

[Tentative translation]

Integrated Innovation Strategy 2024

June 4, 2024

Cabinet decision

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1. Basic Concept

- The Integrated Innovation Strategy 2024 (hereinafter referred to as "Integrated Strategy 2024") is an annual strategy in its fourth year positioned as an implementation plan of the Sixth Basic Plan for Science, Technology and Innovation (Cabinet decision of March 26, 2021; hereinafter referred to as the "Sixth STI Basic Plan"). The Integrated Strategy 2024 is the first step toward making the next Basic Plan for Science, Technology, and Innovation from FY2026, a plan with a long-term vision for the realization of a nation that will create science and technology in the Reiwa era.
- Science, technology and innovation are driving forces in Japan's economic growth, and their importance is growing even more in solving social issues and responding to disasters. In addition, as the global security environment increases in severity, such as the situation in Ukraine and the situation in Israel and Palestine, competition for leadership over key technologies intensifies, and supply chains are fragmenting on a global scale. On the other hand, there are concerns that the decline in relative research capabilities and the delay in the creation of an innovation ecosystem will significantly impact Japan's economic growth and future job creation.
- It is important to further strengthen research capabilities, industrial competitiveness, and responses to economic security from a global perspective, and to strengthen cooperation with the international community, including our ally and like-minded countries such as the G7, as well as the Global South, including ASEAN and India.
- In Japan, automation and labor-saving through AI and robotics are urgently needed as manpower shortages worsen, and preparedness and response to frequently occurring disasters are also urgent issues. As science, technology and innovation play even more important roles in these areas, the social implementation of technology shall be accelerated.
- While investment in science, technology and innovation continues to increase over time in other countries, investment in R&D by Japanese private companies has remained flat. Although domestic investment is showing signs of expansion, as shown by the fact that firms' willingness to invest in capital investment, which had been sluggish, is at its highest level since 1983, and the amount of capital investment by private companies is expected to be 104.8 trillion yen in FY2024, it is extremely important that the public and private sectors continue to make bold R&D investments in cooperation with each other in order to survive fierce competition among countries with the awareness that this is the last chance to connect this "turn of the tide" to continuous growth, and that the results of such investments be implemented and commercialized in society to lead to economic growth in Japan.
- Under the Integrated Strategy 2024, we will continue to promote policies based on the three pillars of "strategic promotion of advanced science and technology," "enhancement of knowledge bases (research capabilities) and human resource development," and "creation of an innovation ecosystem," and we will also promote an "integrated strategy for key technologies," "strengthening cooperation from a global perspective," and "enhancing competitiveness and ensuring safety and security in the AI field" as the three strengthening measures.
- In order to realize Society 5.0, we will steadily grasp and evaluate the progress of the Sixth STI Basic Plan, continuously grasp and analyze changes in the situation and latest trends in Japan and overseas using e-CSTI, etc., and reflect these research conclusions in science, technology and innovation policies to promote measures efficiently and effectively.

2. Three to Strengthening Measures

(1) Integrated Strategy for Key Technologies

- Fusion energy and quantum technologies are emerging technologies that will spawn new industries. AI, biotechnology, materials, semiconductors, and Beyond 5G (6G) are fundamental technologies that support Japan's economy and society, and they are becoming increasingly important in Japan's economic growth. With regard to these key technologies, we will strongly promote R&D, industrialization, and human resource development by integrating technologies across fields from a bird's-eye perspective.

① R&D by Developing Core Technologies and Integrating Technologies with Other Strategic Areas

- As a source of Japan's international competitiveness, R&D of core technologies in each field is becoming increasingly important not only from the viewpoint of securing superiority in the international community but also from the viewpoint of economic security. In light of this situation, we will strongly promote the development of core technologies that can become game changers in the global market through Industry-Academia-Government Collaborations and the implementation of bounty type projects. In order to further promote science, technology and innovation policies, the national government will organize the purpose and effective use of new policy tools such as bounty type projects, in addition to existing policy tools such as subsidies and outsourcing costs.
- We will also engage in R&D by integrating technologies with other strategic fields, and accelerate the creation of new R&D results and their implementation in society. Specifically, through integration with AI, quantum, robotics, and IoT technologies, we will promote automation and speedup of R&D and manufacturing processes, and increase efficiency and sophistication of R&D through data analysis using AI, etc.
- In addition, we will strengthen our technology intelligence functions to explore and identify frontier areas, and provide priority support to frontier areas that will sprout new industries.

② Establishment of Domestic Infrastructure and Promotion of Innovation by Startups

- In the field of advanced science and technology, markets are developing or have not yet been formed on a global scale. Therefore, it is not an exaggeration to say that developing a global market as a blue ocean will be the key to the subsequent leadership battle.
- In order to secure an advantage in new markets, we will promote the early creation of use cases and markets by industry, academia, and government as an exit strategy for R&D. We will also strengthen the development and utilization of test beds and the accumulation of data and know-how as bases and hub functions for this purpose.
- Startups are also important players that play a role in innovation. We will use the bases and hub functions of industry, academia and government to nurture startups and support innovation generation. In particular, we will work to create a strong ecosystem that supports the long-term growth of startups in the field of advanced science and technology, which often requires larger and longer-term funding than other fields.

③ Developing and Securing Human Resources through Industry, Academia, and Government

- In advancing R&D and commercialization of important technologies in Japan, it is essential to develop and secure human resources who can perform the control tower function and management function from a general perspective, rather than from a partially optimal perspective. Industry, academia, and government will collaborate to promote the following initiatives.
- In order to bring technology to market, it is necessary to quickly maintain experts who will be responsible

for the commercialization of technology and integration of production processes and systems. We will work to strengthen the domestic supply capacity of human resources and improve the mobility of industrial human resources.

- In addition, in order to develop new markets in Japan and overseas, we will work to develop human resources, including the formation of human networks in various foreign countries and regions, because there will be many situations in which building alliances with relevant players and dealing with regulations, systems, and standards will be required.
- In addition, from the viewpoint of expanding markets over the long term, it is necessary to develop highly skilled human resources who will carry out R&D of advanced science and technology. We will work to develop R&D human resources who can adapt to new research methods while utilizing knowledge not only from specialized fields but also from other fields.

(2) Strengthening Collaboration from a Global Perspective

① Leading and Participating in International Rulemaking

- In order to implement R&D results and innovations in society, rulemaking, which defines how new markets should be, is extremely important. With regard to important technologies such as AI, fusion energy, quantum technology, biotechnology, and materials, we will lead and participate in international rulemaking in promoting development, use, and ensuring safety, while collaborating with the international community.
- In recent years, EU countries, the United States, China, and other countries have focused on international standardization, which can be done independently by private companies, as an effective means of securing competitiveness. In order to take the initiative from the viewpoint of economic security, they have strengthened their comprehensive national standards strategies to compete with each other, and have focused their political resources on these initiatives. While Japan is further advancing its strategic international standardization activities, Japan will strengthen the government's control tower function, develop measures to develop and implement international standards strategies through industry-academia-government collaborations, in areas such as key technologies, economic security, and environmental rules, that carry large impact on industry and society, and develop measure to sustainably strengthen its capacities.
- Regarding the implementation to promote and strengthen international standards strategies and open and close strategies by private companies and universities will be further promoted and laterally expanded in government R&D projects, support projects, and other projects, based on the effective efforts being made through the Green Innovation Fund Projects and the Beyond 5G (6G) Fund Project. In these projects, from the early stages of R&D, as business strategy activities to secure international competitiveness and promote social implementation, efforts are being made to raise the level of commitment of private management regarding international standardization, strengthen internal systems and human resources, and strongly encourage international alliances.
- In rulemaking, it is necessary for industry, academia, and government to share and implement Japan's policy of making strategic use of bilateral and multilateral frameworks and alliances, starting with our ally, like-minded countries, and ASEAN, from the perspectives of Japan's advantage in the global supply chains and securing markets, as well as the perspective of strengthening the global supply chains from which Japan benefits. In addition, it is necessary to strengthen human resources and support organizations in Japan involved in international rulemaking, promote business models that promote management strategies and international standardization activities in an integrated manner, and develop an ecosystem in which rulemaking is autonomously promoted by private companies and others, as in the West. To this end, Japan will formulate a comprehensive standard strategy in around spring 2025 and strengthen and promote related

measures.

② **Strengthening Coordination between Science, Technology and Innovation Policies and Economic Security Policies**

- In light of the growing importance of science, technology and innovation in the field of economic security, we will strengthen cooperation between science, technology and innovation policies and economic security policies in both offensive and defensive ways.
- Specifically, we will promote strategic R&D on key technologies for economic security, including international cooperation and collaboration, such as joint research between countries, and work to ensure research security and integrity and prevent technology leakage.

③ **Active Use of Resources and Strategic Cooperation from a Global Perspective**

- As global issues such as climate change and infectious diseases are becoming more serious, geopolitical situations are destabilizing, and the impact of emerging technologies on society is expanding, international cooperation for science and technology is becoming increasingly important.
- Under these circumstances, in order to further strengthen Japan's research capabilities, generate outstanding research results, and promote science and technology diplomacy based on diplomatic policies such as the realization of a Free and Open Indo-Pacific (FOIP) based on the rule of law, it is necessary to actively utilize domestic and international resources through cooperation with our ally and like-minded countries, including the G7, and the Global South, including ASEAN and India, and to promote strategic cooperation. In addition, it is necessary to create an environment in which researchers can devote themselves to overseas research, promote international cooperation based on free thinking, and promote international talent mobility and circulation.
- Specifically, the Adopting Sustainable Partnerships for Innovative Research Ecosystem (ASPIRE) program will promote the participation of researchers in the international top science circle through strategic support of international joint research with advanced countries such as in Europe and the United States in the field of advanced science and technology and strengthen exchanges and networks of young researchers.
- With ASEAN countries, the Networked Exchange, United Strength for Stronger Partnerships between Japan and ASEAN (NEXUS) will promote international joint research, exchange and development of research personnel, and contribute to building sustainable relations between Japan and ASEAN.
- In addition, we will continue to promote the formation of bases that serve as hubs for international talent mobility and circulation that attract researchers from overseas through the World Premier International Research Center Initiative (hereinafter referred to as "WPI"), etc. Moreover, we will further accelerate the internationalization of research by, for example, increasing the amount of research funding allocated to research projects expected to have a high ripple effect internationally in the Grants-in-Aid for Scientific Research (hereinafter referred to as "KAKENHI").
- In international student exchange, which forms the basis for strategic collaboration, we will work to enhance and implement continuous support to promote medium- to long-term study abroad by Japanese students, and promote the recruitment and employment of excellent international students. We will also promote the establishment of the co-learning environment for domestic and international students, the strengthening of inter university exchange, and the recruitment and training of university staff with advanced and specialized knowledge in international operations.
- In addition, through contributions to international organizations, Japan will contribute to solving social

issues in developing countries through the knowledge of science, technology and innovation possessed by Japanese companies, and plan to reinforce Japanese companies' technologies overseas. We will also participate strategically in discussions necessary for Japan through the dispatch of experts to international organizations.

(3) Enhancing Competitiveness and Ensuring Safety and Security in the AI Field

- Generative AI is considered to be a technological innovation comparable to that of the Internet, and while it will bring about major changes in socioeconomic systems, various risks such as the dissemination of Dis-/Mis-information and the sophistication of crime are pointed out, and safety and security are required.
- In order to follow the lead of U.S. companies and other companies in developing high-performance and large-scale general-purposed foundation models, Japan is developing computational resources and large-scale models, and is also advancing new research, such as the development of small-scale and high-performance models and combinations of multiple models.
- AI can be used in all fields, and innovations, through such as the development and use of AI can lead directly to solutions to social issues and Japan's competitiveness. In Japan, we aim to form a virtuous cycle that accelerates innovation while suppressing various risks of AI, including generative AI, and ensuring a safe and secure environment. In addition, we will continue to demonstrate leadership internationally through the Hiroshima AI Process and other initiatives that Japan leads.

① Accelerating AI Innovation and Innovation by AI

- In addition to developing and securing human resources and upgrading infrastructure such as computing resources, the government and the private sector will work together to promote the use of AI and strengthen R&D capabilities. Data is essential for the evolution of AI, and AI-related policies will be implemented in coordination with data strategies.

(Strengthening R&D Capabilities (Including Data Improvement))

- To strengthen AI development capabilities, we will improve and expand high-quality Japanese data set and provide it in an appropriate way. In order to develop competitive AI in each field, we will promote data sharing and share good practices.
- The public and private sectors will continue to work together to make computing resources essential for AI development available to a wide range of developers.
- We will collaborate with industry and academia in R&D to promote high efficiency, high precision, multimodalization and risk mitigation of AI model, while supporting startups with innovative technologies.
- We will accelerate AI for Science in the public and private sectors by strengthening the infrastructure for scientific research data development, which is Japan's strength, in fields such as medicine, drug discovery, and materials. We will also start developing and introducing a new flagship system with superior AI performance that will be the next flagship system.
- The public and private sectors will advance R&D and implementation of innovative AI robots that can flexibly respond to changes in the environment that contribute to the elimination of labor shortages and GX.

(Promotion of AI Utilization)

- The government will promote the appropriate procurement and use of AI and the sharing of the obtained knowledge in order to further advance the "Agreement on Business Use of Generated AI such as ChatGPT

(Ver 2.0)" based on the formulation of the AI Guidelines for Business and serve as a model for other organizations.

- We will promote the adoption of AI in important fields such as healthcare and robotics.
- In order to enable users and developers to utilize and develop AI without being overwhelmed, we will clarify the operation of systems that require attention, such as the Act on the Protection of Personal Information (Act No. 57 of 2003), the Copyright Act (Act No. 48 of 1970), and various business laws.

(Upgrading of Infrastructure)

- In addition to promoting R&D in order to increase the size and decentralization of data centers, reduce power consumption, and upgrade to cutting-edge network systems such as Beyond 5G (6G), we will expand private investment in infrastructure critical to AI.
- The government will support the establishment of industry-university collaboration systems for the design, development, and operation of key devices such as AI semiconductors, R&D, and human resource development.
- We will consider creating an environment to secure cheap decarbonized electricity.

(Development and Securing of Human Resources)

- We will enhance and promote educational content for the acquisition of AI skills and improvement of AI literacy. In addition, at the primary and secondary education level, we will further promote pilot initiatives on the use of AI including information ethics.
- We will support young researchers and doctoral students who will take charge of AI development for the next generation.

② Ensuring AI Safety and Security

- In order to promote innovation, we need rules as a guardrail to ensure the safety and security of using AI. In order to respond to changes quickly and flexibly, Japan has a basic policy of encouraging voluntary efforts by businesses operators based on the AI Guidelines for Business. In the future, we will examine how the system should be based on various risks related to AI and international trends in soft law such as specifications and guidelines and hard law such as laws and legal criteria.

(Consideration of Voluntary Governance and Systems)

- We will publicize and disseminate the AI Guidelines for Business to a wide range of industries.
- Based on “The concept for the AI regulation” approved by the AI Strategy Council in May 2024, the AI Regulation Study Group (tentative name), which will be newly established under the AI Strategy Council, will begin to study how the regulation should be.
- Important fields that have a significant impact on society, such as healthcare, autonomous driving, and finance, will be examined for the need to review the system in accordance with the progress and usage of technology.

(Consideration of AI Safety)

- The AI Safety Institute (AISI) has been established at the Information-technology Promotion Agency, Japan (IPA) as a central organization for AI safety. We will foster and maintain experts at AISI and promotes consolidating advanced technological knowledge. Through the AISI Inter-Agency Liaison

Committee, where the Cabinet Office serves as the secretariat, relevant ministries, agencies, etc. will present government policies and other matters for ensuring AI safety to the AISI Steering Committee established by AISI, receive reports on business policies, plans, and outcomes, and cooperate with AISI.

- The public and private sectors will work together to advance cutting-edge R&D on AI safety, including technologies that use external knowledge to prevent hallucinations.

(Countermeasures to Dis-/Mis-information)

- Taking into account international trends, the government will promote comprehensive measures including institutional aspects, such as the promotion of technology and R&D, fact-checking, and strengthening of international cooperation, in response to dis-/mis-information, and fake advertising that circulates and spreads on the Internet, including those using generative AI.
- The government will develop and demonstrate technologies to identify AI-generated content that circulates on the Internet, as well as improve AI literacy.

(Intellectual Property Rights, etc.)

- Based on the interim report of the Cabinet Office's expert panel on intellectual property rights in the AI era of the Cabinet Office, and the "General Understanding on AI and Copyright in Japan" published by the Legal Subcommittee under the Copyright Subdivision of the Cultural Council, the necessary examination including likenesses and voices of actors and voice actors will continue, while observing future technological developments and overseas trends.

③ **Promotion of International Cooperation and Collaboration**

- We will continue to lead international efforts to achieve safe, secure, and trustworthy AI through the Hiroshima AI Process and other initiatives, and continue to promote the creation of innovation in cooperation with Asian countries and the Global South.
- To further advance the outcomes of the Hiroshima AI Process, we will use the Hiroshima AI Process Friends Group to promote outreach outside the G7 and expand the implementation of International Guiding Principles and Code of Conduct.
- Through the Global Partnership on Artificial Intelligence (GPAI) Tokyo Expert Support Center, we will support project-based cooperation such as the evaluation and demonstration of technologies to counter the spread of disinformation that contribute to the implementation of the outcomes of the Hiroshima AI Process.
- We will build international networks between AISIs of Japan and other countries and examine measures to ensure the safety of AI.
- We will promote community activities in the public and private sectors, such as know-how sharing among AI developers and exchanges with global tech companies, and establish role models for cooperation with the Global South in the field of AI.
- We will establish a development system that firmly cooperates with the United States and other interested countries and regions, as well as an industry-academia collaboration system that takes advantage of the potential of universities and the National Research and Development Agencies (Hereinafter referred to as "Kokken").

3. Three Cornerstones of Steady Promotion

(1) Strategic Promotion of Advanced Science and Technology

① Strategic Promotion of Key Fields

- As mentioned above, the government will work to strengthen competitiveness and ensure safety and security in the AI field, and we will strategically promote initiatives in key fields such as fusion energy, quantum technology, biotechnology, materials, and digital social infrastructure as follows.

(Fusion Energy)

- As the next generation of clean energy, fusion energy is expected to be a solution to environmental and energy problems, and private investment in other countries is increasing due to the scientific and technological progress of government-led initiatives such as ITER, which is under construction as an international project, and Lawrence Livermore National Laboratory in the United States. As countries around the world make large-scale investments and strengthen the lock-in of technology and human resources in their countries as a national policy, Japan will accelerate efforts based on the Fusion Energy Innovation Strategy (Integrated Innovation Strategy Promotion Council decision of April 14, 2023)" in order to prevent the outflow of Japanese technology and human resources overseas and contribute to Japan's security policy, including energy. In particular, from the perspective of clarifying the country's commitment, Japan will aim to realize fusion energy as soon as possible by preparing a timetable that includes necessary national efforts toward achieving the first demonstration of power generation in the 2030s ahead of other countries. In order to enhance the predictability of private companies and academia, a roadmap based on backcasting will be developed by taking full advantage of the knowledge of ITER project/BA activities and emerging technologies, while taking into account the ambitious power-generation timing of startups in the US, UK, etc.
- In order to accelerate the development of the foundation for the realization of the DEMO reactor, the research capabilities of industry, academia, and government will be strengthened, and the National Institutes for Quantum Science and Technology (hereinafter referred to as "QST") and other organizations will be strengthened. In cooperation with other Kokken, academia and private companies will be brought together to carry out technology development, as well as to arrange test facilities and equipment for full-scale technology development that can be used for startups, etc. In addition, while the R&D of various types of magnetic confinement systems such as tokamak, helical, field-reversed configuration, mirror, and inertial confinement systems such as laser, etc. are being promoted, in cooperation with the industry such as the Japan Fusion Energy Council (J-Fusion), which was established in March 2024, the government will promote initiatives to build an ecosystem, such as supporting the development of supply chains and the promotion of investment, by strategically taking the lead in international standardization and demonstrating applications for various social implementations such as small power sources. In addition, the government will steadily acquire core technologies through the ITER project/BA activities, while also looking ahead to the revision of the ITER project baseline, and strengthen multilateral and bilateral cooperation based on the Japan-U.S. Joint Leaders' Statement and the Japan-EU Joint Press Statement. In addition, in order to promote the participation of private companies and the development of DEMO reactors, the task force for formulation of basic concepts on ensuring safety in Cabinet Office will cooperate with related academic societies and other like-minded countries, including the G7, to formulate a scientifically rational and internationally coordinated basic approach by the end of FY2024. At the same time, in order to strategically develop human resources involved in fusion energy such as the development of DEMO reactors, a systematic human resource development system will be established through inter-university and international cooperation, and the development of an environment that fosters public understanding through risk communication will be promoted in an integrated manner.

(Quantum Technology)

- Against the background of the remarkable progress of quantum technology, the situation surrounding Japan has changed greatly, with the formulation of national strategies and the activation of international cooperation in various countries. In order to respond quickly to the changing situation for practical application and industrialization in Japan and overseas, “Quantum Technology and Innovation Strategy” (Integrated Innovation Strategy Promotion Council decision of January 21, 2020), “Vision of Quantum Future Society” (Integrated Innovation Strategy Promotion Council decision of April 22, 2022), and “Strategy of Quantum Future Industry Development” (Integrated Innovation Strategy Promotion Council decision of April 14, 2023) formulated so far have been strengthened, and the contents to be complemented have been summarized by Expert Panel on Quantum Technology Innovation as "Promotion Measures for the Development of Quantum Industries," and reported to the Integrated Innovation Strategy Promotion Council in April 2024.
- Based on these strategies and measures, we will steadily engage in basic and applied research on quantum technologies and promote the fusion of quantum technologies with basic technologies (AI technologies, classical computing infrastructure, etc.). In addition, we will advance the creation and demonstration of practical use cases in various fields such as biotechnology and materials, as well as support the creation of startups and new businesses by building and strengthening global supply chains, promoting international standardization activities, and improving the use environment for quantum computing resources and quantum cryptography.
- In addition, with the aim of securing Japan's superiority in quantum technology and acquiring human resources, we will nurture and secure world-class research human resources through overseas dispatch of doctoral students and young researchers, summer schools, etc., develop specialized human resources for industrialization, and educate young people for the future. At the same time, we will strengthen research systems at universities and other institutions that explore the basic science of quantum science and technology, and create opportunities for global expansion and collaboration between industry and academia through intergovernmental cooperation, etc.
- In addition, for the early industrialization of quantum technology, we will develop core technology for quantum computers at RIKEN, build an industrial ecosystem for quantum computers utilizing the facilities of the Global Research and Development Center for Business by Quantum-AI technology (G-QuAT) established last year at the National Institute of Advanced Industrial Science and Technology (AIST), utilize a wide-area testbed of the National Institute of Information and Communications Technology (NICT) for social implementation, and utilize the testbed utilization environment such as quantum sensors at QST.

(Biotechnology)

- Global policy and market competition for biotechnology and biomass-based bioeconomy, including investment and rulemaking, is accelerating.
- There has been a growing expectation for Japan's contribution to solving various issues are growing, as a large budget of 1 trillion yen was set for the biotechnology sector such as biomanufacturing in FY2022.

- In light of this situation, based on the revised Bioeconomy Strategy (Integrated Innovation Strategy Promotion Council decision of June 3, 2024), Japan will further accelerate the resolution of social issues such as the environment, food, and health and the realization of sustainable economic growth through the creation of a bioeconomy market totaling 100 trillion yen.
- Specifically, the government, industry, academia, and financial institutions will work together to accelerate the development of technologies such as synthetic biology, improve the market environment and business environment, and strategically utilize international standards in the following five markets: bio-manufacturing and bio-derived products; sustainable primary production systems; large-scale buildings utilizing wood and smart forestry; biopharmaceuticals, regenerative medicine, cell therapy, and gene therapy-related industries; and lifestyle improvement healthcare and digital health. In addition, we will promote the development of human resources to support life science research as a source of the expansion of the bio-economy, the promotion of basic life sciences such as research focusing on the life course, and the development of research infrastructure such as databases, bio-resources, and biobanks, as well as the promotion of initiatives to demonstrate bio-community functions and the promotion of fundamental and cross-cutting efforts such as data collaboration and utilization for the fusion of bio-digital, in coordination with initiatives in relevant areas such as startups.

(Materials)

- Materials are a cross-cutting fundamental technology that leads to solutions to a wide range of industrial and social issues, including electronics, life sciences, and environment, and energy. Their R&D capabilities are the source of Japan's international competitiveness. Materials are becoming increasingly important in fields where international competition is intensifying, such as quantum technologies and next-generation semiconductors, and in fields important for economic security. Based on the Materials Innovation Strategy (Integrated Innovation Strategy Promotion Council decision of April 27, 2021) Japan will promote the following initiatives.
- In order to respond to the demand for innovative materials development for pressing social issues, we will promote basic research and human resource development by improving infrastructure such as research infrastructure.
- We will accelerate the creation of results through data-driven research by steadily improving the materials DX platform and developing and introducing the latest research methods such as generative AI.
- With regard to manufacturing processes, which are the source of competitiveness in the materials field, we will work to build process science, develop and improve basic technologies for data acquisition, and build and utilize process databases.
- In the third phase of the Strategic Innovation Promotion Program (hereinafter referred to as "SIP"), we will aim to build a startup development ecosystem.

(Formation of a Digital Society)

- The formation of a digital society through digital twins utilizing advanced science and technology and diverse and large amounts of data is the foundation for the realization of Society 5.0. The Digital Agency was established in September 2021, and under the Priority Policy Program for Realizing the Digital Society (Cabinet decision of June 9, 2023; the revision is scheduled for mid- 2024), in cooperation with relevant ministries and agencies, the Agency will steadily promote the creation of a data utilization environment and the review of analog regulations based on the "Timetable for Reviewing Analog Regulations Based on Digital Principles." In addition, we will continue to promote the development of base registries, digitalization in quasi-public fields such as education, medical care, and disaster prevention, the securing of trusts as the basis for Data Free Flow with Trust (hereinafter referred to as "DFFT"), the development of data criteria and standards, and the securing of interoperability between data spaces in Japan and

overseas. We will further promote DFFT under the international framework approved by the G7 Digital and Tech Ministers' Meeting in Takasaki, Gumma and the G7 Hiroshima Summit. In addition, we will promote initiatives for sharing and utilizing data across the borders between enterprises and industries, and national boundaries, such as the Ouranos Ecosystem, and promote initiatives related to the development of CAV (Connected Autonomous Vehicles) corridors, UAS (Urban Aircraft System) corridors, and digital transformation of infrastructure management based on the Digital Lifeline Development Plan.

(Digital Social Infrastructure)

- As the digital society advances further and the fusion of cyberspace and physical space advances, such as the penetration of AI into society and its expected utilization in various fields, it is essential to further enhance data and ensure sound information distribution, secure the industrial base that supports the digital society, and advance the development and upgrading of information and communication infrastructure. For this reason, with regard to semiconductors, which is the strategic basic technology that supports the digital society, we will accelerate efforts to improve the R&D system and human resource development base of industry and academia, and secure the industrial base. In addition, based on the Infrastructure Development Plan for a Digital Garden City Nation revised in April 2023, we will continue to promote the development of 5G and optical fiber, the distributed location of data centers, and the development of regional digital infrastructure in order to support data distribution and the use of advanced AI. We will also promote R&D, international standardization, social implementation, and overseas expansion efforts in an integrated manner for the early realization of Beyond 5G (6G) including all-optical and non-terrestrial networks.
- Health and medicine, space, oceans, food, agriculture, forestry, and fisheries, and the environment and energy are important fields that support people's lives and Japan's economy, and it is necessary to strategically promote them from the perspectives of research capabilities and economic security.

(Health and Medicine)

- Based on the Healthcare Policy (Cabinet decision of March 27, 2020) and the Plan for Promotion of Medical Research and Development (Headquarters for Healthcare Policy decision of March 27, 2020), the following initiatives will be promoted. In addition, based on the fact that the current Phase 2 Healthcare Policy, etc. will covers up to the end of FY2024, the Phase 3 Healthcare Policy, etc. will be formulated.
- With the aim of restoring Japan's drug discovery capabilities, we will promote the development of a biopharmaceutical production system, an internationally competitive system capable of conducting FIH studies (first-in-human studies), and an investigational drug manufacturing facility, and work to realize an international-level R&D environment in which seeds are rapidly put to practical use.
- We will comprehensively promote R&D focusing on the life course in order to realize a society in which all ages, including the elderly, are healthy. Specifically, we will promote research for the early prevention and treatment of neurological diseases such as dementia, innovative fusion research including using next-generation iPS cells and the like, and iPS drug discovery research, the realization of personalized medicine and preventive medicine through cooperation among biobanks, R&D utilizing organoids, etc., to elucidate the mechanisms of the life course, promote cancer research with an awareness of social implementation based on the "(fifth) 10 Year Strategy for Cancer Research," develop an environment where PHRs such as information on health, medical care, and nursing care and life log data can be organically linked, and promote the spread of online medical care and telemedicine.
- In order to continue to generate results from health and medical research over the medium to long term, it is essential to revive basic research. In addition to creating an environment where young researchers can devote themselves to research, efforts will be made to secure human resources for research support and

enhance competitive research funding for young researchers.

- With the aim of accelerating high-value-added research in the medical field, efforts will be made to create an environment for promoting the appropriate management and use of reliable health and medical data, develop infrastructure to support medical research DX, and foster a new research community and environment.
- Strategic promotion and simulation of vaccine R&D will be implemented to prepare for an infectious disease emergency. In addition, we will establish an environment in which scientific knowledge on infectious diseases can be generated and R&D and practical application of crisis drugs can be carried out. We will also further accelerate preparations for the establishment of the National Health Crisis Management Research Organization, which will play a central role, in April 2025.
- With the aim of capturing a global market for Japan's medical device industry, we will support clinical trials, etc. to capture the U.S. market, which is the most important for overseas expansion, promote innovation creation by strengthening cooperation between startups and major companies, and make strategic use of international standards.
- We will steadily promote the "Action Plan for Whole Genome Analysis 2022", and work on formulating a basic plan based on the "Act on the Comprehensive and Systematic Promotion of Measures to Ensure the Public's Safe Access to Good and Appropriate Genomic Medicine" (Act No. 57 of 2023; "Genomic Medicine Promotion Act"), which was promulgated and enforced in June 2023.

(Space)

(Securing Space Security)

- In order to realize space security through the three approaches outlined in the Space Security Initiative (National Space Policy Secretariat decision of June 13, 2023), which Japan first formulated in June 2023, "radically expand the use of space systems for national security," "ensuring safe and stable use of outer space," and "realization of a virtuous cycle of security and fostering space industrial base," it is necessary to establish the necessary space architecture for security at an early stage, including the establishment of a wide-area, high-precision, and high-frequency information collection system, including the strengthening of the functions of information-gathering satellites, the establishment of an information and communications system with high interception and jamming resistance, responses to missile threats, and the enhancement and strengthening of the understanding of the space domain.
- In recent years, the innovation and commercialization of space technology by private companies has been progressing rapidly. It is important to promote the development of the domestic space industry by actively utilizing private space technology for Japan's defense, thereby realizing a virtuous cycle that will lead to the strengthening of Japan's defense capabilities.

(National Resilience, Responding to Global Issues and Realizing Innovation)

- In the case of the Noto Peninsula Earthquake in 2024, processed images from information-gathering satellites, data from the Daichi 2 Large Synthetic Aperture Radar (SAR) satellite, and data from small optical satellites and small SAR satellites from private companies in Japan were used to assess the disaster situation. In addition, satellite communications networks were used to secure communications in the disaster areas, while the terrestrial communications infrastructure was severely damaged.
- Disaster prevention and mitigation, national resilience, and climate change are pressing issues. In the event of a wide-area or large-scale disaster, it is important to quickly grasp the disaster situation and provide information to relevant organizations. The use of satellite data is one of the powerful methods to this end, and its importance is increasing.
- In addition to measures for disaster prevention and mitigation using satellite data, it is necessary to respond to the worsening climate change problem, realize carbon neutrality, and utilize space systems such as

autonomous driving, smart cities, and smart agriculture, forestry, and fisheries to solve global issues and create innovation in the private market sector.

- At the 3rd Ministerial Meeting of the Task Force on the Use of Satellite Remote Sensing Data held on March 26, 2024, the government decided to expand the use of private satellites for three years from FY2024, and in particular, to actively procure and use satellite data provided by domestic startups with technological capabilities in relevant ministries and agencies. In the future, it will be important for the public and private sectors to work together to promote strategic technology development and demonstration, and for the government to take the lead in promoting service procurement by private companies in order to expand the use of satellite data.
- As concerns are growing that space phenomena such as solar flares will have an impact on society, space weather forecasts are being used, and further upgrading will be necessary in the future.

(Creation of New Knowledge and Industry in Space Science and Exploration)

- In addition to the United States, China, India, and other emerging countries are accelerating efforts to explore the Moon, and international competition is intensifying. Japan must actively participate in and contribute to the Artemis program, which the United States is taking the lead in, and show its own presence internationally. As concurred in the Japan-U.S. Joint Leaders' Statement on April 10, 2024, Japan plans to provide and sustain operation of a pressurized lunar rover while the United States plans to allocate two astronaut flight opportunities to the lunar surface for Japan on future Artemis missions. Furthermore, the leaders announced a shared goal for a Japanese national to be the first non-American astronaut to land on the Moon on a future Artemis mission. Japan will promote the development of a pressurized lunar rover and aim to realize the landing of a Japanese astronaut on the moon in the late 2020s. In January 2024, the Japan Aerospace Exploration Agency's (JAXA) Smart Lander for Investigating Moon (SLIM) successfully landed on the moon with the highest precision in the world. In the future, industry, academia, and government need to collaborate to maintain and develop the results of space science and exploration with a view to contributing to the Artemis program.
- At the same time, it is necessary to promote the public's understanding of the use of space development by publicizing the results of space science and exploration, and to develop future human resources to support the use of space development.

(Strengthening the Comprehensive Foundation for Supporting Space Activities)

- In order to maintain self-sustaining space activities, it is necessary to secure Japan's launch capacity of approximately 30 launches per year by the first half of the 2030s by building a space transport system that realizes high frequency launches, greater transport capacity, and lower launch prices throughout Japan through the development of core and private rockets and the development of base launch sites and space ports. In addition, it is necessary to develop the institutional environment necessary to realize new space transport businesses such as the prompt launch of rockets, the capture of launch demand for overseas satellites, and suborbital flights.
- It is necessary to cope with the increased risk of collisions in orbit due to the increase in space objects such as space vehicles and space debris. It is important to contribute to the sustainable, stable, and safe use of space by steadily advancing technology development that contributes to the reduction and removal of space debris, promoting initiatives in line with the "medium- to long-term policy on making rules for the use of orbit," and taking the lead in making international norms and rules.
- The Summit of the Future to be held by the United Nations in September 2024 will cover topics such as traffic management in outer space and the removal of space debris. It is also important to establish rules through such international cooperation and to promote R&D of new technologies through cooperation with ally and like-minded countries.

- In the Space Technology Strategy (Committee on National Space Policy decision of March 28, 2024), we set out the technologies to be developed and the timeline for their development, with a view to Japan's path to victory. In the future, it is important for the relevant government ministries and agencies to strategically advance from technology development to increase technological maturity (front-loading) to technology development for commercialization and, with a view to strengthening Japan's technological superiority and ensuring the autonomy of the supply chain, while referring to the Strategy.
- In particular, with regard to the Space Strategy Fund, which was established last year, it is important to commence support for technology development themes to be implemented by utilizing the supplementary budget measures for FY2023, and to promptly aim for support of a total of ¥1 trillion in order to support the further expansion of activities in the space field by private companies and universities, based on the Comprehensive Economic Measures to Completely Break Free from Deflation (Cabinet decision of November 2, 2023).
- It is also important to create a virtuous cycle for the commercialization of Japanese private companies that have the will, technology, and business models to survive in the international market by connecting the results of such technology development support to the anchor tenancy of the government and others.
- When implementing projects by the government and others, we will review the contract system while taking national interests into consideration so as to ensure the viability and growth potential of private companies.

(Ocean)

- The Fourth Basic Plan on Ocean Policy (Cabinet decision of April 28, 2023) defines two main pillars of ocean policy as "comprehensive maritime security" and "building a sustainable ocean." In addition, among the measures of the Fourth Basic Plan on Ocean Policy, the "Ocean Development Strategy (Headquarters for Ocean Policy decision of April 26, 2024)" was formulated, consisting of six important missions that should be addressed across ministries from the viewpoint of national interests. With regard to the four important missions, which are particularly closely related to science, technology and innovation policy, we will promote the following initiatives and utilize the unlimited potential of the ocean, which is a frontier, for the growth of Japan.
- With regard to the promotion of the development and use of autonomous underwater vehicles (AUV), based on the Strategy for the Social Implementation of AUVs (AUV Strategy) (Headquarters for Ocean Policy decision of December 22, 2023), Japan will work on the development of challenging technologies such as deep-sea AUVs, KAIKU(sea-air) unmanned vehicle, and underwater robotics that can work at great depths, as well as the unification and standardization of hardware and software of underwater robotics, and conduct demonstration tests to promote the use of AUVs.
- With regard to the promotion of the Maritime Domain Awareness (MDA) and the use of information, based on Japan's MDA Concept (Headquarters for Ocean Policy decision of December 22, 2023), Japan will strengthen the capacity of MDA and promote the use of ocean information by promoting the use of ocean information in the industrial field, solving various ocean-related problems using satellite data and AI, supporting MDA capacity building and compatibility of the systems for countries along the sea lines of communication.
- In addition, in order to contribute to the important missions mentioned above, we will promote global ocean observation and build digital twins of the ocean, and we will utilize the MSIL (the MDA Situational Indication Linkages), which will serve as the foundation of MDA and link to collected data.
- With regard to the "Promotion of the Development of the Specified Remote Island of Minamitorishima and its Surrounding Waters," we will promote the development of rare earth production technologies in the third phase of the SIP, "Building a Marine Security Platform," and provide information based on the special characteristics of Minamitorishima.

- With regard to the "Promotion of International Cooperation in Arctic Policy," we will work to further promote Arctic research by ensuring the building of the Arctic Research Vessel (ARV) "Mirai II" and making it an international research platform, promoting new Arctic research projects based on the success of the Arctic Challenge for Sustainability II (ArCS II), and by leveraging their success and strengthening cooperation and collaboration with relevant countries, we will ensure responding to climate change, utilization of the Arctic Sea Routes, and sustainable utilization of Arctic resources.

(Food, Agriculture, Forestry and Fisheries)

- With regard to smart agriculture, as a rapid decline in farmers is expected accompanying the decline in population, in order to accelerate the practical application of smart agriculture, based on the "content of specific measures based on the new direction of development of food, agriculture, and rural policies," the government will take the initiative to clarify the priority development goals that have been envisaged up to implementation. In line with this, the government will promote R&D, etc. by strengthening Industry-Academia-Government Collaborations through the provision of facilities by the National Agriculture and Food Research Organization (NARO) for startups and other businesses engaged in R&D, etc., in order to promote R&D, etc., and encourage the conversion of production methods, such as the review of cultivation systems that conform to smart agriculture technology, in cooperation with service business entities, etc. that support the utilization of smart agriculture technology. Furthermore, in order to provide integrated support through taxation, finance, etc., "a bill on the promotion of the use of smart agricultural technology for the improvement of agricultural productivity" was submitted to the 213 ordinary Diet session. In addition, based on the MIDORI Strategy for Sustainable Food Systems, we will promote efforts to enhance both productivity potential and sustainability in the agriculture, forestry, fisheries and food industries, and establish a food system in harmony with the environment. In addition, we will promote exports in response to increasing overseas demand, utilize new technologies, and strategically utilize international standards to maintain the domestic production base and ensure a stable supply of food, even as the domestic market shrinks due to population decline. In order to realize these efforts, we will promote R&D that will contribute to the acceleration of technology and variety development in response to environmental impact reduction and climate change.

(Environment and Energy)

- In order to realize GX, which combines international pledges such as carbon neutrality with stable energy supply, economic growth, and industrial competitiveness, we have formulated the Strategy for Promoting Structural Transition based on Decarbonization (Cabinet decision of July 28, 2023; hereinafter referred to as "GX Promotion Strategy"). We will continue to promote research and technological development that contribute to solving climate change problems through the Green Innovation Fund Projects and the Green Technologies for Excellence program (GteX), among others. In cooperation with the international community, Japan will also promote technical development cooperation on innovation for energy transitions and green growth under the Japan-U.S. Climate Partnership on Ambition, Decarbonization, and Clean Energy and the Japan-EU Green Alliance. In the agricultural sector, based on the MIDORI Strategy for Sustainable Food Systems and other initiatives, Japan will promote technological development to enhance both productivity potential and sustainability in the agriculture, forestry, fisheries and food industries with innovation.
- In order to utilize diverse energy sources, Japan will promote R&D, demonstration, standardization strategies and international cooperation on Energy efficiency improvement, renewable energy, nuclear energy, and fusion energy, based on the GX Promotion Strategy, the Strategic Energy Plan (Cabinet decision of October 22, 2021), the Basic Policy for Nuclear Energy (Atomic Energy Commission decision of February 20, 2023) and the Fusion Energy Innovation Strategy. In addition, in the third phase of the SIP,

"Building Smart Energy Management System," Japan will promote research toward the social implementation of advanced energy management with renewable energy as the main component. For nuclear energy, Japan will promote R&D and human resource development for next-generation innovative reactors incorporating new safety mechanisms.

- Based on the Basic Environment Plan (Cabinet decision of May 21, 2024), the Basic Plan for Establishing a Recycling-based Society (Cabinet decision of June 19, 2018), and the Strategy for a Growth-Oriented, Resource-Autonomous Circular Economy (formulated by the Ministry of Economy, Trade and Industry on March 31, 2023), Japan aims to realize a recycling-oriented society (a civilization that can grow and develop by protecting its carrying capacity and improving the quality of its environment) while integrating measures such as net-zero greenhouse gas emissions, circular economy, and nature positivity. The government will promote structural transformation of industry and society and the creation of demand through the creation of areas achieving decarbonization ahead of other areas, the demonstration of net-zero energy for housing and buildings, and the national movement to create new affluent lives that lead to decarbonization. In order to realize nature positivity by conserving and expanding natural capital and mainstreaming biodiversity, the government will conduct R&D, including the accumulation and provision of necessary surveys and observation data, and make strategic use of international rules and standards, under the 30x30 target, which aims to effectively conserve more than 30% of land and sea as healthy ecosystems by 2030. In addition, in order to realize a circular economy which unifies arterial industries such as manufacturing and venous industries such as waste-processing, government, industry and academia will cooperate to promote R&D toward the social implementation of a circular economy for plastics through the "Construction of a Circular Economy System" in Phase 3 of the SIP. In addition, the government will promote the recycling of metal resources and renewable energy-related products (solar panels, batteries, permanent magnets, etc.), as well as technological demonstrations of bioplastics and sustainable aviation fuel (SAF), along with the strategic use of international standards.

(Enhancement of Analytical Functions through the Use of an Evidence System (e-CSTI))

- In order to promote R&D in important fields, it is important to efficiently and effectively promote R&D by analyzing, based on objective data, R&D trends in Japan and overseas including the situation of distribution of funds in Japan, research papers, and patent information. For this reason, we will continue to collect data and analyze the relationship between research inputs and outputs, such as budgets, and promote objective evidence-based policymaking (EBPM) and evidence-based management (EBMgt) such as developing tools that can comprehensively and multifaceted grasp R&D trends in Japan.

② **Promotion of R&D on Key Technologies for Economic Security and Strengthening of Survey and Research Functions**

- Japan will continue to support the R&D and practical application of important advanced technologies that are essential for Japan to continue to secure a solid position in the international community over the medium to long term through the Key and Advanced Technology R&D through Cross Community Collaboration Program (K Program) (hereinafter referred to as "K Program") and other programs. The K Program will promote the R&D of technologies that are subject to support based on the R&D vision determined by the Council for the Promotion of Economic Security and the Integrated Innovation Strategy Promotion Council through support from the public and private sectors through a council for a designated fund.
- In addition, we will work to ensure research security and integrity at universities and research institutions in response to the risks associated with the internationalization and openness of research activities, as well as, from the perspective of preventing technology leakage, continue to strengthen the system for investment screening, strengthen screening for the acceptance of foreign students and foreign researchers, strengthen

the management of sensitive technical information at universities, research institutions, and companies, and establish requirements for security trade management in government R&D projects.

- Furthermore, in order to grasp trends at home and abroad and strategically plan policies, the government will strengthen survey and research functions on critical technologies by proceeding with preparatory work for the establishment of a think tank related to safety and security in anticipation of being entrusted with surveys and research based on the Act on the Promotion of Ensuring National Security through Integrated Implementation of Economic Measures (Act No. 43 of 2022; "Economic Security Promotion Act"). The government will also continue and evolve research and analysis activities, taking over the results of the entrusted projects conducted from FY2021 to FY2023.

(Active Use of Advanced Science and Technology in the Field of Security Based on National Security Strategy)

- Based on the National Security Strategy (National Security Council and Cabinet decision of December 16, 2022), in order to utilize the high technological capabilities of the public and private sectors of Japan in a broad and active manner for a wide range of subjects and fields of security, we will enhance those capabilities and strengthen the whole-of-government mechanism for utilizing funds and information related to R&D, etc. Specifically, a whole-of-government mechanism was established in August 2023 to promote the R&D of science and technology that will contribute to the strengthening of the comprehensive defense architecture by matching the R&D needs based on the views of the Ministry of Defense with the technological seeds held by relevant ministries and agencies. Under this mechanism, we will strengthen our efforts that lead to defense innovation while identifying advanced technologies with various potential uses.

③ **Promotion of R&D and Social Implementation through SIP, BRIDGE, Moonshot Research and Development Program, etc.**

- With the growing labor shortage in Japan, there is an urgent need to improve productivity through automation and labor-saving through AI and robotics. In addition, preparation for and response to frequent disasters, such as the Noto Peninsula Earthquake in January 2024, are also urgent issues. The role that science, technology and innovation play in addressing these issues has become even more important. With regard to automation and labor-saving, we will not only eliminate labor shortages, but also promote R&D and expand the introduction of robot systems that contribute to DX in the manufacturing industry. At the same time, as the development and implementation of the robot and AI fields are speeding up internationally, we will build a high-cycle innovation platform in which industry, research institutions, and local governments participate, not only in the manufacturing industry but also in the service industry, in order to drive industry in Japan.
- In order to promote the social implementation of technology, the resolution of social issues, and the creation of new value, it is important to utilize "Convergence Knowledge (So-Go-Chi)" that brings together diverse "knowledge" not only in the natural sciences but also in the humanities and social sciences. We have been promoting the use of Convergence Knowledge (So-Go-Chi) and raising awareness through the holding of webinars, workshops, symposia, etc., and have been promoting the dissemination of concrete use cases. In order to further disseminate Convergence Knowledge (So-Go-Chi), we will continue to promote the active collaborations of industry, academia, and government players in various fields without remaining in their specialized fields, and promote awareness raising through the dissemination of use cases and the holding of workshops.
- In order to implement technology visibly, concretely, and strategically in society, we will consistently promote 14 issues set by backcasting from the needs of solving social issues through basic research to social implementation in the SIP Phase 3. We will introduce the five perspectives (technology, institutions,

business, social acceptability, and human resources) necessary for social implementation from the perspective of Convergence Knowledge (So-Go-Chi). In addition to the fields of science and technology, humanities and social sciences will be included in the program, and we will actively collaborate among issues. We will promote the project with a concrete picture of social implementation in mind for the stage gate evaluation to be conducted by the third year of the project (FY2025). Furthermore, we will accelerate the social implementation of technology by integrating SIP with the programs for bridging the gap between R&D and the ideal society (Society 5.0) and generating economic and social value (BRIDGE), which supports the social implementation of R&D results by ministries and agencies.

- From the perspective of disaster prevention and mitigation, in light of the 2024 Noto Peninsula Earthquake, we will promote social implementation of new technologies, etc. that are found to be effective in disaster response, etc., in order to strengthen initial response and emergency measures in the future, while taking into consideration their utilization in normal times. In addition, in the third phase of the SIP, "Development of a Resilient Smart Network System against Natural Disasters," we will develop disaster prediction simulation technology, etc. for risk prediction assuming the severity of disasters, taking into account the effects of climate change, by utilizing data integration infrastructure using a wide variety of sensing data such as small SAR satellites, systems utilizing disaster information IoT technology, earth observation and prediction data, etc. for rapid and detailed disaster information collection. We will also utilize AI, etc. to build a digital twin that enables effective disaster response and develop an information provision infrastructure, as well as engage in efficient and effective R&D investment and social implementation based on a holistic view of disaster prevention research. In addition, under The Headquarters for Volcano Research Promotion, we will promote data collection, necessary research and study, development of observation systems, and human resource development.
- From the perspective of infrastructure resilience, in light of the fact that Japan's vast infrastructure and buildings are aging, we will work on technology development and R&D to realize efficient infrastructure management by conducting integrated management from design to construction, inspection, and repair using digital technology in the third phase of the SIP "Smart Infrastructure Management System". In particular, we will consider "building digital twin," which is the key of Society 5.0, as the core of development, and work on developing technologies for innovation in construction production process, building an advanced infrastructure maintenance cycles, strategic utilization of human resources for infrastructure management in local governments, creating attractive national land, cities, and regions through smart infrastructure.
- With regard to technology development for infrastructure facility maintenance and management, we will promote initiatives for infrastructure facility maintenance and management using AI analysis of images acquired by drones, satellites, etc., such as continuously providing information on drone demonstration results using the sites of projects under the direct control of the national government in order to realize sustainable infrastructure facility maintenance and management.
- With regard to the development of the MLIT Data Platform, we will further promote cooperation with data on national land, economic activities, and natural phenomena held by the national government, local governments, and private companies, and we will continue to develop use cases and improve usability and search functions in order to expand data utilization.
- Science, technology and innovation are required to boldly challenge social issues such as the declining birthrate and aging population, large-scale natural disasters, and global warming, and to open up a future society. For this reason, the Moonshot Research and Development Program will set ambitious targets and promote challenging R&D based on more bold ideas than the extension of conventional technologies. In the fifth year since the start of research, we will review the portfolio of Goals 4 (Cool Earth & Clean Earth) and 5 (Sustainable food supply and consumption), which were launched in FY2020 in accordance with the

Operational and Evaluation Guidelines, based on the fifth-year evaluation. In addition, we will identify areas for improvement and strengthening of the program, such as human resource development as a source of competitiveness, cooperation with industry for social implementation, and consideration for the development of new issues, and promote efforts to achieve the goals.

- The Fukushima Institute for Research, Education and Innovation (F-REI) aims to be a world-class ‘center of excellence for creative reconstruction’ that will strengthen Japan’s scientific and technological capabilities and industrial competitiveness, while embodying hopes and dreams for realizing the reconstruction of Fukushima, which was affected by the nuclear disaster, and the entire Tohoku region. We will promote initiatives to support F-REI for the acceleration of R&D. In addition, in order to further promote the Fukushima Innovation Coast Initiative, the Fukushima Innovation Coast Initiative Promotion Organization and other organizations will continue to improve the demonstration environment, such as the expansion of demonstration sites, and strengthen their calls to the Fukushima Hamadori area making the region a leading location for the creation of startups.

(2) Enhancement of Knowledge Bases (Research Capabilities) and Human Resource Development

① Strengthening the Research Base through University Endowment Fund, the Promotion of Research Universities with a Regional Core and Distinctive Characteristics, and the Strengthening of the Functions of Kokken

(Realization of World-Class Research Universities through University Funds)

- In order to improve research capabilities through friendly international competition, attract world-class researchers, and foster independent young researchers who will lead the next generation, we will make bold efforts to allocate resources, reduce the burden of securing research time, and value the intellectual resources possessed by universities. We will also work to rapidly realize research universities that can continue to secure and utilize financial resources for the creation of universities' own funds that enable flexible upfront investment. Specifically, universities that are expected to develop internationally outstanding research and utilize the results of research that will bring about changes in the economy and society to a considerable extent will be recognized as Universities for International Research Excellence, and from FY2024 onward, we will aim to subsidize the Research System Strengthening Plan prepared by such universities through the investment profit of university funds of 10 trillion yen. The Minister of Education, Culture, Sports, Science and Technology will decide whether to accreditate/approve Tohoku University, which was announced as a candidate for accreditation in September 2023, during FY2024. The next call for proposals is scheduled to begin in FY2024, taking into account the investment status of the university fund and other factors.

(Promotion of Research Universities with a Regional Core and Distinctive Characteristics)

- As two wheels of the 10 trillion yen University Endowment Fund, we will support initiatives to drive regional and social change through the Package for Comprehensive Promotion of Research Universities with a Regional Core and Distinctive Characteristics (Council for Science, Technology and Innovation decision of February 1, 2022; revised on February 8, 2023), so that ambitious and diverse universities can fully demonstrate their strengths and characteristics and pursue regional economic and social development, solutions to domestic and international issues, and diverse international expansion of research. At the same time, we will promote university change by improving the research environment, including securing research time, through the "Guidelines for Improving the Quality and Quantity of Research Time" presented in the package. In the Program for Forming Japan's Peak Research Universities (J-PEAKS), a new 150-billion-yen fund created in the second supplementary budget for FY2022, we will provide support for 12 universities that were selected in 2023, including accompanying support with a view to the next 10 years, and we will open applications for the second term in FY2024.
- We will also promote the formation of research networks across organizations and fields through the Coalition of Universities for Research Excellence Program (CURE), the establishment of Industry-Academia-Government Collaboration hubs that contribute to the development of human resources for social change while responding to local needs through the Program on Open Innovation Platforms for Industry-academia Co-creation, and the establishment of world-class international research centers through WPI.

(Promotion of Initiatives to Strengthen the Functions of Kokken)

- Kokken are institutions that play a central role in Industry-Academia-Government Collaborations and supports the foundation of Japan's science, technology and innovation policy. In light of the increasing stringency of their operations due to increased responses to new administrative needs, we will strengthen their functions by enhancing their research infrastructure, human resources, and mutual cooperation. Specifically, based on the agreement between the relevant ministries and agencies in FY2023, Kokken will, in cooperation with other agencies, work to introduce a flexible personnel and salary system and secure

human resource development opportunities such as training, and further strengthen research security and integrity, including the development of information security measures, objective review by third parties and external experts, and appropriate follow-up, in order to implement research results in society. In addition, the Cabinet Office and the ministries with jurisdiction over each corporation will continue to consider support measures to promote the efforts of Kokken.

(Realization of a Research Environment Conducive to Research)

- In order to realize an environment in which researchers can devote themselves to research, we will promote initiatives to improve the research environment, including securing research time. Specifically, we will further strengthen research capabilities through basic funds such as grants for operating funds of national universities and competitive research funds such as KAKENHI, consider institutional reforms that will further enhance the challenging nature and internationality of KAKENHI, and promote the lateral development of good practices for improving the research environment in Fusion Oriented Research for disruptive Science and Technology (FOREST) and the perpetuation of it. In addition, we will provide continuous support to outstanding researchers from young to mid-career and above in strategic creative research promotion projects.

② Strengthen Research Facilities and Equipment, and Promote Open Science

(Promote the Development of Infrastructure to Support Research DX and the Sharing of Research Facilities and Equipment)

- In order to promote the efficiency and speed of R&D through AI and data-driven research, we will advance the sophistication of research digital infrastructure such as ultra-high-speed, high-capacity network infrastructure (SINET), computing resources, and storage.
- We will continue to operate Fugaku efficiently and steadily to promote its wide use in academia and industry. In addition, we will begin to develop and introduce a new flagship system of supercomputers considering the rapidly expanding and diversifying demand for computing resources, which is necessary for R&D with the advancement of data science and technological innovations in generative AI.
- In addition, SPring-8, a large synchrotron radiation facility, has been in public use for more than 25 years and is falling behind overseas facilities in terms of performance. With an eye toward turning points in industry and society, such as the realization of next-generation semiconductors and the GX society, SPring-8-II will be launched with the aim of becoming the world's highest synchrotron radiation facility with a brightness 100 times that of the current one. In addition, considering the period of suspension associated with the installation, we will consider expanding the shared beamline of NanoTerasu Synchrotron Light Source that began operating in FY2024.
- We will also establish a single point of contact for quantum beam facilities, such as synchrotron radiation and neutron facilities, and promote the utilization of advanced large-scale research facilities by industry and academia. In addition, in order to strengthen the mechanism for strategically introducing, updating, and sharing research facilities and equipment across universities and research institutions, we will promote support for the construction of core facilities. We will also promote the development of precedents and inter-institutional cooperation based on the follow-up survey of the Guidelines for Shared Use of Research Facilities and Equipment and the study for policy consideration on research facilities and equipment.

(Promotion of Open Access to Scholarly Publications and Scientific Data)

- Publicly funded research outputs including scholarly publications and scientific data should be widely given back to the public. However, their distribution is under the market dominance of global academic publishers (academic platformers), then the financial burden on universities, institutes and researchers for their subscription fees for academic journals and APCs (Article Processing Charges) is increasing.

Therefore, based on the 'Basic Policy on Promoting Open Access to Publicly Funded Scholarly Publications and Scientific Data' decided by Integrated Innovation Strategy Promotion Council

- on February 16, 2024, we, in cooperation with relevant agencies and organizations will promote
 - supporting the establishment of collective bargaining system of universities to negotiate with academic platformers,
 - publishing scholarly publications and scientific data on information platforms such as institutional repositories and intersystem federation, and
 - supporting the development and enhancement of platforms for the dissemination of research outputs
- in order to achieve immediate open access to publicly funded scholarly publications and scientific data for new applications of the selected Competitive Research Funds starting FY2025. Then, we aim to make publicly funded research outputs accessible to the public and contribute to solving global issues, to optimize the financial burden of the total amount of subscription fees and APC throughout Japan, and to enhance the ability of disseminating research outputs. Furthermore, we will aim establishment and transition to new systems for evaluation and assessment providing incentives for open access while understanding and analyzing the current situation and problems in order to break away the excessive dependence on quantitative indicators in research evaluation and assessment.

(Promotion of Management and Utilization of Publicly Funded Research Data)

- Based on the 'Principle on Management and Utilization of Publicly Funded Research Data' decided by the Integrated Innovation Strategy Promotion Council on April 27, 2021, we will introduce the system to grant metadata or DMP (Data Management Plan) for all new applications for the Competitive Research Funds. We will also promote for universities and other R&D institutions to formulate data policies, and include research data in their institutional repositories. We will examine leading initiatives of advanced data management in the Moonshot Research and Development Program, and promote the management and utilization of research data by introducing DMP in the third phase of the SIP and share their good practices with other research funds. We will carry out international cooperations with the G7 and other countries and organizations. In addition, we will continue to upgrade the nationwide research data infrastructure and improve the environment for its use in the "Developing a Research Data Ecosystem for the Promotion of Data-Driven Science".

③ **Strengthen Efforts by Industry, Academia, and Government to Foster Creative and Diverse Human Resources, Enhance Education, and Promote Active Participation**

(Promotion and Creation of Opportunities for Doctoral Human Resources and Young Researchers, and Support for Students)

- As society becomes more sophisticated and complex, in order to realize a society in which doctoral human resources play an active role not only in academia but also in various fields such as private companies, public institutions, and international organizations, we will promote internships that lead to more practical and diverse careers; provide content for career development and training, foster, support, and promote R&D management human resources, and actively promote the recruitment of doctoral human resources at Super Science High Schools (SSH) to build diverse career paths and create opportunities for them to play an active role, as well as engage in supporting startup creation and human resources provision. In addition, we will continue to work to improve the treatment of doctoral students and young researchers, including the Research Fellowship for Young Scientists (DC and PD), along with promoting graduate school reforms such as the establishment of world-class centers for postgraduate education, internationalization of education and research, and improvement of the educational and research environment. In order to promote

the active participation of doctoral talents in industry, we will conduct cross-ministerial studies to formulate guidelines for companies, universities, etc., and disseminate the attractiveness of doctoral talents through PR of role models. In addition, we will encourage business organizations to promote understanding of the importance of doctoral talents in a wide range of industries, etc. Furthermore, we will promote the acquisition of doctoral degrees by private sector employees through joint research, while utilizing a mechanism for finding (matching) talented young researchers between companies and universities. We aim to strengthen research capabilities and innovation creation through the active participation of doctoral talents.

(Promotion of the Active Participation of Female Researchers)

- From the viewpoint of improving diversity in research and the research environment, we will accelerate the active participation of female researchers through the elimination of gender gaps, etc. Based on the Sixth STI Basic Plan and the Fifth Basic Plan for Gender Equality (Cabinet decision of December 25, 2020), we will continue to steadily enact initiatives to further promote the careers of female researchers, including in leadership positions, by supporting the efforts of universities and other institutions to create an environment where life events such as childbirth and childcare can be balanced with research, and to realize diversity, equity, and inclusion in the research environment.

(Promotion of Measures Based on the Policy Package on Education and Human Resource Development for the Realization of Society 5.0)

- Based on the Policy Package on Education and Human Resource Development for the Realization of Society 5.0, we will promote (1) the diversification of "time" and "space" for learning with an emphasis on the characteristics of children, (2) the establishment of an ecosystem that supports Inquiry Based and STEAM education throughout society, and (3) the elimination of the divide between the humanities and sciences and the elimination of the gender gap in learning in science and mathematics. In particular, we will work with the cooperation of industry to promote initiatives to support study abroad at the high school and higher education levels throughout society, including the Tobitate! Study Abroad Initiative through public-private collaboration, and to build an ecosystem that provides diverse learning to children through the participation of companies, etc. The results of these initiatives will be fed back into the policy as needed along with the follow-up results of this package.

(Enhancement of Recurrent Education)

- To respond to changes in the social and economic structure by relearning and continuing to learn, and to realize an environment in which those who wish for it to be able to receive diverse and high-quality recurrent education. Therefore, in order to ensure that individual relearning is appropriately evaluated, the government will promote the visualization of learning histories, required abilities and learning, and the reflection of relearning in the evaluation and treatment of companies, and will continue to promote initiatives such as the construction of a recurrent education model through an industry-academia collaborative system.

(3) Creation of Innovation Ecosystem

- In order to open up the excellent technological potential of universities and companies in cities and regions (local) on a global basis, and to continuously generate innovations that lead to new industries and social changes, it is essential to create a startup ecosystem that is equal to that of the world. We will strongly promote the creation of an innovation ecosystem so that highly creative human resources can jump into the path of entrepreneurship without hesitation in order to realize the creation and large-scale growth of startups by utilizing new technologies (deep tech) derived from high-quality basic research, with

universities and other institutions serving as the source of innovation at the core.

① **Thorough Support for R&D-Startups**

(Enhancement of Support through the SBIR System)

- With regard to the SBIR (Small/Startup Business Innovation Research) system, in April 2021, the rationale was transferred to the Act Concerning the Revitalization of Science, Technology and Innovation Creation (Act No. 63 of 2008), and the system was changed to focus on innovation creation with the Cabinet Office as the control tower. R&D issues based on policy needs and government procurement needs will be set, and continuous support will continue to be provided through multi-level selection across ministries and agencies, supported by program managers. We will also continue to support the technology demonstration phase in the advanced technology field, which has been added since FY2023, and strongly promote social implementation by startups and others. In addition, with a view to responding to the "valley of death" caused by the shortage of R&D funds at startups in the seed period (stage before receiving investment from venture capital firms (hereinafter referred to as "VC"), etc.), we will implement initiatives for collaboration among the three organizations: the Japan Science and Technology Agency (JST), the New Energy and Industrial Technology Development Organization (NEDO), and the Japan Agency for Medical Research and Development (AMED), based on the "Basic Policy on Funding for R&D Startups" formulated in March 2024.

(Promoting Public Procurement from Startups)

- To promote public procurement for startup development, it is important for government agencies to create a virtuous circle of "knowing," "seeing," and "using" new technologies of startups. Therefore, in order to solve administrative problems for which it is difficult for the government alone to find optimal solutions, the government will utilize a new flexible procurement mechanism that enables voluntary contracts for advanced and unique new technologies of startups in accordance with the procurement needs of the government. In addition, we will promote the use of special measures for eligibility of startups to participate in bidding, which was expanded in FY2023, and special measures for voluntary contracts for companies using the SBIR system, as well as enhancing matching opportunities between startups and government agencies.

② **Ecosystem Creation by Cities, Regions, Universities, and Startups**

(Accelerating the Realization of the Global Startup Campus (GSC) Initiative)

- As a powerful driving engine for the Japanese economy, we will create a hub for the innovation ecosystem through cooperation with domestic and foreign startups. Toward this realization, the flagship hub of the GSC Initiative will be equipped with cutting-edge research functions and provide support for incubations, seamlessly connecting the potential of deep tech to businesses that can dominate the world. Efforts to realize the GSC Initiative will be accelerated under the Integrated Innovation Strategy Promotion Council. In cooperation with top universities and research institutes overseas, including the Massachusetts Institute of Technology (MIT), as well as experts from inside and outside Japan, the management structure of the flagship hub will be promptly implemented in order to attract world-leading human resources from an early stage. Prior to the establishment of the hub, prior research and fellowships with innovative themes based on the ideas of outstanding young researchers will be launched. In addition, efforts by local governments nationwide to promote startups and cooperation with related private companies will be strengthened to promote structural reform of the innovation ecosystem throughout Japan. Furthermore, in order to improve its attractiveness as a hub for global networks, related measures will be accelerated to improve the stay environment for overseas researchers and the business environment for startups.

(Supporting Startup Ecosystem Hub Cities)

- In addition to the utilization of the Global Acceleration Program, the ideal state of the next hub city will be considered by expanding the membership and area of each hub city consortium, globalization, and promoting co-creation with large companies. In addition, we will expand the programs nationwide extending the maximum period of stay to two years, integrating the Project to Promote Foreign National Entrepreneurial Activities and the Project for Facilitation of Acceptance of Foreign Entrepreneurs in National Strategic Special Zones.

(Improving Intellectual Property Governance at University)

- We will continue to promote publicity activities to disseminate the University IP Governance Guidelines to targeted universities nationwide through explanations at conferences and meetings related to industry-academia collaboration and improve university IP governance. In addition, we will exchange views on the Guidelines with major universities and other institutions nationwide and taking into account the views received consider how to reflect them in policies.

(Human Resource Development as a Foundation for Startups)

- We will steadily promote the 5-year 1,000-person dispatch program, expand efforts to develop young human resources through mentors, strengthen entrepreneurship education at the primary and secondary education levels, and provide opportunities for entrepreneurship education to all university students who wish to do so.

(Accelerating the Vision for a Digital Garden City Nation)

- In the comprehensive strategy for the Vision for a Digital Garden City Nation (Cabinet decision of December 23, 2022), smart cities have been positioned as a model regional vision, together with initiatives such as super cities and digital garden health special zones and have become a part of the Vision for a Digital Garden City Nation. Smart cities are required to move from the demonstration project stage to implementation, and measures will be steadily implemented based on the road map prepared in March 2024. In addition, based on the Package for Comprehensive Promotion of Research Universities with a Regional Core and Distinctive Characteristics, we will promote Industry-Academia-Government Collaborations and open innovation with universities at its core, and contribute to the realization of the digital rural city-state concept by utilizing such groups as smart cities, startup ecosystem hub cities, and regional bio- communities.

③ **Promoting a virtuous cycle of human resources, technology, and funds**

- In order for "technology and ideas" to lead to "creation of new value" for products and services, etc., we will support R&D at universities, etc. and the identifying and nurturing CxO and other management and innovation human resources, etc., and promote the mobilization of innovation resources (human resources, technology, equipment, funds, etc.) of large companies such as cross-border learning and carve-outs to startups.

(Formation of a Growth-Oriented Financial Cycle)

- From the viewpoint of strengthening the supply of growth funds for startups, we will diversify the exit strategies of startups by focusing on sector-specific support such as deep tech and drug discovery, promoting the development of an environment for the introduction of fair value assessment in VC funds to encourage institutional investment, increasing the investment of public capital to stimulate private

investment, including investment by public and private funds such as the Organization for Small & Medium Enterprises and Regional Innovation, JAPAN (SME Support, JAPAN) and Japan Investment Corporation (JIC), and promoting the use of an open innovation promotion tax system, as well as promoting the concentration of public and private sector support through J-Startup.

(Expanding R&D Investment)

- While a deflationary mindset prevailed in Japan during the “lost 30 years,” many companies focused on cutting costs of existing businesses and investing overseas. While investment in science, technology and innovation continued to increase over time in other countries, investment in R&D for new business creation in Japan remained almost flat.
- In the Sixth STI Basic Plan, the government set a target of about 30 trillion yen in R&D investment and about 120 trillion yen in R&D investment by the public and private sectors over a period of five years, of which the government's R&D investment reached about 32 trillion yen including the government budget for FY2024. Currently, firms' willingness for capital investment, which had been sluggish, is at its highest level since 1983, and the amount of private firms' capital investment is expected to be 104.8 trillion yen in FY2024. In addition, domestic investment in R&D by private firms, which had been flat until now, finally picked up in FY2022, showing signs of expansion.
- Wages that did not rise also showed their highest level in 30 years in the spring wage offensive, and wages have started to rise. In addition, the amount of funding raised by startups has increased about 10 times in the 10 years since 2013, and the number of M&As is on the rise.
- It is extremely important that the public and private sectors continue to make bold R&D investments in cooperation with each other in order to survive fierce competition among countries with the awareness that now is the last chance to connect this “turn of the tide” to continuous growth, and that the results of such investments be implemented and commercialized in society to lead to economic growth in Japan.

(End)