has committed misconduct or violated laws and regulations. - The university president selection council shall be able to request the university president to report on the status of his/her duties when the council receives the above report from the auditors or when the council finds that the president may fall under the requirements for dismissal. The name of the university president selection council	・In order to secure excellent foreign students at national universities, the quota for graduate schools will be set, and the Ministerial Ordinance will be revised by the end of FY2021 in order to make the tuition fee for foreign students more flexible. [MEXT] ・Reorganization procedures at national universities will be simplified for faculties and departments in the event that the total number of admission capacity does not increase without changing the field of academic degrees. These procedures will be implemented starting with the cases scheduled to open in FY2022. [MEXT]

[157] code that serves as a basic principle for national university corporations to further enhance their functions while controlling their own management, in order to enhance their management transparency, strengthen their educational, research, and social contribution functions, and continue to fulfill their roles in response to changes in society.

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
	shall be the University President Selection and Inspection Council.	
○By FY2025, the government will expand preferential treatment in the tax system for donations to universities and encourage universities to expand their own financial resources. [STI, MEXT]	・Regarding the tax system for donations to national university corporations, the tax system was revised to allow individual donations to educational support projects and research support projects conducted by national university corporations, etc. to be subject to tax credits, and to relax the requirements for approval of tax exemption of deemed capital gains tax for donations in kind to national university corporations, etc.	・The government will promote the application of the system by publicizing the contents of the revisions, and verify the effects of the revisions quantitatively. [STI, MEXT]
○The accounting standards for national university corporations will be revised so that they can be easily understood from the viewpoints of various stakeholders. At the same time, a mechanism will be established to strategically accumulate various financial resources acquired by national university corporations, and the objective reserves will be revised so that they can be carried over to the next medium-term target period. [MEXT]	・An expert panel will discuss revisions to accounting standards, such as a review of the presentation of profit and loss statements and a mechanism to set aside funds for the replacement and renewal of facilities, in order to make them easier to understand from the perspective of various stakeholders.	・Discussions will be held with relevant ministries and agencies based on discussions at by the expert panel on the revision of accounting standards. The review of the purpose reserve will be continued. [MEXT]
○The government will enable stable financial management by further expanding and extending the scope of bond-issuing projects by national universities and the redemption period, diversifying the financial sources for redemption and by promoting discussions on making the use of indirect expenses of public research funds more flexible (such as using them for medium-to long-term funding and facility renewal) for the fourth medium-term target period. [STI, MEXT]	・Discussions were held at the Review Conference for the Realization of Strategic Management of National University Corporations regarding the expansion of the scope of projects for which bonds are issued by national university corporations and the redemption period.	・The government will continue to consider expanding the scope of projects for which national university corporations can issue bonds and the redemption period, based on the final report of the Review Conference for the Realization of Strategic Management of National University Corporations held in December 2020. [MEXT]

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○At the university support forum PEAKS by university officials, industry, and the government, management issues at universities and solutions thereof will be discussed in detail, horizontal development of good practices leading to the creation of innovation, consideration of deregulation, and development of university management will be promoted. The government will also promptly consider proposals for deregulation from the field and implement necessary policies. [STI, MEXT, METI.]	・We are implementing concrete measures for horizontal deployment of good practices leading to the creation of innovation, examination of deregulation, etc., and training of university management. ・Taking into account discussions at the Ministry of Education, Culture, Sports, Science and Technology based on the recommendations of PEAKS, measures are being considered to expand the management discretion of national university corporations toward the Fourth Medium-term Objectives Period for national universities from FY2022, including the review of accounting standards.	・In conjunction with the establishment of University Endowment Fund, the government will focus on the activities of working groups which disseminate recommendations on necessary institutional reforms and overseas training programs, and will further promote the study of deregulation and the development of university management. [STI, MEXT, METI] ・Based on discussions at the Ministry of Education, Culture, Sports, Science and Technology in light of the recommendations of PEAKS, a conclusion will be reached by the end of FY2021 on measures that will enable the expansion of management discretion of national university corporations, such as the review of accounting standards, toward the Fourth Medium-term Objectives Period for national universities from FY2022. [MEXT]

③ Creation of a 10 trillion yen University Endowment Fund

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○In order to overcome the current situation of declining international competitiveness and weakening financial base of Japanese universities, and to further fulfill the role of universities, which should be the core of the innovation ecosystem, such as producing human resources that meet social needs, creating research results at the global level, and creating university-based start-ups that lead social change, bold investments will be made to construct a research infrastructure at the global	・In order to establish the University Endowment Fund with a scale of 10 trillion yen, the Act on Japan Science and Technology Agency, National Research and Development Agency was revised in the 204 ordinary session of the Diet, and as a part of resources of this fund, government secured 500 billion yen as for investment (the third supplementary budget of FY2020) and 4 trillion yen for loan (the initial plan amount of fiscal investment and loan program of FY2021) to apan Science & Technology Agency (JST).	・With a view to establishing a University Endowment Fund, the government will summarize an interim report by around the summer of 2021 on the requirements and necessary reforms required for research universities that are on a par with the world. The government will also compile a conclusion on a new legal framework by the end of 2021 and submit it to the next ordinary Diet session. In addition, the Basic Approach to Investment Policy of University

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
level using unprecedented methods. Specifically, the government will construct the innovation ecosystem of Japan by providing long-term and stable support for the development of shared facilities and data collaboration infrastructure for universities that conduct research and development at a level comparable to that of the world, and the development of young human resources, by realizing a fund of approximately 10 trillion yen at an early date and utilizing its investment profits.[158] In participating in this fund, the government will seek commitment to university reforms, such as autonomous management and responsible governance, and contribution to the fund. It will also review related existing projects. In addition, the government will introduce mechanisms such as increasing the acquisition of external funds and reserving a portion of the funds to the fund from the viewpoint of the participating universities aiming at managing the fund with their own funds in the future.. [STI, METI]		Endowment Fund toward Building World-class Research Universities will be formulated around the summer of 2021, and the management will begin by the end of FY2021. Also, based on the system design of university reforms, etc., an expansion of the University Endowment Fund to the will be expanded to the scale of 10 trillion yen by the end of FY2021. [STI, MEXT]

④ Diversification of public funds and governance to support university foundations

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○With regard to the allocation of national university corporation operating expense subsidies in FY2021, the scale of the allocation based on the	・For allocations of national university budget subsidies based on performance indicators such as research and education, the target amount for allocations and the range of	・We will reach a conclusion by the end of FY2021 on the allocation mechanism for the new mechanism for national university corporation national university budget

[158] The funds for major universities in the world include Harvard University (about 4.,5 trillion yen), Yale University (about 3.3 trillion yen), Stanford University (about 3.1 trillion yen) and other universities in the United States (about 65 trillion yen), Cambridge University (about 1.0 trillion yen), Oxford University (about 820 billion yen) and others.

* 2019 figures for each university and 2017 figures for the total for U.S. universities (latest values for each)

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
performance indicators for research and education will be increased to make the allocation more varied. In addition, new allocation rules for national university corporation operating expense subsidies will be introduced and evaluated every fiscal year to make the allocation more varied for the fourth medium-term target period. For example, the common performance indicators will be carefully revised to be more objective and quantitative by utilizing e-CSTI, etc., while taking into account the missions of each university such as world-class research universities and universities that will be hubs for regional revitalization. [MEXT]	fluctuations were increased in the FY2021 budget.	subsidies toward the Fourth Medium-term Objectives Period. [MEXT]
○With regard to national universities, new legal frameworks for realizing world-class research universities will be examined by the end of FY2021, and a conclusion will be reached. These include a system to check the selection method and execution of university presidents to realize strategic management, a salary and evaluation system to invite world-class researchers through a non-national government employee-type salary system, autonomous management and decision-making of student quotas and tuition fees, a new financial and accounting system to promote strategic management, and a unique government management and evaluation system. [STI, MEXT]	・Based on the final report of the Review Conference for the Realization of Strategic Management of National University Corporations released in December 2020, the National University Corporation Act was amended during the ordinary session of the Diet in 2021 to improve the governance of national university corporations and expand the scope of investments.	・In light of trends in the establishment of University Endowment Fund, the government will consider a new legal framework suitable for a "business entity that shoulders the public" and will draw a conclusion by the end of FY2021. [STI, MEXT]
○In order to introduce a salary system that is not based on public service standards or seniority-based systems, such as the assignment of professionals who are required to support the	・Based on the Method of Publication of Remuneration, etc. of Officers and Remuneration Levels of Employees of National University Corporations, etc. (Guidelines) every fiscal year,	・Consideration will be given to how to describe the results of verification of the validity of salary levels for administrative and technical employees at national

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
strategic management of national university corporations according to their advanced specialized skills and abilities, the government will consider how to verify the salary levels of national university corporation employees. In addition, national university corporations will actively promote equal personnel exchanges not only with other universities companies, as well as other universities, and digitalization of university management in order to promote the career development and enhancement of expertise of employees who support such management. [STI, MEXT]	the validity of salary levels for administrative and technical staff at national university corporations is verified and announced.	university corporations. [STI, MEXT]
○With regard to the facilities of national university corporations, etc. (meaning national university corporations, inter-university research institute corporations, and national institutes of technology; the same shall apply hereinafter), the government will aim to realize the Innovation Commons[159], a base where all players can co-create in all fields and in all scenes by organically cooperating with the entire campus. The government will formulate a facility development plan for the entire national university corporations, etc., incorporating such viewpoints, and provide continuous support. In addition, planned and focused facility development will be	・Discussions were held at the Conference of Research Partners on Future Improvement of Facilities for National University Corporations established in June 2019, and the final report was published in December. ・Based on the final report of the Conference of Research and Development Collaborators on Future Improvement of Facilities of National University Corporations, etc., the Fifth Five-Year Plan for the Improvement of Facilities of National University Corporations, etc. (decided by the Minister of Education, Culture, Sports, Science and Technology on March 31, 2021) was formulated, which covers the period from FY2021 to FY2025.	・Assistance will be provided for the development of facilities for the realization of an Innovation Commons implemented by national university corporations through the use of facilities improvement grants and various financial resources. [MEXT]

[159] Innovation Commons is a campus where students, researchers, industry, local governments, and various other players can freely gather, interact, and create new value through face-to-face and online exchanges in various fields and situations such as education, research, industry-academia collaboration and regional collaboration.

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
promoted through strategic facility development and facility management carried out by national university corporations, etc. [MEXT]		
○With regard to private universities, the government will make a more balanced allocation of private school subsidies, etc. so that they can engage in high-quality education and research utilizing the spirit of establishment and the characteristics of private schools. [MEXT]	・With regard to current expenditure subsidies for private universities, etc., the improvement of the quality of education will be promoted through the well-balanced allocation of funds through the full-scale introduction of objective indicators related to the quality of education, including outcome indicators. In addition, against the backdrop of a declining population, declining birthrate and aging population, as well as socioeconomic globalization, Japan will provide intensive support to universities, etc. that are engaged in reforms that make use of their own characteristics, taking into account issues that Japan is tackling, such as the realization of Society 5.0 and the promotion of regional revitalization.	・The government will continue to allocate funds in financial aid to private educational institutions and other areas in a balanced manner. [MEXT]
○In order to increase the value of universities as investment targets and to effectively allocate resources within universities, the government will promote the introduction of an university institutional research (IR) system, which visualizes research seeds, human resources, and other resources possessed by universities, through activities such as the university support forum PEAKS, and will promote the matching with corporate needs and the construction of a strategic university management base. [STI, MEXT]	・We will promote the introduction of university IR systems at universities to build a foundation for university management through activities such as the Leaders´ Forum on Promoting the Evolution of Academia for Knowledge Society PEAKS. ・Regarding matching with corporate needs, the implementation of functions to realize such needs and their introduction to universities and companies are future issues.	・We will further promote the spread of university IR systems through lateral deployment of good practices in PEAKS, etc., such as the use of such systems to build university management foundations. [STI, MEXT] ・With regard to functions for matching corporate needs, issues and solutions up to the implementation stage will be arranged based on the accumulation of trial examples. [STI, MEXT]
○In order to strengthen research capabilities at universities, from FY2021, MEXT will review and	・We will review and strengthen the Ministry of Education, Culture, Sports, Science and Technology's organizations and	・In order to enable each university to demonstrate their strengths and characteristics in accordance with the

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
strengthen its organization and systems, and will strategically and comprehensively promote measures for research personnel, funds, environment, etc. at national, public, and private universities throughout the period of the Sixth Basic Plan. [MEXT]	systems.	accumulation of knowledge and the actual conditions of the region towards strengthening university research capabilities, the government will promote efforts to make national, public, and private universities, etc. the core of an innovation ecosystem by promoting activities at world-class research hubs, establishing a platform for co-creation through industry-university cooperation, and steadily developing research foundations. [MEXT] ・For the review and strengthening of organizations and systems of the Ministry of Education, Culture, Sports, Science and Technology from 2021, we will strategically and comprehensively study measures for research personnel, funds, environment, etc. such as establishing the Office for Strengthening University Research Capabilities (tentative name) within the Ministry of Education, Culture, Sports, Science and Technology anew. [MEXT] ・・In order to contribute to the revitalization of regions and the enhancement of research capabilities of Japan as a whole, a package for the promotion of regional universities will be formulated with the aim of strengthening universities, and regional universities were established as bases for co-creation. At the same time, research and development that leads to fostering human resources that are sought by the region and the resolution of issues faced by the region, and various research activities that make use of their strengths, will be promoted. [MEXT]

⑤ Strengthening the functions and financial bases of national research and development agencies

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○The government shall endeavor to improve investment items, taking into account the opinions of each corporation, so that national research and development agencies can fulfill their responsibilities and operate and manage operations effectively and efficiently in order to maximize research and development results. It shall also promote necessary measures to enable national research and development agencies to strengthen their financial base, such as promoting joint research with private companies. In addition, specific national research and development agencies shall create the world's highest level of research and development results and serve as the core organizations that strongly drive innovation systems. [STI, relevant ministries and agencies]	・At the ordinary session of the Diet in 2020, the Act on the Vitalization of the Creation of Science, Technology, and Innovation was amended to expand the number of research and development agencies that can invest in businesses that utilize the results of research and development, and to allow joint research to be conducted by businesses to which the research and development corporations invest. ・In FY2020, the Ministry of Education, Culture, Sports, Science and Technology held seminars for self-financing for national research and development agencies.	・We will disseminate good practices on the simplification of national research and development agencies' acceptance of donations and promote strengthening of their financial base. [STI, relevant ministries and agencies] ・A symposium will be held to promote open innovation at national research and development agencies. [STI]

3. Education and human resources fostering to realize the well-being of individuals and the challenges they face

[Ideal vision and direction toward its realization]

We aim to develop human resources who will pursue diverse happiness and confront challenges by honing and enhancing the abilities and qualities that can be acquired through investigative activities, which are important in the Society 5.0 era and which identify issues and seek solutions.

For this reason, children and students will be able to draw out their own "Why?" "Why?" from the elementary and secondary education stages, and realize learning based on curiosity. This is the process of scientific research that has supported the prosperity of humankind, and these efforts are the learning itself to develop the ability to inquire to confront problems through trial and error.

In this process, we will promote cooperation between school education and society by utilizing local human resources. For example, we will encourages the participation of frontline researchers and entrepreneurs in educational settings, and increases students' curiosity by providing them with more opportunities to experience "first class" and "genuine" articles. Cooperation between science, technology, and innovation policies and education policies can further enhance their effectiveness, and strategic cooperation will be promoted. At the same time, through the use of DX and digital tools in the field of education, we will provide each student with individually optimized and collaborative educational opportunities and reduce the excessive burden of teachers in the field of education. In doing so, idealism and ideology should not be simply imposed on the education field, but rather the entire society, including industry and families, should support learning by reviewing the contents of work and cooperating with local communities.

Furthermore, at the higher education stage, along with the development of university groups as diverse and unique knowledge bases, through the advancement of education in national institutes of technology, we will provide learning that meets the diverse needs of individuals and enrich people's lives and living. In particular, from the perspective of creating innovation, in an age in which it is impossible to predict the future, it will become more important to have skills to understand things from multiple perspectives and solve problems, beyond what is called the humanities and science, and learning that actively incorporates curricula and educational methods that enables students to acquire such skills will be further activated.

In addition, by expanding opportunities for people in the workforce to learn again and supporting individuals in their dual jobs, side jobs, and changing jobs, etc., the mobility of people with motivation and abilities will be increased, and the circulation of knowledge as a society as a whole will be promoted, leading to the creation of new value. To realize an environment in which an individual who so desires can receive a variety and high-quality recurrent education in a double-track career path so that individual abilities can be fully demonstrated even after he or she enters the workforce.

[Target]

- With the participation of various social actors, the ability to inquire is strengthened through learning based on curiosity.
- Individuals will discover what they want to do, and continually improve their abilities and qualities

toward that goal.

[Key targets in science, technology, and innovation policies] (Key indicators)

- By FY2025, the government will aim to increase the percentage of children and students who find arithmetic, mathematics, and science at the elementary and junior high school level to be fun, with a view to achieving an international level of excellence[160].
- By FY2022, the number of adults in the workforce in recurrent education at universities, technical colleges, etc. shall be 1 million.

[Current data] (Reference index)

- The percentage of children and students who find math, math and science fun: 77% in arithmetic (elementary school), 56% in mathematics (junior high school), 92% in science (elementary school) and 70% in science (junior high school) (all figures from 2019) [161]
- Percentage of young people who want to contribute to society: 70.8% (FY2019) [162]
- Percentage of teachers with over 80 hours of overtime: 13.2% in elementary school, 27.5% in junior high school, and 19.9% in high school (all figures from June 2019). [163]
- ICT environment improvement in schools: 60.0% of regular classrooms equipped with large bulletin boards, 64.8% with integrated school administration support systems, and 7.9% with digital textbooks for students (all figures from March 2020) [164]
- Percentage of employees taking leave for educational training: 8.5% (FY2019) [165]
- Number of career consultants: 59,557 (as of March 2021) [166]

① Enhancing the development of the ability to inquire by promoting STEAM education

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○In order to promote STEAM education, in accordance with the new high school educational guidelines, which will be fully	・The new curriculum guidelines for high schools, which will be implemented annually	・We will continue to disseminate the new curriculum guidelines for high schools. [MEXT]

[160] According to the Ministry of Education, Culture, Sports, Science and Technology's Trends in International Mathematics and Science Study (TIMSS 2019), the international average percentage of children and students who find arithmetic, mathematics, and science "fun" is 84% for elementary school arithmetic, 70% for junior high school mathematics, 86% for elementary school science, and 81% for junior high school science.

[161] Ministry of Education, Culture, Sports, Science and Technology, Trends in International Mathematics and Science Study (TIMSS 2019)"

[162] Cabinet Office, Survey on Awareness of Children and Young People (FY2019)"

[163] Ministry of Education, Culture, Sports, Science and Technology, Survey on the State of Efforts by the Board of Education to Reform Workstyles 2019

[164] Ministry of Education, Culture, Sports, Science and Technology, FY2019 Survey on the State of Informatization in School Education

[165] Ministry of Health, Labour and Welfare, Basic Survey of Capacity Development FY2019

[166] Ministry of Health, Labour and Welfare, Number of Registered Career Consultants by Prefecture as of March 31, 2021

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
implemented annually from FY2022, efforts will be made to enhance learning activities to discover problems and solve problems in "science and mathematics exploration" and "time for comprehensive research." In addition, outstanding R&D will be promoted at Super Science High Schools (SSH) to lead the reform of science and technology human resource development systems. With a view to disseminating and developing the results of SSH R&D to date, efforts will be made to enhance and strengthen efforts that contribute to the development of abilities through STEAM education by establishing a new system to certify high schools, etc. with a certain level of achievements by around FY2022, and by disseminating the system. [MEXT]	from FY2022, are being disseminated nationwide. ・In the SSH designated schools (2021: 218 schools), advanced science and mathematics education is being tackled, and outstanding research and development are being promoted so as to lead the science and technology human resources development system reform.	・We will active promote SSH business and outstanding R&D that leads science and technology human resources development system reform among designated schools. [MEXT] ・We will design in detail a system to certify high schools with certain achievements in the SSH project. [MEXT] ・In order to enhance systematic learning in math and science education at the compulsory education stage, the government will promote a subject-based teacher assignment system in the upper grades of elementary school, including the examination of the teacher's license system. [MEXT]
○The government will accelerate the development of the STEAM library , which can be widely used in elementary and secondary education in Japan. At the same time, the government will present model plans for educational content that can be used in elementary and secondary education and disseminate it throughout the country. In addition, in order to promote STEAM education not only in elementary and secondary education institutions but also in society as a whole, in FY2021, the government will promote the horizontal development and coordination of human resources, knowledge, and content distributed throughout the country in cooperation with platforms established by COCN . In addition, in order to create educational content for elementary and secondary education based on state-of-the-art research content, the government will consider measures to incorporate research content into teaching materials that stimulate the intellectual curiosity of children and students and are appropriate as subjects, by FY2021, and draw conclusions. [STI, MEXT, METI]	・ The development of STEAM libraries is progressing steadily. ・We are organizing and reviewing available educational content to enhance STEAM education.	・In order to enhance STEAM education, we will consider specific cooperation measures for the learning ecosystem supported by society as a whole. [STI, MEXT, METI] ・In promoting STEAM education, in cooperation with COCN and the industry, we will expand and refine the constructed libraries and contents, and promote the creation and dissemination of examples of utilization of the contents by schools and teachers, aiming for networking for teachers. [STI, MEXT, METI] ・In order to promote outreach activities targeting students in research conducted with public funds, by the end of FY2021, the government will consider specific measures and draw a conclusion. [STI, MEXT, METI]
○In order to greatly enhance the abilities	・In the Global Science	・In order to develop the

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
of pupils and students with outstanding intentions and abilities and to develop the "stakes" that will emerge, the government will enhance opportunities for learning outside of schools, such as joint training camps and research presentations held by universities, private organizations, etc., and opportunities for students in Japan and overseas to develop their abilities through friendly competition, such as support for international science contests. [MEXT]	Campus (GSC) (for high school students) and the junior doctor training school (for elementary and junior high school students), we will continue to support universities and other institutions that discover a wide range of students with outstanding ambitions and abilities in the community and conduct advanced practical lectures and research for selected students throughout the year. In FY2021, 14 GSCs and 30 junior doctor training schools were established nationwide.	abilities of those with outstanding motivation and ability, in FY2021, the government will consider and draw a conclusion on effective cooperation measures for measures that are necessary from the elementary and secondary education stage and measures implemented by universities and private companies. [STI, MEXT] ・By the end of FY2021, a panel of experts will be established under the CSTI with the participation of members of the Central Council for Education, and studies will be carried out to create an educational environment for children with special talents to develop their abilities. [STI, MEXT]
○From the perspective of education open to society, with a view to accelerating efforts toward the realization of Society 5.0, while also taking into account the latest technology trends, the government will establish a forum in CSTI to study the development of students' abilities to explore through STEAM education and the promotion of understanding of the importance of STEAM education among society as a whole. From FY2021, the government will conduct surveys and studies with the participation of members of the Central Council for Education, and will provide feedback on the results of the study on policies for science, technology, innovation, and education. [STI, MEXT]	・The government will continue to coordinate with relevant ministries and agencies to set up a forum for discussions.	・In FY2021, a panel of experts will be established under the CSTI with the participation of members of the Central Council for Education. Members of the Industrial Structure Council shall participate in the panel as appropriate in order to promote cooperation with the business community. [STI, MEXT, METI]

② Participation and utilization of external personnel and resources in learning

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○In cooperation with local universities and technology-related venture companies, examples of educational	・Under the Project for Promotion of Higher School Education	・We will compile examples of education and regional revitalization ecosystems

and human resource development ecosystems that contribute to regional revitalization, such as creating opportunities for high school students to actually experience research activities, will be compiled by the end of 2021, and efforts will be promoted by spreading them nationwide.. [MEXT]	Reform in Cooperation with Local Communities launched in FY2019, we are creating precedent cases regarding educational activities in cooperation and collaboration with regional universities and local municipalities.	contributing to fostering human resources by the end of 2021. [MEXT]
○In order to realize diverse school education that is open to society, the government will further promote the use of the special part-time teacher system and special license certificates by, for example, promoting the dissemination to local governments in FY2021 of the Guidelines for the Examination of Educational Personnel pertaining to the granting of special license certificates, which will be revised by the end of FY2020, so that persons with a doctorate degree or persons with experience in private enterprises with excellent knowledge and experience can be invited. [MEXT]	・Based on the Plan for the Recruitment and Quality Improvement of Teachers Responsible for a Reiwa-style Japanese School Education[167] compiled in January 2021, the guidelines on the examination for educational staff concerning the granting of special licenses were revised.	・We will further promote the use of the special part-time lecturer system and special licenses by disseminating information to local governments, etc. [MEXT]
○In FY2021, the government will investigate good practices that appropriately utilize evaluations of abilities and qualities acquired through exploratory activities when selecting university students or taking employment examinations at companies, and will actively promote lateral development. From FY2022, the government will also tabulate and publicize the number (or percentage) of universities and companies that have implemented such measures. [STI, MEXT, METI]	・In order to conduct interviews and surveys on good practices with universities, companies, etc., the content of the survey was carefully examined.	・By the end of FY2021, the government will hold interviews and conduct surveys with universities and companies concerning good practices, and will consider measures for the horizontal development of good practices. [STI, MEXT, METI]

③ Promotion of DX in the education field

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○In line with the realization of one terminal per person based on the GIGA School Program, the allocation of ICT human resources in the educational field will be promoted.	・Terminal installation is expected to be completed by the end of FY2020 in 1,748 municipalities	・To steadily implement the GIGA School Plan, in FY2021, the government will promote the placement of ICT human resources at

[167] Decision made by the Headquarters for the Study of the Recruitment and Quality Improvement of Teachers Responsible for a Reiwa-style Japanese School Education on February 2, 2021

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
[MEXT]	(96.5%). ・In addition to promoting the placement of ICT supporters who provide support for the daily use of ICT by teachers at each school, and GIGA school supporters who provide initial support, including the development of a per-person terminal environment, support is being provided by dispatching ICT utilization education advisors who provide specialized advice and training support for ICT utilization to each Board of Education, etc.	educational workplaces through the GIGA school supporter and ICT utilization education advisor projects. [MEXT] ・We will further promote the deployment of ICT assistants by publicizing good practices nationwide. [MEXT]
○By the end of FY2021, the government will publish the Educational Data Standard (2nd edition) so that individual children and students can reflect on their own learning by using educational data generated through daily learning, teachers can provide individually optimum learning guidance and student guidance, and new knowledge such as teaching methods and learning methods can be created and reflected in the planning and formulation of policies by national and local governments. [MEXT]	・Study is underway to publish the Educational Data Standards (2nd edition).	・By the end of FY2021, the Educational Data Standards (2nd edition) will be compiled and published with statistical data, school health examination information, and other data that have been universally utilized at schools based on the existing system. [MEXT]
○By FY2022, the government will complete the introduction of an integrated school administration support system that can reduce the workload of teachers. [MEXT]	・Currently, 64.8% of all public schools in Japan have integrated support systems (as of March 2020). ・We will promote the introduction of joint procurement in local governments by conducting a pilot project on joint procurement at the prefectural level and preparing and disseminating a guidebook on joint	・By FY2022, the introduction of an integrated school affairs support system, which can reduce teachers' workload, will be completed. [MEXT]

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
	procurement.	

④ **Promotion of mobility of human resources and enhancement of learning for career changes and career advancement**

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○By FY2023, the government will establish nationwide systems of cooperation and collaboration with local industries, domestic and overseas universities, and international organizations so that high school students can take active action toward their future by expanding opportunities to realize learning in cooperation and collaboration with industry, universities, and international organizations in order to resolve regional and global social issues. [MEXT]	・In the Ministry of Education, Culture, Sports, Science and Technology's Project to Promote Higher School Education Reform through Collaboration with Local Communities, WWL Consortium Construction Support Project, and Master High School Project, we are creating precedent cases for educational activities in cooperation with related organizations.	・By FY2023, we will develop a nationwide system for cooperation and collaboration with local industries, universities and international organizations in Japan and overseas. [MEXT] ・In addition to promoting networking among teachers who are driving unique initiatives such as entrepreneurial education, a mechanism to promote horizontal development of these initiatives will be considered. [MEXT]
○In FY2021, the government will start coordinating the functions of the vocational information service site (Japanese Version of O-NET), which started its operation in FY2019, and the site introducing programs for adults at universities (Manapass). In addition, the government will strengthen the functions of these two sites by FY2022. The government will also improve and further disseminate the expertise of career consultants. Through these efforts, the government will develop an environment in which individuals can easily take steps toward career advancement and career change. [MEXT, MHLW]	・In February 2021, a link was added to each job description page of the Japanese version O-NET to a site where you can search for training courses and lectures such as for job skills and knowledge required for a desired job. ・The number of registered career consultants was 59,557 as of March 2021. ・Efforts are underway to improve the expertise of career consultants by enhancing online training for career consultants.	・By the end of FY2021, work will begin on functional collaboration between the Japanese version of O-NET and Manapass, a website that introduces programs for working adults at universities. [MEXT, MHLW] ・We will continue to improve the expertise of career consultants by enhancing online training. [MHLW]
○The relevant ministries and agencies will cooperate to promote the utilization and expand the spread of the professional engineer system in the industrial arena, etc., as well as	・In order to secure international acceptance of professional engineer and to utilize its	・In order to secure international acceptance of professional engineers and to utilize their qualifications, the government will consider the

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
make the necessary revisions to the system in order to secure international applicability, promote the entry of young human resources, and improve the quality and ability of professional engineers. engineers. [MEXT, relevant ministries and agencies]	qualifications, and so that more young engineers and training engineers can refer to professional engineer, concrete efforts are being considered for the construction and improvement of a consistent system throughout life.	establishment and improvement of a system that is consistent and coherent throughout life, and will draw a certain conclusion by the end of FY2021. [MEXT]
○The government will create opportunities for the development and active participation of innovative human resources in order to increase the depth of a diverse range of innovative human resources, including management human resources involved in the creation of innovation, and to improve the quality of human resources by increasing their mobility. To this end, the government will, by FY2023, engage in conducting a fact-finding survey on the development of an environment for developing innovative human resources and disseminate best practices, taking into account the accumulation of discussions on human resource development. (Restated) [METI]	・From July 2020 to March 2021, the Industry-Academia Innovation HR Circulation Training Study Group was established to carry out discussions on the improvement of the Innovation human resources development environment.	・We will conduct a fact-finding survey on the development of an environment for fostering innovation human resources and disseminate best practices (Restated) [METI]
○In order to improve the mobility of research personnel between universities and corporations, the Guidelines for Guideline for Enhancing Industry-Academia-Government Collaboration Activities shall be disseminated to promote the utilization of cross-appointment systems and concurrent employment at each institution, the implementation of risk management for conflicts of interest, etc., and the relaxation of organizational rules, etc. [MEXT, METI]	・In June 2020, the Ministry of Economy, Trade and Industry and the Ministry of Education, Culture, Sports, Science and Technology jointly produced the Guidelines for the Enhancement of Join Research through Industry-academia-government Collaboration [Supplementary Edition]. It was distributed to the business community and universities, and symposiums and seminars were held from January to February 2021 to disseminate	・In order to deepen the understanding of universities and companies, the government will continue to disseminate the industry-academia-government collaboration guidelines to promote the utilization of the cross-appointment system and dual jobs, implementation risk management for conflicts of interest, and relaxation of organizational rules. [MEXT, METI]

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
	information to relevant parties.	

⑤ Fostering an environment and culture in which society and companies promote continuous learning

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○By FY2023, the government will develop indicators for evaluating the effects of recurrent education on society, in addition to the number of employees who have participated in such education. [STI, MEXT, MHLW, METI]	・Consideration is underway to develop indicators.	・We will develop new indicators in cooperation with relevant ministries and agencies. [STI, MEXT, MHLW, METI]
○From the perspective of creating an environment in which individuals can make the most of their abilities by relearning even after they have reached a certain age, from FY2021, the relevant ministries and agencies will jointly study concrete measures to promote the utilization of the educational training leave system and the introduction of recurrent education for employees in companies, in order to contribute to the continuation of individual learning supported by work style reform, while taking into account the movement of employment to the job type, and summarize the results. [STI, MEXT, MHLW, METI]	・We will continue to consider measures to promote the use of the educational training leave system and to promote the introduction of recurrent education for employees at companies.	・The relevant ministries and agencies will set up a forum for discussions on measures to promote the use of the education and training leave system and promote the introduction of recurrent education for employees at companies. [STI, MEXT, MHWL, METI]
○Companies that provide sabbatical leave and economic support to employees for relearning will be evaluated as leading companies in human resource development, and measures will be introduced to improve their corporate image. [METI]	・From July 2020 to March 2021, the Industry-Academia Innovation HR Circulation Training Study Group was established to carry out discussions on re-learning (reskilling/recurrent).	・By the end of FY2021, we will evaluate companies that provide sabbatical leave and economic support as leading companies in fostering human resources. We will conduct surveys and research to introduce measures to improve the corporate image. [METI]
○The government will make efforts to accelerate joint research and joint education between companies and universities that will contribute to both the expansion of career paths for doctoral researchers to the industrial sector and relearning for corporate human resources. [METI]	・From July 2020 to March 2021, the Industry-Academia Innovation HR Circulation Training Study Group was established to carry out discussions the	・By the end of FY2021, the government will conduct surveys and research aimed at promoting the active participation of PhD holders in industry and re-learning (reskilling/recurrent). [METI]

	promotion of the active participation of PhD holders in industry and re-learning (reskilling/recurrent).	

⑥ Provision of diverse curricula and programs at universities and national institutes of technology

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○The government will develop a group of universities that support individual self-actualization based on various values. Specifically, in higher education, students, who are the most important stakeholders as recipients of higher education and are members of universities, are regarded as those who share long-term interests in the development of universities. In addition to requiring the publication of information to national universities about the educational outcomes that students were able to enjoy under the Governance Code, each university will conduct surveys, analyses, and verifications, including long-term perspectives such as student satisfaction and how students' abilities are evaluated by society after graduation. The results of these surveys, analyses, and verifications will not only be linked to education courses and the selection of new students, but also to enhance information disclosure in a comparable manner so that students can make appropriate choices for universities, thereby explaining education to students and the people who can become students and fulfilling their responsibilities as a result. [STI, MEXT]	・The National University Corporation Governance Code formulated in March 2020 requires each national university corporation to disclose information that indicates the educational outcomes that students have enjoyed. ・In February 2021, all national university corporations published reports on compliance with the Code. In March 2021, the Ministry of Education, Culture, Sports, Science and Technology conducted a review of the published reports based on the opinion of an expert committee, and disseminated to each national university corporation the results of the review and a collection of case studies that would serve as a reference in reporting the compliance status for the following fiscal year and beyond. ・In the collection of case studies, as information showing educational outcomes, examples showing only the policies established by each university, such as	・Based on the opinions of the expert committee, the government will continue to confirm reports on the status of compliance with the Code and promote the disclosure of information on the educational outcomes that students enjoy. [MEXT]

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
	their diploma policies, are cited as problematic cases, and it was made known that objective grounds for educational outcomes should be presented, and appropriate information from each national university corporation is promoted to be published.	
○The government will encourage the active utilization of a degree program system that allows students to establish curricula beyond the boundaries of faculties and graduate system that allows students to acquire degrees such as double majors. In addition, in order to realize a wide range of liberal arts education across the humanities and sciences in university education, the government will use such a system to construct multiple new types of educational programs (late specialization program, etc.) that are both broad and deep through all-university common education and graduate education. [MEXT]	・In FY2020, six projects were adopted under the Program for Human Resources Development for Supporting a Knowledge-intensive Society, and each university that adopted these initiatives accepted students from FY2021 and implemented the programs on a full scale.	・Follow-up and other activities will be conducted on the initiatives of universities selected under the Program for Human Resources Development for Supporting a Knowledge-intensive Society . [MEXT]
○In line with the fourth medium-term target period for national university corporation from FY2022, the government will actively evaluate universities whose management is based on recurrent education based on regional issues and university strengths. At the same time, the government will actively promote cooperation between the liaison functions of organizations such as the Center for Industry-Academia Collaboration and the Center for Regional Collaboration, which accumulate information on the needs of local industries, and recurrent education and human resource development programs that respond to the needs of local industries, and will secure specialized human resources who will play the role of coordinators, such as program design and public reports. [MEXT, METI]	・With regard to the FY2021 national university budget subsidies which are allocated based on the status of the performance of universities centered on outcomes, universities were evaluated and allocated subsidies based on the status of their diversity-fostering environment including the status of enrollment of students in the workforce. ・The Minister of Education, Culture, Sports, Science and Technology certified practical and	・The government will draw a conclusion by the end of FY2021 on the allocation mechanism of the new, national university budget subsidies, toward the Fourth Medium-term Objectives Period. [MEXT] ・We conducted surveys and studies on measures necessary to secure specialized human resources to play the role of coordinators, such as in program design and public relations. [METI]

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
	specialized programs conducted by universities, etc. in response to the needs of students in the workforce, companies, etc., as Programs for Developing Practical Skills in the Workplace (BP). (As of March 2021: 314 courses)	
○In order to promote strategic implementation of the functions of recurrent education and human resource development by universities in cooperation with external organizations, the government will develop an environment that enables all national university corporations to invest in enterprises that implement training and training. [MEXT]	・The National University Corporation Act was amended during the ordinary session of the Diet in 2021 in order to allow all national university corporations, etc. to invest in enterprises that provide consulting, training, and training, etc. that utilize the research outcomes of universities, which are limited to designated national university corporations.	・We will disseminate the contents of the system revisions and promote the implementation of projects utilizing the system at national university corporations. [MEXT]
○Utilizing a variety of digital content including MOOC, we will expand recurrent education programs for members of society, etc. For this purpose, we will design incentives for universities, etc., such as certification and systematization of courses that are considered to be particularly effective for recurrent education for members of society, etc. We will also consider the establishment of a system to realize university education in the new normal system, which allows a variety of learners to learn from each other, such as face-to-face and online hybridization. We will draw a certain conclusion by the end of FY2021, including the flexibility of university establishment standards. [MEXT, METI]	・The Council for the Implementation of Education Rebuilding and the Central Council for Education are studying the establishment of a system to realize university education under the new normal.	・The government will consider the establishment of a system to realize university education under the new normal, in which various students can learn from each other, such as through a hybrid system of face-to-face and online education. The government will also consider the flexibility of university establishment standards, and will draw a certain conclusion by the end of FY2021. [MEXT, METI]
○With regard to national institutes of technology, in order to improve education for the development of practical engineers, the government	・In November 2020, the Standards for Establishment of National Institutes of	・From FY2021, we will establish a human resources development system that fuses AI with other fields to

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
will promote the participation of persons who are active in the front lines of companies in education as teachers, and from FY2021, the government will establish a human resource development system to solve social issues requiring a wide range of knowledge and skills, such as disaster prevention, disaster reduction and epidemic prevention, in addition to nursing care, medical engineering, and materials, by integrating AI and other fields. [MEXT]	Technology (Ordinance of the Ministry of Education No. 23 of 1961) was partially revised to promote the participation of practitioners as teachers in national institutes of technology education.	solve social issues requiring a wide range of knowledge and technology, such as disaster prevention, disaster reduction, and epidemic prevention, in addition to nursing care, medical engineering, and materials. [MEXT]

⑦ Co-Creation of knowledge and strengthening of science and technology communication through participation of various actors such as citizen participation

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○From FY2021, multi-layered science and technology communications will be strengthened, including efforts for science and technology literacy and risk literacy based on social events and social changes caused by the novel coronavirus pandemic, efforts to collect opinions from the general public at science museums and other museums, efforts to participate in policy processes by citizens, and efforts to engage in dialogue and collaborative activities that overcome differences in age, gender, physical ability, values, etc., utilizing state-of-the-art technologies essential for the realization of Society 5.0 such as IoT and AI. [STI, MEXT]	・We are considering building a foundation for scientific communication that will enable various people to experience concrete images of Society 5.0 using ICT and AI.	・As a foundation for scientific communication that enables people to experience concrete images of Society 5.0, we have started to build sensing systems through the use of AI. [STI, MEXT]
○In order to promote science and technology literacy, risk literacy, and co-creation research activities, proactive activities by science and technology communicators are essential as human resources who play a role in connecting various entities. The government will support such efforts. [MEXT]	・Efforts are being made for scientific and technical literacy and risk literacy based on social phenomena related to COVID-19, and consideration is being given to developing science communicators who will contribute to the promotion of research activities through co-creation based on the	・We have initiated efforts for scientific and technical literacy and risk literacy initiatives based on social phenomena related to COVID-19, and training of scientific communicators to contribute to the promotion of research activities through co-creation based on the revision of the Based Act on Science and Technology. [MEXT]

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
	revision of the Basic Act on Science and Technology.	
○The government will promote research activities such as the creation and fusion of knowledge by co-creating with various entities such as local governments, NPOs and NGOs, small and medium-sized enterprises and start-ups, freelance researchers, and citizen participation. In addition, the government will implement the development of an environment that encourages the participation of various entities as a new science, technology, and innovation policy formulation process as a bottom-up approach by industry, academia, and government, such as the launch of citizen science research projects that expect the participation of many citizens by collecting many samples and conducting scientific experiments that cannot be realized by researchers alone (on a scale of 10,000 people, with the assumption that it will start by FY2022). (Restated) [STI, MEXT]	・Discussions are underway on how to co-create with diverse entities that contribute to the promotion of research activities such as the creation and fusion of knowledge. (Restated)	・We will accelerate efforts for co-creation by diverse entities and promote research activities such as the creation and integration of knowledge through opportunities such as Science Agora. [STI, MEXT]

4. Promoting sectoral strategies through public-private partnerships

So far, we have formulated sectoral strategies for AI technology, biotechnology, quantum technology, and materials in the field of fundamental technologies, and for environmental energy, safety and security, health and medical care, space, ocean, food, agriculture, forestry, and fisheries as applied fields. Based on these strategies, during the period of the Sixth Basic Plan, the government will steadily implement research and development and social implementation while cooperating with related projects such as SIP and the Moonshot Research and Development Program, while paying attention to the following points. The sectoral strategies will be flexibly formulated and reviewed based on quantitative analysis and expert judgment.

For strategies in the field of environmental energy and the field of safety and security see Chapter 2, 1. (2) and Chapter 2, 1. (3) respectively.

(Fundamental technologies that should be addressed strategically)

(1)AI technology

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
The utilization of artificial intelligence (AI) has been widely advancing in society, and countries such as the United States and China have formulated national strategies on AI and are competing to lead the world. In these circumstances, it is necessary to promote appropriate development and social implementation based on the fact that AI brings great benefits to society and has a great influence on society. For this reason, during the period of the Sixth Basic Plan, efforts will be made by the relevant ministries and agencies in order to realize concrete goals set forth in AI Strategy 2019, such as educational reform, restructuring of research systems, social implementation, development of data-related infrastructure, and ethics. In addition, the government will continuously review the progress of strategies and the progress of social implementation of AI, and will promote strategies so that each and every citizen can feel the specific benefits of AI, by securing and strengthening	・Measures are being promoted based on AI Strategy 2019 and its follow-up. Key achievements include: (Educational reform) - Launch of the Mathematical, Data Science, and AI Education Program Certification System (Literacy Level) to certify excellent education programs at universities, etc. (Research and development) (1. See (1) ④) (Social implementation) - Construction of a cloud infrastructure common to the six medical societies related to the support of diagnostic imaging by National Institute of Informatics (NII). Introduction of an approval system based on the characteristics of medical devices using AI (amendment of relevant laws and regulations) - A smart agriculture demonstration project underway at 148 sites (as of March 2021) - The ratio of facility managers who introduced new technologies for infrastructure checks and diagnoses (MLIT) is [35%] (as of March 2021)	・We will promote various measures based on AI Strategy 2021. The main initiatives are as follows. (Educational reform) -Establishment of a website that lists companies that support and cooperate with the Mathematical, Data Science, and AI Education Program Certification System [METI] - Establishment and start of operation of the Mathematical, Data Science, and AI Education Program Certification System (Applied Basic Level) to certify excellent education programs at universities, etc. [MEXT, METI, STI] - Development of teaching materials based on mathematical, data science, and AI model curriculums at universities and national institutes of technology throughout Japan, in order to develop digital human resources, and in addition to the literacy level, acquisition of basic skills that can be applied to one's own specialized fields regardless of wether it is in the humanties or science. At

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
advanced R&D, human resources, research environments, and data that are comparable to those in other countries, such as next-generation machine learning algorithms based on the principles of deep learning, advanced natural language processing such as simultaneous interpretation, and highly reliable AI that is important for application to medical care and manufacturing fields.	- 90 demonstration projects have been adopted and are being implemented for smart city-related projects by the relevant ministries and agencies. (Ethics, etc.) - Participation in international expert meetings such as the Global Partnership on AI (GPAI) ・AI Strategy 2019 was revised to AI Streategy 2021 based on this year's follow-up.	the same time, an internationally competitive cross-sectoral doctoral education program will be established to develop the top human resources to be taught, and double majors will be promoted in graduate school education of human resources. [MEXT, METI] - Implementation of AI education for government employees on a trial basis [STI] (Restated 1. (1) ⑤) (Research and development) (1. See (1) ④) (Social implementation, etc.) - Based on the Comprehensive Data Strategy, promoted the development of a base registry, data exchange infrastructure for each field, and a comprehensive trust infrastructure, as well as the construction of a data utilization environment such as expanded cooperation for cross-sectoral data linkage infrastructure, and the social implementation of AI services using the developed data. [IT, STI, relevant ministries and agencies] - Leverage the Japanese version of SBIR, which came into effect in April this year, to increase funding opportunities for R&D-oriented startups and promote R&D based on social needs and policy issues [STI] - Compilation and implementation of comprehensive measures to promote the use of AI by the government while ensuring transparency, fairness, etc. [STI] - Formulation of new AI strategy by the end of 2021 [STI]

(2)Biotechnology

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
The promotion of the bioeconomy contributes to responses to the convergence of the novel coronavirus infection, the construction of strategic supply chains for food and pharmaceutical products, and the reduction of environmental impact. It also contributes to the rapid recovery of the Japanese economy, and its importance is further increasing. Based on this recognition, during the period of the Sixth Basic Plan, the government will steadily implement measures incorporated in the Market Domain Roadmap, which sets market size targets as of 2030, in nine market domains, including high-performance bio-materials, sustainable primary production systems, and biopharmaceuticals and regenerative medicine-related industries, based on Bio Strategy 2020 (Basic Policies)[168] and Bio Strategy 2020 (Definitive Measures for Market Domains)[169], which embody and update Bio Strategy 2019. Specifically, the government will formulate guidelines for collaboration and utilization of bio-data and promote measures based on the guidelines, promote the formation and investment of global and regional bio-communities, and develop bio-manufacturing demonstration and human resource development base functions in global bio-communities, in accordance with each field.	・Guidelines for cooperation and utilization of biodata are being considered for the interim compilation by mid-2021. ・For bio communities, the government announced the Basic Concept on the Formation of Bio Communities in early March 2021, and held meetings to formulate requirements for certification and review certification so that the first regional bio communities can be certified by summer 2021. ・For the demonstration of bio-manufacturing and the development human resources development hub functions, we are constructing demonstration facilities, installing equipment necessary for fostering human resources, and preparing educational contents. In FY2020, the government will start soliciting applications for one new demonstration site for large-scale production demonstration. ・For Japan Environment and Children's Study (JECS), which is one of the large-scale cohorts, a genome/gene analysis research plan was formulated for the construction of a biobank.	・We will link and develop the outcomes of the Tohoku Medical Megabank (TMM) Project, BioBank Japan (BBJ), and the National Center Biobank Network (NCBN), which are the three major biobanks in Japan, and promote the construction of a large-scale genome data infrastructure. [Healthcare, MEXT, MHLW] ・The Council for Basic Utilization of Health and Medical Data will conduct studies to develop a data utilization infrastructure for all of Japan that will contribute to cutting-edge research and development and the creation of new industries related to health and medical care. [Healthcare, PPC, MEXT, MHLW, METI] ・Based on the status of local bio-community open recruitment and certification, Japan will draw up an overall picture of the optimal bio-community by recruiting and certifying global bio-communities in the Tokyo and Kansai regions by the end of FY2021, and accelerate the expansion of market areas. [STI] ・We will steadily promote the Strategy for Strengthening Vaccine Development and Production Systems to strengthen vaccine development and production systems in Japan. [Healthcare, MEXT, MHLW, METI, MOFA] ・With regard to Japan Environment and Children's Study (JECS), which is one of the large-scale cohorts, the government will promote concrete studies on genetic

[168] June 26, 2020 Decision of the Integrated Innovation Strategy Promotion Council

[169] January 19, 2021 Decision of the Integrated Innovation Strategy Promotion Council

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
		analysis. [MOE]

(3)Quantum technology

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
Quantum technology is an innovative technology that has the potential to bring about major changes in the society, economy, industry, and security of Japan and the world. In recent years, competition between countries and companies has intensified in various countries, including the United States, European countries, and China. Each country has been engaged in large-scale investment and large-scale-scale R&D. Thus, competition between countries and companies that will exert hegemony in the future has intensified. In Japan, too, strategic efforts are required for R&D of quantum technology and their implementation in society. For this reason, during the period of the Sixth Basic Plan, based on the Quantum Technology and Innovation Strategy , industry, academia and the government will strongly promote a wide range of initiatives ranging from basic R&D to implementation in society, including the promotion of utilization of quantum technology in industry and society, including practical application of quantum technology in the short and medium term by combining existing technologies, in addition to the fundamental strengthening of R&D on key technologies such as quantum computers, quantum measurement and sensing, quantum communication and cryptography, etc., formation of innovation bases, promotion of international cooperation,	・In other countries, particularly in the United States, European countries, and China, quantum technology is positioned as a key technology in national strategies that will bring about future economic and social changes, and strategic initiatives such as the formulation of national strategies, expansion of research and development investment, and formation of bases are being rapidly implemented. ・In order to rank with other countries with regard to the development of quantum technology in Japan while securing future growth of Japan and the safety and security of the country and its people, upon clearly setting the vision of the future that quantum technology will lead, and taking a panoramic view of the whole country, we will advance (1) focused research and development, (2) international cooperation, (3) formation of research and development hubs, (4) intellectual property and international standardization strategies, and (5) development and securing of excellent human resources under the Quantum Technology Innovation Strategy formulated in January 2020. Of these initiatives, with regard to the formation of research and development hubs, we have developed eight Quantum Technology Innovation Hubs in Japan. ・Global momentum toward carbon neutrality is rapidly increasing. The key to the advancement of real-time data utilization, which promotes	To respond to growing concerns about economic security and environmental changes such as carbon neutrality, we will drastically strengthen our efforts, including the review of strategies. ① For the quantum computer social implementation, research and development on superconducting quantum computers, quantum AI systems, etc. will be promoted, and research and development on advanced control of solid state quantum sensors, quantum life technology, etc. will be promoted with the aim of realizing quantum measurement and sensing systems. In addition, we will strategically foster outstanding young researchers and engineers who support quantum technology as "quantum natives" who can use quantum technology from an early stage. ・Optical/Quantum Leap Flagship Program (Q-LEAP) [MEXT] ・University fellowship program to create science and technology innovation [MEXT] ② Demonstration of quantum cryptography toward social implementation and promotion of research and development on quantum cryptography communication by various methods: ・R&D for constructing global quantum cryptography networks ・Research and development of quantum cryptography

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
strategic intellectual property management and international standardization, and development of excellent human resources.	changes in people's behavior, is secure and eco-friendly data utilization technology, and competition in the development of quantum technology, which is the core technology, is intensifying.	technology for satellite communications [MIC] ・Research and development of satellite quantum cryptography communication for the construction of a global quantum cryptography communication network ③ Full-fledged R&D at eight quantum technology innovation hubs in Japan and promotion of collaboration among hubs centered on RIKEN. In addition, based on the Japan-U.S. Leaders' Joint Statement of April 2021, Japan and the United States will strengthen joint research and exchange of researchers in the field of quantum science and technology. : ・Cross-sectoral efforts will be promoted through the Conference for the Promotion of Quantum Technology Innovation Hubs (established in April 2021) comprising eight centers. [MEXT, MIC, METI] ・In the second half of 2021, the quantum technology innovation hubs will take the lead to hold an international symposium. In addition, we will build collaborative and cooperating relationships with quantum hubs overseas and promote joint research with Europe and the United States. [MEXT, MIC, METI] ・We will steadily promote R&D through collaboration among industry, academia and government at each hub. [MEXT, MIC, METI]

(4)Materials

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
Materials are a basic technology that supports Japan's science, technology, and innovation. They have also produced numerous innovations such as lithium-ion batteries and blue light-emitting diodes, and have supported the world economy and society. On the other hand, in recent years, as international competition for materials has intensified, Japan has lost its strength in this field, and it is necessary to strengthen strategic efforts while taking advantage of the remaining strength. For this reason, during the 6th Basic Plan period, based on the Materials Innovation Strategy , the government will vigorously promote the initiatives set forth in the strategy under the common vision of industry, academia, and government, by utilizing the strengths of Japan, which has the world's highest level R&D infrastructure with a large number of diverse researchers and companies in Japan, such as the rapid implementation of society through industry-academia co-creation, the creation of new value through the development of a data-driven R&D infrastructure and the pursuit of the essence of things, and the securing of sustainable development such as human resource development.	・Japan's materials-related industries are supported by industrial competitiveness supported by the power of its products and technology development capabilities. In academia and basic research, we have produced many innovative materials, including the development of blue light-emitting diodes and lithium-ion batteries. However, in recent years, as a result of aggressive R&D in emerging countries, commoditization of products, and intensification of price competition, Japan's production share of some components has been lost, and a crisis has become apparent. ・Therefore, in order to strengthen Japan’s materials innovation capability, which plays an important role in realizing Society 5.0, achieving the SDGs, overcoming resource and environmental constraints, and building a resilient society and industry, and with an eye on the social and industrial images in 2030, Material Innovation Strategy (decided by the Integrated Innovation Strategy Council on April 27, 2020) was formulated as a comprehensive policy package that includes R&D, industry-government-academia collaboration, and human resources development.	・In order to realize the Materials DX Platform, we will implement AI analysis functions, develop common facilities and facilities that can obtain high-quality data, and conduct data-driven research in the materials field, which will be deployed nationwide from FY2022. [MEXT] ・From the perspective of overcoming resource constraints such as decarbonization and rare metals and rare earths through the use of data-driven research and development methods, we will concretize the technical challenges that we should focus on in particular and promote R&D. [MEXT, METI] ・We will work to build a process databases for manufacturing processes, which are the source of Japan's competitiveness in the materials industry and are important for economic security. At the same time, we will promote development of fundamental technologies that will contribute to improving the performance of ultra-high-performance ceramics, photoresists, and other materials needed to manufacture electronic equipment for 6G and high-performance semiconductors. [METI] ・Steady follow-up will be carried out at expert meetings, etc., and improvements will be made continuously through further discussion and collaboration between the government and experts from industry and academia. [Cabinet Office, MEXT, METI]

(Strategic applied fields to be addressed)

(5)Health and medical care

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
In the midst of the 4th Industrial Revolution [170], R&D is advancing in the medical and life science fields worldwide, and as innovation in these fields accelerates, it is expected that elucidation of disease mechanisms, development of new diagnostic and treatment methods, R&D of drug discovery using AI, big data, etc., and personalized medicine and precision medicine tailored to individual conditions will advance. Against this background, during the period of the Sixth Basic Plan, based on the Healthcare and Medical Strategy and the Plan for Promotion of Medical Research and Development for the second period covering FY2020 to FY2024, the government will promote integrated research and development from the basics to practical application in the medical care field in cooperation with other funding agencies, in-house research institutes, and private companies, with support from AMED at the core, as the promotion of research and development in the medical care field. As a particularly pressing issue, the government will concentrate support for research and development in order to put into practical use a domestic vaccine, drugs, etc. for the novel coronavirus infection at an early stage. In addition, for the development of the medical care field R&D environment, the government will promote the development of systems and	・Based on the second term of the Plan for Promotion of Medical Research and Development, we have promoted six integrated projects (pharmaceuticals, medical devices/healthcare, regenerative medicine/cell therapy/gene therapy, genome/data base, basic disease research, seeds development/research hubs) centered on modalities (technologies and methods). ・With regard to the Moonshot Research and Development Program, which is based on ambitious goals that envision the future we should aim for, we have set a goal of realizing a society in which people can enjoy life without health concerns until the age of 100. We have also appointed five project managers who will be responsible for research subjects to achieve these goals, and have promoted research and development. ・For in-house research in the medical field conducted by in-house research institutes under the jurisdiction of the ministries and agencies concerned, a mechanism was established to constantly ensure information sharing and coordination among the Headquarters for Healthcare Policy Secretariat, the ministries and agencies concerned, in-house research institutes, and AMED. ・In order to improve the environment for research and development in the medical field, the following will be	<Promotion of research and development in the medical field> ・Collaborating with other funding agencies, in-house research institutes, and private companies, we will promote integrated research and development from basic to practical use in the medical field with AMED as the core. [Healthcare, MIC, MEXT, MHLW, METI] ・In order to realize a sustainable medical and nursing care system that prevents and overcomes major diseases and enables people to enjoy life without health concerns until the age of 100, by 2040, we will promote challenging research and development and accelerate the rapid social implementation of cutting-edge technologies. [STI, AMED, MEXT, MHLW, METI] <Improvement of the environment for research and development in the medical field> ・Based on the issues identified in the past studies, the organization of the National Center for Advanced and Specialized Medical Care as a base for clinical research in Japan will be urgently discussed. [Healthcare, MHLW] ・In addition to promoting the training and securing of biostatisticians and other specialists as well as regulatory science experts, the government will promote the

[170] The 4th Industrial Revolution refers to the industrial revolution with several core technological innovations such as IoT, big data and AI following the 1st Industrial Revolution, which was the mechanization of factories by hydraulic and steam engines since the end of the 18th century, the 2nd Industrial Revolution, which was the mass production using electricity based on the division of labor in the early 20th century, and the 3rd Industrial Revolution, which was the further automation using electronics and information technology since the early 1970s.

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
mechanisms at specialized human resources such as biostatisticians and regulatory science experts, and the dissemination and enhancement of regulatory science in research and development, as the improvement of the medical care research and development environment. In addition, the government will promote health management for the promotion of health care industries other than public insurance, the promotion of regional and occupational partnerships, and the promotion of efforts for individual health, as the creation of new industries and their international expansion. In addition, the government will promote the international expansion of Japan's health and medical care-related industries under the Asia Health and Wellbeing Initiative and the African Health Initiative with the aim of contributing to the achievement of universal health coverage (UHC), with the aim of promoting autonomous industries in each country and contributing to the wide range of health and medical care fields.	promoted: development of systems and mechanisms at support bases in translational research core hubs and core clinical research hopsitals; development and securing of specialist human resources such as biostatisticians and specialists in regulatory science; and dissemination and enhancement of regulatory science in research and development. ・The Health and Medical New Industry Council was established to discuss and promote health management to promote the health care industry outside public insurance, promote regional and occupational partnerships, and promote efforts to improve the health of individuals. ・Japan has established the Council for International Development of Health and Medical Care to promote the international development of health and medical-related industries in our country under the Asian Health and Wellbeing Initiative and the African Health and Wellbeing Initiative, aiming to autonomously promote industries in various countries and contribute to a wide range of health and medical fields. ・With regard to COVID-19, which is an urgent issue, the Headquarters for Healthcare Policy has compiled support measures (approximately 193 billion yen in total) for the relevant ministries and agencies, including research and development related to COVID-19, from Phase 1 through Phase 7, and provided support for related research and development.	education necessary for the practical application of regulatory science and intellectual property for researchers. [MEXT, MHLW, METI] ・In order to further enhance public trust in our country's clinical research and promote research, the government will appropriately apply the Clinical Trials Act and review it as necessary based on the status of its implementation. [MHLW] ・In order to ensure that research and development results are efficiently linked to pharmaceutical approval, the necessary operational improvements will be made to the regulatory science strategic consultation system and the priority clinical trial consultation system of the Pharmaceuticals and Medical Devices Agency (PMDA), with the aim of rapidly commercializing innovative pharmaceuticals. [MHLW] ・The government will promote and enhance regulatory science in research and development by supporting research on the quality, efficacy, and safety of drugs, etc. based on international regulatory harmonization, developing review guidelines, and improving expert knowledge for reviewers. [MHLW] ・Japan Agency for Medical Research and Development (AMED) is studying a mechanism to safely and efficiently utilize quality-controlled data in industry-academia research and development as a platform for the utilization of data obtained from AMED-supported R&D in order to extend healthy life expectancy for citizens and provide world-class medical care, and will aim for the early commencement of its

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
		operation. [Healthcare, MEXT, MHLW, METI] (Restated) ・The government will steadily promote the Action Plan for Whole Genome Analysis and Roadmap 2021. In addition to providing new individualized medicine to patients for whom treatment had not been available, the government will promote the establishment of a system that enables the relevant parties in industry, government, and academia to analyze and utilize the information widely. [Healthcare, MHLW] <Creation of new industries and international expansion> ・The government will promote health management to advance the health care industry outside the public insurance system, promote regional and occupational cooperation, and promote efforts to improve the health of individuals. In addition, efforts will be made to evaluate the quality of healthcare services and to link public and non-public insurance services in order to develop an environment for the provision of appropriate healthcare services. [MIC, MHLW, METI] ・We will strengthen the innovation ecosystem to create new industries in the health and medical fields by promoting initiatives such as financial support through public-private funds, information dissemination through one-stop windows, consulting support, and network support with support organizations. [REVIC, MEXT, MHLW, METI] ・With a view to contributing to the achievement of UHC, the government will promote the international development of health and medical-related industries in our country

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
		under the Asian Health and Wellbeing Initiative and the African Health and Wellbeing Initiative, aiming to autonomously promote industries in various countries and contribute to a wide range of health and medical fields. The target fields include not only medical and nursing care but also a wide range of healthcare services in a package. [Healthcare, MIC, MOJ, MOFA, MOF, MEXT, MHLW, MAFF, METI, MLIT] <Strengthening Vaccine Development and Production Systems> ・Based on the strategy for strengthening systems to develop and produce vaccines, the government will work together to rebuild the necessary systems and make efforts as a national strategy to be continuously implemented over the long term. [Healthcare, MEXT, MHLW, METI, MOFA] (Restated)

(6)Space

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
Today, space systems such as positioning, communication, and observation support Japan's security and economic and social activities. They are also becoming increasingly important as a basis for realizing Society 5.0. Under these circumstances, space activities have entered an age of co-creation by the public and private sectors, and efforts are being made to vitalize industries through space utilization in a wide range of fields. In addition, with the progress of space exploration, the sphere of human activities is expanding beyond the earth's orbit to the moon surface and deep space,	・The role of the space system in Japan's security and economy is growing, and this trend is even stronger. Space is becoming increasingly important as a frontier of science and technology and as a driving force for economic growth. Space can also be a big driver of Japan's economic growth. ・Space activities have entered an era of public and private sector co-creation from the traditional government initiative, and the use of space has been used to invigorate industries in a wide range of fields. ・With the progress of space	Based on the Basic Plan on Space Policy and Basic Plan on Space Policy Roadmap, the government will promote space development and utilization through measures including the following. [Space, relevant ministries and agencies] (1)Ensuring space security ・Steady development of space systems such as the Quasi-Zenith Satellite System, information-gathering satellites, and SSA satellites ・Promotion of utilization of small satellite constellations that enable frequent information collection ・Reinforcement of desk

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
and the success of the collection of samples from asteroids by Hayabusa 2 has demonstrated to the world the high level of Japan's science and technology, raising public expectations for its power. Space is becoming increasingly important as a driving force for the frontier of science and technology and economic growth, and it can be a major driving force in the creation of innovation in Japan. Based on this recognition, during the period of the Sixth Basic Plan, based on the Basic Plan on Space Policy, the government will promote, in cooperation with industry, academia, and government, development for quasi-zenith satellite systems and information-gathering satellites, satellite development that contributes to disaster countermeasures and national resilience and the resolution of global issues, research and development for lunar exploration under the Artemis program, promotion of space science and exploration, development and upgrading of key rockets, examination of future space transportation systems, promotion of strategic satellite development and demonstration in cooperation with each ministry, expanding and upgrading utilization of satellite data, formation of rules for future space activities including space debris countermeasures and Space Traffic Management, and strengthening of the human resource base that supports space activities.	exploration, the area of human activities is expanding beyond the earth's orbit to the lunar surface and to deep space. ・The construction of constellations of small and microsatellites is advancing, and game changes in the space industry are occurring. Japan's space equipment industry is lagging behind, and it is essential for our country to re-strengthen its industrial and scientific infrastructure in order to maintain the independence of space activities. ・Recognizing the great potential of space and the severe situation that Japan is currently facing, we are making steady progress toward the implementation of the Basic Plan on Space Policy decided as the ten-year Basic Policy on Space, which was determined with a view toward the next 20 years, based on the roadmap.	exercises ・Promotion of cyber security measures (2)Contributing to disaster countermeasures, national resilience and resolution of global challenges ・Establishment of a system to quickly and effectively grasp the disaster situation in the event of a disaster ・Examination of the development and operation system of the next-generation meteorological satellite ・Formulation and promotion of international greenhouse gas observation mission concept utilizing satellites, etc. ・Strengthening of efforts to realize the Space Solar power Systems (3)Creation of new knowledge through space science and exploration ・Promotion of space science and exploration such as the Martian Moons Exploration Program (MMX) ・Promotion of the Artemis Program and technological development with a view to sustainable lunar activities (4)Realization of economic growth and innovation driven by space ・Strengthening of efforts to expand the use of satellite data ・Establishment of institutional environment for new space business ・Promotion of efforts to establish international standards concerning the use of orbit (5)Reinforcement of comprehensive infrastructure, including industrial and scientific infrastructure ・Promotion of strategic initiatives in public-private partnerships for the construction of small satellite constellations ・Development and demonstration in fundamental technologies under the

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
		satellite development and demonstration platform (space computing, quantum cryptography, fundamental technologies necessary for satellite constellations, digitalization, advanced sensors, etc.) ・Development of core rockets and future R&D in space transport systems ・Development of human resources for space

(7)Ocean

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
For Japan, which is surrounded by the sea on all sides and has one of the largest control areas in the world, it is necessary to protect the ocean [171] in order to preserve its territory and territorial waters and ensure the safety of its people, to make use of the sea as a basis for the existence and growth of economic society, and to pass on the sea to its descendants as a basis for the existence of precious human beings. In addition, it is essential to collect and utilize scientific knowledge on the ocean in the following areas: conservation of marine living resources and ecosystems, securing of energy and mineral resources, response to global-scale issues such as global warming and marine plastic litter, measures against threats such as earthquakes, tsunamis, and volcanoes, sustainable use and utilization of the Arctic region, and strengthening of competitive power in the marine industry. In the United Nations Decade of Ocean Science for Sustainable Development (2021), it is	・Based on the Basic Plan on Ocean Policy, we will comprehensively and systematically promote ocean policies. ・Regarding response to global challenges such as marine plastic litter, for example, Japan domesticaly promotes domestic measures based on the Action Plan for Marine Litter as well as internationally promotes various measures based on the G20 Implementation Framework for Actions on Marine Plastic Litter related to the G20 Osaka Summit in 2019 with in international cooperation. ・Regarding ocean observation, we are developing observation using research vessels, floats, buoys, etc., and promoting the development of unmanned observation technologies such as AUV. ・For SIP Phase 2, efforts were made to develop and demonstrate ocean resources survey technologies, and sea trial of deep sea terminal systems and a long-term	・In order to solve the problem of marine plastic litter, we will promote research and study on the actual distribution of marine plastic litter, gathering global data for around 2023, and impacts on organisms and ecosystems. In addition, we will promote the development of resource-recycling industries through innovation and enhanced recycling of alternative materials such as marine biodegradable plastics, treatment of marine debris and reduction of its generation of marine debris, and implementation of the initiatives outlined in the framework of international cooperation which is, the outcome of the G20 Osaka Summit. [STI, MEXT, METI, and MOE] ・In order to strengthen the capacity of MDA and to make maximum use of Japan's vast exclusive economic zone, it is essential to upgrade and improve the efficiency of ocean observation technologies. In addition to

[171] Japan ranks sixth in the world in terms of the area of its territorial waters (including inland waters) and exclusive economic zones, and eighth in the world in terms of the sea areas owned by each country's overseas territories.

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
necessary to contribute to the world with the power of science and technology, which is Japan's strength. Therefore, during the period of the Sixth Basic Plan, the government will comprehensively and systematically promote measures relating to the oceans based on the Basic Plan for Ocean Policy. In particular, ocean observation is the most important foundation for ocean science and technology. In order to strengthen the capacity of MDA and to enhance the ability to understand the vast marine environment for realizing carbon neutrality, the government will develop observation technologies such as research vessels, ROVs[172], AUVs, submarine optical fiber cables, unmanned observation boats, etc., with the aim of improving ocean survey and observation technologies including those for ice areas, deep sea areas, and subseafloor. In addition, the government will aim for thorough utilization of observation data by building and strengthening a common base for data and calculations in order to advance the sophistication of data and information processing, sharing, and utilization. At the same time, the government will also aim to create marine value, which is an asset of mankind as a whole, through the promotion of data-driven research in the ocean field by realizing the Internet of Laboratory[173] for ocean observations. In order to promote these activities, we will strongly promote industry-academia-government collaboration and aim to create innovation in the maritime field.	operational ASV were developed for the Development of Innovative Technologies for Exploration of Deep-Sea Resources. ・ In addition to enhancing the information contained MDA Situational Indication Linkages (MSIL), we are improving the environment for the release of APIs in order to promote the coordination of ocean information. A public-private forum on data linkage was also held. ・ Construction of the Arctic research vessels began, and Arctic observation and research and human resources development were carried out through the Arctic Challenge for Sustainability II (ArCSII), which started in FY2020. ・ As of March 2021, in accordance with the Act on Promoting Utilization of Sea Areas for the Development of Power Generation Facilities Using Maritime Renewable Energy Resources, public applications were being implemented at four locations (five areas) across the country (a total of approximately 1.5 million kilowatts), and efforts in the supply chain as a whole centering on power producers are being vitalized toward gaining cases. ・ The government is striving to develop international regulations to improve energy efficiency of ships so as to promote the replacement of old inefficient ships with new greener ships. Japan drafted and co-sponsored a joint-proposal to the International Maritime Organization (IMO), on the mandatory energy efficiency	manned observation by ships and other vessels, we will develop technology that makes it possible to observe the ocean more widely, in detail and efficiently by unmanned observation using AUV and submarine optical fiber cables. [MEXT] ・ For SIP Phase 2, we will promote the development and demonstration of ocean resources survey technologies, including the development of AUV technology, multi-AUV operation technology and deep sea terminal technology, as well as research and development on ocean observation technologies for the Development of Innovative Technologies for Exploration of Deep Sea-Resources. [STI] ・ In order to expand the range of uses of collected marine data with an eye on social implementation, as part of the strengthening of the MDA's capabilities, functions have been enhanced with an eye to making further use of advanced information sharing systems, such as DIAS, which accumulates and analyzes global environmental big data, and the Ocean Status Display System, which can display various types of marine information superimposed on maps. In addition, in order to enhance maritime information at an accelerated pace, we will strengthen cooperation with systems owned not only by government agencies but also by local governments, the private sector and foreign organizations. Furthermore, in order to promote the distribution and utilization of

[172] ROV: Remotely Operated Vehicle (ROV)

[173] A system in which various devices and data can be connected in real time through a network infrastructure that enables large - - capacity data communications, and research activities can be conducted seamlessly regardless of location.

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
	requirements on existing ships, consisting of the energy efficiency existing ship index (EEXI) and the annual operational carbon intensity indicator rating (CII rating), which were approved in November 2020.	data, the government will promote the development of an environment, such as API linkage and the standardization of necessary data. These data will be used to accelerate data-driven research in the ocean field. [MEXT, MLIT] ・ Amid the intensification of activities related to the Arctic, we will steadily construct the Arctic research vessels, and continue to conduct observations and research in the Arctic, as well as developing human resources for research, in order to respond to the needs of global challenges, such as climate change, and to contribute to the sustainable use of the Arctic. In addition, Japan will make use of the outcomes of the Third Arctic Science Ministerial to promote international cooperation and collaboration with other countries and promote the enhancement of Japan's presence through science and technology. [MEXT] ・ In order to promote the introduction of offshore wind power generation, the government will appropriately implement the Act on Promoting the Utilization of Sea Areas in Development of Power Generation Facilities Using Maritime Renewable Energy Resources, and based on the Offshore Wind Industry Vision (Phase 1) formulated in December 2020, the government will make a commitment to create attractive domestic markets, thereby creating a competitive and resilient domestic supply chain by attracting domestic and foreign investment and promoting investment through improving the business environment, etc. Furthermore, with a view to expanding into Asia, we will

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
		engage in next-generation technology development and international cooperation, and promote the creation of next-generation industries that will survive international competition. [METI, MLIT] ・In order to actively contribute to taking measures in the international shipping sector against climate change, and to strengthen the international competitiveness of the maritime industry in Japan, we will promote to the development and mplementation of low-carbon and decarbonizing technologies for ships and formulate of international rules to promote the spread of new greener ships. [MLIT]

(8)Food, agriculture, forestry and fisheries

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
Today, it is necessary to protect and develop Japan's abundant food and environment by utilizing the power of science and technology, and to strengthen the international competitiveness of the agriculture, forestry, and fisheries industries in order to expand exports by capturing expanding overseas demand. In particular, in order to respond to the diverse needs of farmers, it is necessary for farmers to dramatically improve productivity and contribute to income growth by fully utilizing data and implementing innovative agriculture incorporating smart agricultural technology. For this reason, during the period of the Sixth Basic Plan, the Ministry of Agriculture, Forestry and Fisheries formulates the Strategy for Research and Innovation	・Demonstrating an unmanned autmated driving system with remote monitoring, including movement between fields, we achieved the targets set forth in Japan Revitalization Strategy 2016[176]. ・We are promoting R&D to expand the functions of the agricultural data linkage infrastructure not only for production but also for the entire food chain, including processing, distribution and consumption. ・The smart agriculture demonstration project, which aims to accelerate the social implementation of smart agriculture by demonstrating smart agriculture, started in FY2019 and has been conducted at 179 sites nationwide. ・We are pursuing aggressive R&D toward realizing the Moonshot Goal #5, Creation	Based on the Strategy for Sustainable Food Systems, from a medium- to long-term perspective, the government will promote initiatives at each stage from procurement to consumption and innovation to reduce environmental impact, such as carbon neutrality, with the aim of expanding employment, improving local income, and realizing a rich diet. Specifically, ・We will promote the procurement of sustainable materials and energy, the further utilization of regional and unused resources, the establishment of systems and technology development for the reuse and recycling of resources, and the elimination of imports, decarbonization, and environmental impact reduction in materials and energy procurement. [MAFF relevant ministries and

[176] Cabinet decision of June 2, 2016

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
Concerning Agriculture, Forestry and Fisheries every fiscal year based on the Basic Plan for Food, Agriculture and Rural Areas[174] and promotes smart agriculture, forestry and fisheries policies, environmental policies, and biotechnology policies in cooperation with various fields other than agriculture, forestry, and fisheries. Among these policies, the Ministry will contribute to the improvement of Japan's agricultural brand power and the reduction of food loss by deploying production bases utilizing Japan's smart agriculture technologies and systems in the Asia-Pacific region and other regions. In the forestry and fisheries sectors, the Ministry will also steadily implement new technologies such as ICT, AI forestry and fisheries sectors. In addition, based on the Plan to Create Dynamism through Agriculture, Forestry, and Fisheries and Local Communities[175], the Green Food System Strategy, which will be formulated by May 2021, and demonstrate the vision for 2050 to realize both the productivity improvement and the sustainability of food, agriculture, forestry and fisheries through innovation.	of the industry that enables sustainable global food supply by exploiting unused biological resources by 2050. ・ In May 2020, the government formulated Agriculture, Forestry and Fisheries Research Innovation Strategy 2020 to promote various policies on smart agriculture, forestry and fisheries, the environment and biotechnology. ・ In December 2020, the Strategy for Sustainable Food Systems was published. In January 2021, the committee began exchanging opinions with producers, organizations, and companies, and released an interim report in March. A strategy was formulated in May.	agencies] ・ The government will promote the conversion to a sustainable production system compatible with high productivity, the promotion of smart agriculture, forestry and fisheries, the electrification and hydrogenation of machinery, the greening of materials, the development and dissemination of environmentally friendly super breed varieties, the long-term and mass storage of carbon in agricultural land, forests and oceans, the improvement of labor safety and productivity, the expansion of the base of producers, the appropriate management of fishery resources, and the establishment of a sustainable production system through innovation. [MAFF, relevant ministries and agencies] ・ We will establish a sustainable processing and distribution system that is free from waste and waste by promoting the switch to sustainable imported food and raw materials, promoting environmental activities, streamlining and optimizing processing and distribution through the use of data and AI, developing packaging materials for long-term storage and transportation, decarbonizing, and strengthening the competitiveness of the food industry with consideration for health and the environment. [MAFF, relevant ministries and agencies] ・ We will promote sustainable consumption such as reducing food loss, promoting mutual

[174] Cabinet decision of March 31, 2020

[175] Decision of the Headquarters for the Revitalization of Food, Agriculture, Forestry, and (chair: Prime Minister) on December 10, 2013(revised on December 15, 2020).

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
		understanding through interaction between consumers and producers, comprehensively promoting a nutritionally well-balanced Japanese diet, promoting the conversion of buildings to wooden structures and lifestyles, promoting the expansion of sustainable consumption of marine products, expanding environmentally friendly sustainable consumption, and promoting dietary education. [MAFF, relevant ministries and agencies] ・ We will promote infrastructure development, promote innovation from rural areas, promote urban agriculture with diverse functions, promote the use of diverse agricultural land, develop and conserve forests that support food production and livelihood infrastructure, conserve and create seagrass beds and tidal flats, and demonstrate the multifaceted functions of fisheries and fishing villages to create sustainable rural areas that support food systems. [MAFF, relevant ministries and agencies] ・ We will establish and collaborate on fundamental technologies across the entire supply chain by promoting industry-academia-government collaboration that has a virtuous cycle of people, knowledge, and funds; establishing and utilizing infrastructure to promote innovation; expanding investment in human resources development and future technologies; building a global research system; strategically utilizing intellectual property; strengthening breed variety development capabilities; and building smart food chains. [MAFF, relevant ministries

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
		and agencies] ・ We will work to maximize the absorption and fixation of CO_2 by fully utilizing forests and timber for carbon neutrality, such as improving forest absorption through forestry innovation, and maximizing the effects of carbon storage and CO_2 emissions reduction through expanded use of timber. [MAFF, relevant ministries and agencies]

5. Revitalizing the flow of funds to create knowledge and value

[Ideal vision and direction toward its realization]

In order to realize Society 5.0, cyberspace and physical space will be able to merge and create new value by creating a digital twin using a wide variety of high-quality data in cyberspace. On the basis of this digital twin, physical space will be changed by actively using AI, and the results will be reproduced in cyberspace. This society will be transformed into a society that creates a dynamic virtuous cycle that is constantly changing.

The government will invest in activities to create knowledge and create economic and social values to realize Society 5.0 (according to estimates by Keidanren[177] and other organizations, the total cumulative investment required for the 15 years to 2030 will be 844 trillion yen.). It will also aim to significantly expand public and private investment, utilizing various financial resources, in order to expand business by doing so.

To this end, the government will secure sufficient investment in basic research by steadily securing the government's budget for science and technology, promoting industry-academia joint research, and establishing funds comparable to those of the world, and will strengthen responses to nationally important issues through public-private cooperation.

In addition to these measures, the government will mobilize all policy tools, including the R&D Promotion Tax System, SBIR, innovation in government projects, and promotion of public procurement of research outcomes, in order to create an environment conducive to private investment. At the same time, the government will promote innovation management that places sustainability at the heart of business.

[Target]

While other countries are planning large-scale research and development investments in anticipation of the post-corona era, Japan will secure a daring size of government R&D investments in order to survive the fierce competition between countries.

In addition, efforts will be made to induce private sector investment in research and development.

[Key targets in science, technology, and innovation policies] (Key indicators)

Total value of government R&D investments[178] between FY2021 and FY2025: approx. 30 trillion yen
The total amount of research and development investment between FY2021 and FY2025, including both the public and private sectors, is approximately 120 trillion yen (Taking into account synergies between government investment and promotion of private investment, as well as the level of our country's share of government-funded research funds).

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[177] Joint report by Keidanren, the University of Tokyo, and the GPIF, Evolution of ESG investment, realization of Society 5.0, and achievement of SDGs (March 26, 2020)

[178] Taking into account the diversification of funding sources for investment in science, technology, and innovation policies, including the establishment of University Endowment Fund, the government will consider appropriate methods of identifying research and development investment during the period of the Sixth Basic Plan, while paying close attention to trends in the OECD Frascati Manual.

[Current data] (Reference index)

- Total R&D expenditure by the public and private sectors: 3.50% against the target of 4% of GDP (FY2019) [179]
- Science and technology budget during the Fifth Basic Plan period: approximately 26.1 trillion yen (Including Green Innovation Fund projects and 10 trillion yen University Endowment Funds: 28.6 trillion yen)[180] (as of March 2021)
- Total amount of R&D expenditure executed by national university corporations, research and development corporations, and the inter-university research institute corporations: approximately 600 billion yen[181] (FY2018)
- Investment in intangible assets in Japan, including investment in corporate capacity building: 53.9 trillion yen (2015) [182]
- ESG investment: Japan's investment balance approximately 336 trillion yen (2019)[183]
- Impact investment: Japan's investment balance approximately 317.9 billion yen (2019)[184]

① Expansion of public and private sector investment

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○The government budget for science and technology shall be expanded during the period of the Sixth Basic Plan, taking full account of the constant improvement of the quality of science, technology, and innovation policies and the fiscal sustainability. [STI, relevant ministries and agencies]	・As other countries are also significantly increasing their investment in science and technology innovation, it is important for Japan to secure a daring size of government R&D investments in order to survive the fierce international competition. ・Although the size of Japan's science and technology budget exceeds that of Germany and the United Kingdom in terms of the ratio to GDP, a decline in its research capabilities has been pointed out. Therefore, it is important to address the improvement of research productivity and the quality of science, technology, and innovation policies as	・The Cabinet Office and related ministries and agencies will work together to improve the quality of science and technology and innovation policies by reviewing evidence-based projects based on evidence through the use of e-CSTI, etc., and to expand the government's budget for science and technology. [Relevant ministries and agencies]

[179] Ministry of Internal Affairs and Communications, 2020 Results of the Survey of Research and Development (December 2020)

[180] While maintaining consistency with the economic and fiscal revitalization plan, the target is set at 1% of GDP, and if the average nominal GDP growth rate during the period is assumed to be 3.3%, the target is approximately 26 trillion yen.

[181] A total of 604.7 billion yen was collected for 26-70 year-old researchers from 117 out of 119 institutions surveyed at e-CSTI.

[182] JIP Database 2018. Japan's ratio of investment in intangible assets to GDP is low compared with other countries, and investment in economic competitiveness in particular has been at a low level.

[183] Sustainable Investment Survey 2019

[184] GSG National Advisory Committee, Current Status of Impact Investment in Japan 2019, revised edition (2020)

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
	essential issues. ・ The necessary budget for science and technology was secured in the FY2021 budget.	
○In order to promote the development of shared facilities and data collaboration infrastructure and the development of young human resources at universities that conduct R&D at a level comparable to that in the world, the government will construct a world-class research infrastructure by promptly realizing a fund approximately 10 trillion yen and utilizing its investment profits. [STI, MEXT]	・While major universities around the world have an ample financial base thanks to a fund of several trillion yen, universities in Japan have extremely limited financial resources, and the gap with the world's top universities continues to widen. ・It has become difficult to provide young researchers with sufficient salaries and posts, and the number of stable posts for young researchers is decreasing year by year. The rate of advancement to doctoral courses has become low due to anxiety about future posts. ・As international competition intensifies, research foundations in Japan have become fragile, and our country's research capacity (the number of high-quality papers) has declined relatively. ・In order to establish the University Endowment Fund with a scale of 10 trillion yen, the Act on Japan Science and Technology Agency was amended in the 204 ordinary session of the Diet, and as a part of resources of this fund, government secured500 billion yen as for investment (the third supplementary budget of FY2020) and 4 trillion yen (the initial plan amount of fiscal investment and loan program of FY2021) to Japan Science and Technology Agency (JST).	・By the summer of 2021, the government will formulate a basic policy on the management of University Endowment Fund, compile an interim report on the requirements and necessary reforms required for research universities that are on a par with the world, and compile a conclusion on a new legal framework by the end of 2021, and submit it to the next ordinary Diet session. [STI, MEXT] ・The basic concept of University Endowment Fund management will be formulated around the summer of 2021, and the fund management will begin by the end of FY2021. In addition, based on the system design of university reforms, etc., an expansion of University Endowment Fund to the scale of 10 trillion yen will be planned by the end of FY2021. [STI, MEXT]
○From the perspective of strengthening Japan's basic research capabilities, the trend of research funds at national, public, and private universities	・We continue to collect data based on the Guidelines for the Promotion of Data Standardization for the Analysis of Research	・We will continue to collect data based on the Guidelines for the Promotion of Data Standardization for the Analysis of Research

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
and inter-university research institutes will be analyzed and monitored. [MEXT]	Capabilities. ・In developing the analysis function of e-CSTI, the results of analytical that are considered to be effective for trend analysis of research funds are shared with the relevant ministries and agencies and published.	Capabilities. [STI] ・In developing the analytical function of e-CSTI, the results of analysis that are considered to be effective for trend analysis of research funds will be shared with the relevant ministries and agencies and published. [STI] ・The trend of research funds will be monitored using various statistics. [MEXT]

② **Improvement of the private investment environment**

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
○The R&D tax system will be enhanced in order to encourage the medium- to long-term and innovative R&D of private enterprises, maintain and expand R&D investment, and thereby create knowledge, value, and innovation. [METI, relevant ministries and agencies]	・In the Tax Reform Outline for FY2021 (approved by the Cabinet on December 21, 2020), revisions to special measures for test and research funds, the upper limit of tax credits, and cloud-based software were implemented.	・In FY2021, the government will promote the application of the system by disseminating and publicizing the contents of the revisions. In FY2022 and beyond, we will examine the effects of the revisions.
○In order to continuously create knowledge and value, the government will endeavor to build a brand, improve management organizations, improve the quality of human resources through education and training, and create an environment conducive to investment in intangible assets such as software and databases [METI]	・In the Tax Reform Outline for FY2021 (approved by the Cabinet on December 21, 2020), revisions to special measures for test and research funds, the upper limit of tax credits, and cloud-based software were implemented.	・In FY2021, the government will promote the application of the system by disseminating and publicizing the contents of the revisions. In FY2022 and beyond, we will examine the effects of the revisions. [METI]
○The government will promote ESG finance and impact finance as a form of development of ESG finance to mainstream finance that pursues positive impact on society, the economy, and the environment. In particular, the government will aim to ensure that all institutional investors and financial institutions implement impact finance in all asset classes. In FY2021, the government will develop a promotion system for major	・In the Positive Impact Finance Task Force under the ESG Finance High Level Panel, Basic Approach to Impact Finance (July 2020) and "Guide to Impact Assessment Starting with Green" (March 2021) were compiled.	・We will promote implementation of impact finance in all asset classes by disseminating the Basic Approach to Impact Finance and the Impact Assessment Guide Starting with Green and formulating specific projects through model projects. [MOE]

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
financial institutions and institutional investors, and as the next step, the government will encourage a ripple effect on efforts towards regional financial institutions and small and medium-sized, and individual investors . [FSA, METI, MOE]		
○Society 5.0 Indicators will be developed by the end of FY2022 to grasp the status of investment toward realization. [STI]	・Discussions were held on measures to activate the flow of funds for investment in science, technology and innovation toward realization of Society 5.0.	・We will examine investment details and related statistics to realize Society 5.0. [STI]

6. Strengthening control tower functions in Council for Science, Technology and Innovation

(1)Strengthening functions to utilize the convergence of knowledge and formulation of policies for the future and dissemination of information

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
In order to solve social issues, it is necessary to present new values and to take a systematic approach, in addition to the approaches that are an extension of conventional approaches. In order to respond to issues such as the institutional and ethical aspects and social acceptance that arise when new technologies are used in society, we will construct a system that can utilize the convergence of knowledge including the humanities and social sciences. In this process, in 2030, we will draw up a social image for which to aim further down the road, and systematize policies by taking a back-cast approach from that social image. In addition, we will firmly grasp and analyze the current situation, formulate new policies for the future by taking a forward-cast approach, and take a foresight approach by combining these.[185]. In policy formulation, multi-layered science and technology communication with society and information transmission to the public and diverse sectors are also important. In light of the importance of Science for Policy in an age in which t trans-science[186] is emphasized, it is important for academia, politics, and administration to share a recognition of issues and assumptions, and to provide independent and appropriate advice and recommendations based on scientific knowledge. For example, the establishment of a mechanism to connect these parties will be examined.	・The Sixth Basic Plan was formulated using the foresightapproach. The same applies to Integrated Strategic Innovation Strategy 2021. ・In March 2021, the Cabinet Office began using social media to disseminate information on science, technology, and innovation policies.	・We will formulate the annual Integrated Innovation Strategy using comprehensive knowledge and a foresight approach. [STI] ・We will continue to disseminate information through various media including social media. [STI] ・We will follow up on efforts by each stakeholder to consider ways to deal with problems with a trans-scientific structure. [STI]

(2)Strengthening policymaking functions and ensuring policy effectiveness through the use of the evidence system (e-CSTI)

Specific measures under the Basic Plan	Analysis of implementation status	Future action policy

[185] An activity in which various pieces of information are combined to examine a rapidly changing, complex and uncertain future.

[186] A question that can be asked of science but cannot be answered by science alone.

	and current status	
In science, technology, and innovation administration, the EBPM of policy formulation based on objective evidence shall be thoroughly implemented, and policy formulation based on evidence shall be carried out in all relevant ministries and agencies by FY2023. In doing so, the performance of management of government R&D investment that serves as a catalyst for private investment, various measures including advanced corporate management (EBMgt[187]) in national universities and research and development agencies, and national strategy planning shall be improved by utilizing the evidence system (e-CSTI).	・We will strive to further enhance the analytical functions of e-CSTI and promote the sharing of analytical functions with related organizations such as related ministries and agencies, national universities, and research and development agencies.	・A scheme will be established to facilitate the smooth use of e-CSTI data in implementing Evidence-based Policymaking at the relevant ministries and agencies. [STI]

(3)Implementation of policy evaluation and formulation of integrated strategies linked to the Sixth Basic Plan

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
Based on the direction of medium- and long-term policies indicated in the Sixth Basic Plan, the Integrated Strategy has been formulated as an annual strategy since FY2013, and measures that should be given special emphasis in that fiscal year have been determined based on the changes in the situation every year. During the period of the Sixth Basic Plan as well, measures that should be given particular emphasis in each fiscal year will be indicated in the annual strategy by clarifying their relevance to the Sixth Basic Plan. In this regard, the progress of the Sixth Basic Plan will be continuously monitored and evaluated by an expert committee for evaluation using indicators. The results will be used in the formulation of the Annual Strategy and the next Basic Plan. In addition, the Sixth Basic Plan will be revised as necessary to promote flexible science, technology, and innovation policies in response to changes in social conditions, etc. For this purpose, the functions of e-CSTI will be continuously expanded, the collection of monitoring indicators will be	・Integrated Innovation Strategy 2021 was formulated as an annual plan to promote the Sixth Science and Technology Basic Plan. ・Indicators were established to monitor the progress of the Sixth Basic Plan. ・The viewpoints for the evaluation, analysis and monitoring of the Basic Plan were summarized by the Expert Panel on Evaluation.	・By analyzing the relationship between various indicators and outputs, we will promote the development of evaluation infrastructure that can simulate changes in outputs due to the promotion of various policies through e-CSTI. At the same time, the ideal way of utilizing this function will be studied by the Expert Panel on Evaluation. [STI] ・We will monitor the progress of the Basic Plan by monitoring key indicators and reference indicators. [STI] At the same time, we will develop methods for assessing and analyzing progress. [STI] ・We will conduct surveys and studies to establish a mechanism to collect information that supports the evaluation and analysis of the progress of the Basic Plan. [STI]

[187] Management based on evidence

automated, and the basis for cross-sectoral evaluation will be put into operation by the end of FY2023. In addition, research and studies will be carried out to upgrade the EBPM, including the development of analytical methods, and the indicators will be continuously improved and revised.		

(4)Ensuring effectiveness of control tower functions

Specific measures under the Basic Plan	Analysis of implementation status and current status	Future action policy
Command and control centers such as CSTI, the Strategic Headquarters for the Promotion of an Advanced Information and Telecommunications Network Society, the Intellectual Property Strategy Headquarters, the Headquarters for Healthcare and Medical Strategy Promotion, the Strategic Headquarters for National Space Policy, and the Headquarters for Ocean Policy, all of which are closely related to science, technology, and innovation policies, are required to strengthen their command-and-control functions to coordinate policies across-the-board. To this end, the Act for Establishment of the Cabinet Office was amended to establish the Office for the Promotion of Science, Technology, and Innovation in April 2021. With regard to science, technology, and innovation-related policies promoted by related command and control centers and related ministries and agencies, a system will be established as soon as possible so that the secretariat can effectively work out coordination functions such as eliminating overlapping policies and promoting collaboration. In order to realize Society 5.0, CSTI will further deepen cooperation with the above-mentioned command and control centers and the Science Council of Japan, and strengthen cooperative relations with various councils of relevant ministries and agencies in policy studies. In addition, based on the progress of concrete reform of the Science Council of Japan in order for it to play a better role as the representative institution of scientists in Japan, new cooperative relations will be established according to the roles required of the Science Council of Japan.	・In April 2021, the Science, Technology and Innovation Promotion Secretariat was established in the Cabinet Office. ・Through the Integrated Innovation Strategy Promotion Council, the government will strengthen cooperation with related control tower function meetings and relevant ministries and agencies. ・Toward a Better Role for Science Council of Japan was reported in Science Council of Japan (April 22, 2021).	・In order to ensure the effectiveness of the control tower functions, the government will continue to promote cooperation with relevant control tower meetings and relevant ministries and agencies through the Integrated Innovation Strategy Promotion Council, etc. [STI] ・The status of the strengthening of the control tower functions by the Science, Technology and Innovation Promotion Secretariat will be reviewed, and if necessary, the control tower functions and their structure will be reviewed. [STI] ・The Council of Experts will hold policy discussions on the modality of Science Council of Japan and deepen discussions. [Cabinet Office]

List of abbreviations

*Abbreviations of ministries and agencies used in [] are as follows:

Abbreviation	Name of Ministries and Agencies		
CPB	Cabinet Secretariat	Cabinet Personnel Bureau	
IT		National Strategy Office of Information and Communication Technology	
G-Space		Geospatial Information Utilization Promotion Office	
Expo		Secretariat of the Headquarters for the World Expo	
NPA	National Personnel Authority (NPA)		
Reconstruction	Reconstruction Agency		
EFSS	Cabinet Office	Director General for Economic, Fiscal and Social Structures	
Disaster		Director-General for Disaster Management	
REVIC		Office for Regional Economy Vitalization Corporation of Japan	
Gender Equality		Gender Equality Bureau	
Regulatory Reform		Office of Regulatory Reform	
OPDVLE		Office for the Promotion of Overcoming Population Decline and Vitalizing Local Economy in Japan	
SIPSH		Secretariat of the Intellectual Property Strategy Headquarters	
STI		Science, Technology, and Innovation Promotion Secretariat	
Healthcare		Healthcare Policy Promotion Secretariat	
Space		National Space Policy Secretariat	
CCRA		Child and Child-Rearing Administration	
Ocean		National Ocean Policy Secretariat	
AMED		Office for Japan Agency for Medical Research and Development (AMED) and Medical Information Infrastructure	
JFTC		Japan Fair Trade Commission	
Police		National Public Safety Commission	National Police Agency
PPC		Personal Information Protection Commission Secretariat	
FSA		Financial Services Agency	
MIC	Ministry of Internal Affairs and Communications		

Abbreviation	Name of Ministries and Agencies
MOFA	Ministry of Foreign Affairs
MEXT	Ministry of Education, Culture, Sports, Science and Technology
MHLW	Ministry of Health, Labour and Welfare
MAFF	Ministry of Agriculture, Forestry and Fisheries
METI	Ministry of Economy, Trade and Industry
MLIT	Ministry of Land, Infrastructure, Transport and Tourism
MOE	Ministry of the Environment
MOD	Ministry of Defense