

Section 7 Trends in ICT technology policy

1. Summary

(1) Initiatives so far

The MIC has been promoting technology policies in the field of information and communication, focusing on efforts towards Beyond 5G, which is expected to become the next-generation fundamental information and communication infrastructure, serving as the foundation for various industries and social activities and being utilized across borders.

Specifically, since the establishment of the “Beyond 5G Promotion Strategy” by the MIC in June 2020, discussions on the “Strategy for Information and Communication Technology towards Beyond 5G” have been progressing within the Information and Communication Council. Additionally, a research and development fund has been established based on this strategy, aiming to strengthen support for research and development activities related to Beyond 5G and international standardization efforts by private entities and others.

Furthermore, in March 2021, the “6th Science, Tech-

nology, and Innovation Basic Plan” was approved by the Cabinet, aiming to promote research and development in advanced fields to ensure the safety and security of the public and to achieve a sustainable and resilient society. Relevant government ministries and agencies are collaborating and cooperating to advance research and development in advanced fields such as AI, quantum technology, remote sensing, and space.

The NICT is promoting fundamental and foundational research and development in five key areas (advanced electromagnetic wave technology, innovative networks, cybersecurity, universal communication, and frontier science) during the 5th medium- to long-term plan period (from April 2021 to March 2026).

Additionally, the MIC is providing support for the creation of technological innovations and for startups, which are one of the key players in implementing advanced ICT and fostering next-generation industries.

(2) Future challenges and directions

Regarding Beyond 5G, it is necessary to address the lesson learned from the past that even if Japan’s information and communication industry has established internationally excellent technologies, it has not always been able to translate them into significant business results. From the perspective of ensuring Japan’s economic security, it is also essential to demonstrate competitiveness in the global market. Therefore, it is imperative to comprehensively address research and development, international standardization, social implementation,

and overseas expansion to achieve its early realization.

In addition, for advanced fields such as AI, quantum technology, and space, early social implementation is considered a challenge for various issues, including strengthening the development of large LLMs, achieving simultaneous interpretation in anticipation of the Osaka-Kansai Expo, realizing highly reliable quantum communication, and achieving advanced space network technology.

2. Beyond 5G

In September 30, 2021, the MIC consulted the Information and Communications Council on the “Strategy for Information and Communication Technology Toward Beyond 5G,” and the council’s Information and Communication Technology Subcommittee on Technology Strategy deliberated on various activities and insights of industry, academia, and government, including the “Beyond 5G Promotion Consortium,” major companies, universities, and national research and development institutions, to discuss technology strategies such as research and development, intellectual property, and standardization. As a result, an interim report was com-

piled on June 30, 2022, containing recommendations for Japan’s focus on key technology areas for Beyond 5G and the establishment of a framework enabling multi-year budgeting.

Subsequently, the “Act to Amend the Act on the National Institute of Information and Communications Technology, National Research and Development Agency and the Radio Act” (Act No. 93 of 2022) was enacted in December 2022, leading to the full-scale operation of the research and development fund established at the NICT in March 2023, as well as progress in the efforts of private sector entities and international discussions.

(1) Implementation of the Innovative Information and Communication Technology (Beyond 5G (6G)) Fund Program

The MIC is implementing the Innovative Information and Communication Technology (Beyond 5G (6G)) Fund Project based on the “Act to Amend the Act on the National Institute of Information and Communications Technology, National Research and Development Agency and the Radio Act” (Act No. 93 of 2022), which established a permanent fund at the NICT in March 2023 as a succes-

sor to the temporary fund set up in February 2021.

Under the aforementioned fund project, three programs have been established: the “Social Implementation and Overseas Deployment-Oriented Strategic Program” that provides focused support for research and development projects with strategic commitment for social implementation and overseas deployment; the “Element Tech-

nology and Seed Creation-Oriented Program” targeting the establishment of long-term element technologies and the creation of technology seeds; and the “Radio Effective Utilization Research and Development Program” targeting the research and development of technologies specified in Article 103-2, Paragraph 4, Item 3 of the Radio Act.

In particular, for the main target of the fund project, the “Social Implementation and Overseas Deployment-Oriented Strategic Program,” strong promotion of research and development aimed at social implementation and overseas deployment is being pursued, focusing on the following key technology areas based on the interim report of the Information and Communications Council, with the aim of sequentially implementing social implementation of the development results after 2025:

- (1) All photonics network technology to achieve ultra-high-speed, ultra-low-latency, and ultra-low-power consumption of communication infrastructure
- (2) Non-terrestrial network (NTN) technology such as satellite and HAPS for seamless connection of land, sea, and air communication coverage
- (3) Secure virtualization and integrated network tech-

(2) Promotion of intellectual property and standardization activities for Beyond 5G

The international standardization activities for Beyond 5G are expected to intensify, with major companies from around the world focusing their efforts on this. To achieve success in international standardization activities related to our country’s development achievements, it is important to support strategic projects with investments, business strategies, and management commitments in research and development projects. This support is crucial for the social implementation and overseas deployment of strategic products. The MIC has expanded the Innovative Information and Communication Technology (Beyond 5G (6G)) Fund project through the supplementary budget for FY2023, and has established a new menu to support international standardization activities in addition to research and development. The operation of this support menu will be based on the “Approach to Support for International Standardization Activities through the Innovative Information and Communication Technology (Beyond 5G (6G)) Fund Project,” which was compiled in March 2024 based on discussions in the Information and Communication Technology Subcommittee of the Information and Communication Council, the Technology Strategy Committee, and the Innovative Information and Communication Technology Project Business Evaluation WG.

Furthermore, in preparation for Beyond 5G, a “Business Strategy” in organizations and companies is essential as a strategic promotion of international standardization and intellectual property activities through collaboration between industry, government, and academia is being pursued. In line with this principle, the “Beyond 5G New Business Strategy Center” was estab-

nology to ensure a safe and highly reliable communication environment for users

In carrying out these activities, the MIC has established the “WG on Innovative Information and Communication Technology Project Business Evaluation¹⁾” within the Information and Communications Council (Information and Communication Technology Subcommittee on Technology Strategy) and compiled the “Appropriate Evaluation of Business Aspects of the Innovative Information and Communication Technology (Beyond 5G (6G)) Fund Project” (announced on March 10, 2023), taking into account the interim report. In FY2023, 17 major research and development projects have been adopted in the Social Implementation and Overseas Deployment-Oriented Strategic Program, and the operation of the fund project is in full swing.

Furthermore, the fund will be expanded with FY2023 supplementary budget, and new initiatives will be launched, including the development of common infrastructure technology for inter-operator cooperation in all-optical networks, as well as support for strategic projects in international standardization activities.

lished in December 2020 to develop talent leading standardization and intellectual property activities, promote industry collaboration, raise awareness, and disseminate information. Specific activities include cross-organizational training programs for young talent at the core of next-generation corporate management, such as the “Leaders Forum,” and awareness-raising and information dissemination seminars for companies, especially in management and business departments, known as the “New Business Strategy Seminar.” Additionally, a new industry collaboration activity, “XG Ignite,” bridging information and communication, digital, and diverse fields and industries, was initiated from FY2023.

To advance international standardization activities from the early stages of research and development, international joint research with trustworthy and synergistic strategic partners in countries and regions is being conducted. Specifically, international joint research has been conducted with the U.S. and Germany since FY2022. Furthermore, based on the “Japan-EU Digital Partnership” in May 2022, joint research themes were solicited for the Innovative Information and Communication Technology (Beyond 5G (6G)) Fund project “Element Technology and Seed Creation Program.”

The “Beyond 5G Promotion Consortium,” established in December 2020 to vigorously and actively promote Beyond 5G through collaboration between industry, government, and academia, has been conducting studies on future technological trends and prospects for Beyond 5G as part of its activities. It has contributed to the development of the IMT-2030 framework recommendation²⁾ at the ITU-R based on input of contribution docu-

¹⁾ Changed the name of the WG from “WG Innovative Information and Communications Technology Project” (February 22, 2024)

²⁾ The recommendation ITU-R M.2160-0 “Framework and overall objectives of the future development of IMT for 2030 and beyond” was newly approved at the ITU Radiocommunication Assembly (RA-23) held in November 2023. Its purpose is to provide an overview, including the capabilities and use cases required for the next-generation mobile phone standards expected to be realized around 2030.

ments derived from the study results, following the 38th meeting of ITU-R SG5 WP5D in June 2021. Additionally, a “Beyond 5G White Paper” summarizing the study results on usage methods and performance targets was created in March 2022. Furthermore, to contribute to the discussion and promotion of the ITU-R WRC-27 Agenda Item 1.7, which focuses on the consideration of new frequency allocations for IMT beyond 5G, a survey of the usage status of existing wireless systems in the frequency bands under consideration, 7,125MHz-8,400MHz and 14.8GHz-15.35GHz, was conducted. Based on this survey, an updated version of the “Beyond 5G White Paper ver. 3.0” was published in March 2024. In addition, to promote the spread and advancement of Open RAN in our country and the overseas expansion of

(3) Trends in Japan and overseas surrounding Beyond 5G

A Initiatives by private sector entities

The number of domestic and international participants in the industry forum “IOWN Global Forum,” established by NTT, Intel, and Sony in 2019 as part of NTT’s IOWN concept, has been steadily increasing. In addition, Japan’s telecommunications industry has been making efforts as a whole, with KDDI joining in March 2023, following Rakuten Mobile’s participation.

In March 2023, NTT East and West commenced commercial services for “IOWN 1.0,” an all-optical network that achieves ultra-low latency. Furthermore, KDDI and SoftBank announced the introduction of all photonics

B Initiatives towards societal implementation

Various private sector entities and organizations are advancing efforts towards societal implementation for Beyond 5G.

The IOWN Global Forum is collaborating with various industries to consider use cases for the realization and proliferation of the IOWN concept, targeting practical use and commercialization around 2025, in addition to envisioning the future around 2030. They have cited early adoption examples around 2025, such as data center connections for the financial industry and remote/cloud media production for the broadcasting industry. They plan to proceed with specification development and verification towards commercialization.

In June 2023, Tokyu Land Corporation agreed to collaborate with NTT and its affiliates on new urban development utilizing IOWN-related technologies and service-

C Efforts toward overseas expansion

Regarding Open RAN, NTT DOCOMO established OREX as a brand to globally deploy Open RAN architecture and announced the establishment of a joint venture company “OREX SAI” with NEC in February 2024 to provide it in response to the requests of overseas telecommunications operators. Rakuten Mobile is also aiming to promote and expand the adoption of Open RAN

domestic companies, the “Open RAN Promotion Subcommittee” was established in March 2022 to discuss various issues related to Open RAN. The results of these discussions were compiled in the “Open RAN Promotion Subcommittee Activity Report” in March 2023. Furthermore, an “Beyond 5G International Conference” was held in February 2024 with the aim of strengthening collaboration between domestic and international stakeholders. In FY2024, the consortium plans to integrate with the 5th Generation Mobile Communications Promotion Forum (5GMF) to enhance the promotion structure for next-generation mobile communications and further accelerate efforts toward the social implementation of Beyond 5G technologies.

networks into their core networks. Regarding non-terrestrial network (NTN) technologies such as low-earth orbit satellites and HAPS, SoftBank is promoting the utilization of HAPS through alliances such as the “HAPS Alliance,” aiming to integrate various communication technologies into a single system to provide ubiquitous communication on land, at sea, and in the air. Additionally, Rakuten Mobile announced plans to provide domestic services using satellite-to-mobile direct communication in 2026 in collaboration with AST SpaceMobile in February 2024.

es, with the initial implementation being the introduction of IOWN 1.0 to “Shibuya Sakura Stage” in December 2023.

Furthermore, towards international standardization, organizations such as the NICT and the “Beyond 5G Promotion Consortium” have been contributing to the international vision for Beyond 5G. In November 2023, a framework recommendation was approved by ITU-R, reflecting proposals from Japan, outlining the capabilities and use cases for “IMT-2030,” with 6G in mind.

Additionally, at the 2023 World Radiocommunication Conference (WRC-23), frequencies and other resources were secured for the realization of Beyond 5G, including non-terrestrial network (NTN) technologies such as HAPS.

technology, establishing facilities for showcasing Open RAN technology and flexible technical verification environments to meet requests domestically and internationally. Against this backdrop, the adoption of Open RAN-related products by major telecommunications operators in North America and Europe is progressing (Figure 2-2-7-1).

Figure 2-2-7-1 Status of promotion of Open RAN to foreign telecommunication operators

Dish (the U.S.) adapted Open RAN of Fujitsu <ul style="list-style-type: none"> Dish, the U.S. telecommunication carrier, started to introduce the RU of Open RAN by Fujitsu (March 2021). 	NEC & Mavenir constructed the examination environment of Open RAN of Orange (France) <ul style="list-style-type: none"> NEC and Mavenir, who provides network software, constructed Open RAN in the 5G examination environment (September 2022).
1 & 1 (Germany) started commercial service using fully virtual technology by Rakuten <ul style="list-style-type: none"> 1&1 (German telecommunication carrier) constructed fully virtual mobile network of Open RAN technology by Rakuten and launched 5G commercial service (December 2022). 	Deutsche Telekom (Germany) adapted Open RAN of Fujitsu <ul style="list-style-type: none"> Deutsche Telekom selected Fujitsu and Nokia as the first commercial partner of Open RAN (February 2023).
NEC & Freshwave (the UK) demonstrated Open RAN in London <ul style="list-style-type: none"> DSIT (the UK) selected NEC & Freshwave (the UK telecommunication carrier), as a project to demonstrate technology, trust and possibility of realization of Open RAN in the center of London, and supported approximately 600 million yen (September 2023). 	AT&T (the U.S.) collaborate with Ericsson & Fujitsu in Open RAN <ul style="list-style-type: none"> AT&T announced a plan to lead the development of Open RAN in the U.S. It is planned to collaborate with suppliers such as Fujitsu and Ericsson to expand the Open RAN environment to full of wireless network (December 2023).
Fujitsu & Rakuten joined consortium of the U.S Open RAN construction <ul style="list-style-type: none"> NTIA (the U.S.) selected consortium (Fujitsu, Mavenir etc.) led by Dish, as a project to integrate and construct Open RAN, and supported approximately 76 hundred million yen (January 2024). Moreover, NTIA (the U.S.) selected a consortium led by AT&T (Verizon and docomo etc.), as a project to promote compatibility and commercialization of Open RAN, and supported approximately 64 hundred million yen (February 2024). Fujitsu & Rakuten collaborate as a supplier. 	White paper published by the European major telecommunication carriers <ul style="list-style-type: none"> Deutsche Telekom (Germany), Orange (France), TIM (Italy), Telefonica (Spain), Vodafone (the UK) published white paper on a process of Open RAN (February 2023) Europe plans many pilot projects of Open RAN after 2023, and also plans to implement commercially until 2025 in the all of Europe.

(Source) Compiled from various press materials

In preparation for Beyond 5G, NTT and its group companies are working on global deployment, including the establishment of the IOWN Global Promotion Office. NTT and NTT Data Group have conducted demonstrations of data center interconnection using all-optical networks in the U.S. and the UK. In October 2023, NTT and Chunghwa Telecom in Taiwan signed a basic agreement to realize international network connections based on IOWN. Additionally, in February 2024, Fujitsu announced joint discussions with Chunghwa Telecom to

build all-optical networks based on the IOWN concept in Taiwan. In the optical field, Japanese companies have been expanding their share of major transmission equipment in the global market, particularly in North America.

At the G7 Digital Technology Ministers' Meeting held in Gunma Takasaki in April 2023, a future vision for next-generation networks, including both wireless and wired networks, based on the vision of Beyond 5G, was formulated, and agreement was reached on the G7 Action Plan for building safe and resilient digital infrastructure.

(4) Formulation of a new information and communication technology strategy

Based on these trends related to Beyond 5G, a new strategy for research and development, international standardization, social implementation, and overseas expansion of Beyond 5G was formulated through organic collaboration. In November 2023, discussions were re-

sumed at the Information and Communication Council, and in June 2024, the final report "Approach to Information and Communication Technology Strategy for Beyond 5G" was compiled.

3. AI technologies

Since the proposal of deep learning in 2006, the third AI boom has arrived, leading to significant technological innovations in fields such as image recognition and natural language processing. Furthermore, in 2022, the trend of generating AI³, which can automatically generate images and text based on training data, began to gain popularity worldwide, intensifying the competition in the development of generating AI. In Japan, the development of generating AI has become active in numerous private companies, academia, and other entities. Simultaneously, the utilization of generating AI in a wide range of industrial sectors is progressing, showing signs of

bringing about a major transformation in society.

The MIC, based on the "AI Strategy 2022" (decided by the Integrated Innovation Strategy Promotion Council in April 2022) and the "Tentative Summary of AI Issues" (AI Strategic Council in May 2023), is collaborating with the NICT, a core center for AI-related activities, to conduct a wide range of research and development and social implementation related to natural language processing technologies such as large-scale language models and multilingual speech translation, distributed federated machine learning technologies, and AI technologies based on cognitive models of the brain.

³ In 2022, "Stable Diffusion" which can automatically generate images, and "ChatGPT" which can automatically generate sentences appeared.

(1) Strengthening the development capability and risk response capability of LLMs

The NICT has accumulated a vast amount of language data through years of research and development in AI technology. In addition, in July 2023, it prototyped LLMs based on high-quality Japanese data created from the language data, demonstrating expertise in constructing high-quality training language data required for LLMs development. Leveraging the data and expertise possessed by the NICT, efforts are underway to enhance

the development capability of LLMs in Japan by establishing and expanding a large amount of high-quality, safe Japanese-centric training language data required for LLMs development and providing access to LLMs developers in Japan. Additionally, research and development efforts are being made to address various risks associated with LLMs.



Figure (related data) Process of the development and use of LLMs and initiatives by the NICT
URL: <https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00408>
(Data collection)

(2) Research and development for advanced multilingual translation technology

The MIC, in collaboration with the NICT, is working on research and development of multilingual translation technology to eliminate the “Language Barrier” worldwide and achieve free global exchange. The NICT’s multilingual translation technology, utilizing the latest AI technology, has achieved practical-level translation accuracy for 18 languages, considering visits to Japan, foreign residents, and diplomatic responses. Furthermore,

the MIC and the NICT are promoting the social implementation of multilingual translation technology. The NICT provides “VoiceTra,” a research app for individual travelers, and over 30 private services have been deployed through technology transfer⁴, utilized in a wide range of fields such as government agencies, disaster prevention, transportation, and healthcare.



Figure (related data) Multilingual translation technology
URL: <https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00409>
(Data collection)

In anticipation of the 2025 Osaka-Kansai Expo, the MIC formulated the “Global Communication Plan 2025” in March 2020. Based on this plan, the MIC is establishing a computing environment for the NICT to conduct AI research and development at the world’s top level and

is conducting research and development from FY2020 to achieve “Simultaneous Interpretation” that goes beyond the conventional sequential translation, addressing business and international conference discussions.



Figure (related data) Initiatives to further advance multilingual translation technology
URL: <https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00410>
(Data collection)

Additionally, plans are in place to add three more languages, along with research and development for multilingual simultaneous interpretation, for the languages

with practical-level translation accuracy, considering responses to foreign residents.

⁴ Council for the Promotion of Global Communication Development: Examples of Products and Services by Private Companies Utilizing Multilingual Translation Technology from the NICT https://gcp.nict.go.jp/news/products_and_services_GCP.pdf

4. Quantum technologies

(1) Trends in quantum security and network policy

Quantum technology is an innovative technology that will dramatically and discontinuously advance future society and the economy. It is also crucial for economic security. Countries such as the U.S., Europe, and China have significantly expanded their investments in research and development and have strategically developed research and development bases and talent in various countries.

The government as a whole, based on the “Quantum Technology Innovation Strategy” (decided by the Integrated Innovation Strategy Promotion Council in January 2020), the “Vision for a Quantum Future Society - Vision for the Future Society to be Aims by Quantum Technology and Strategies for its Realization -” (decided by the Integrated Innovation Strategy Promotion Council in April 2022), and the “Quantum Future Industry Creation Strategy” (decided by the Integrated Innova-

tion Strategy Promotion Council in April 2023), as well as the “Promotion Measures for the Creation and Development of the Quantum Industry” (reported by the Quantum Technology Innovation Conference to the Integrated Innovation Strategy Promotion Council in April 2024), have been working to strengthen and complement these three strategies. They are also promoting activities to support the strengthening of research and development and commercialization in various technology fields (quantum computers, quantum software, quantum security networks, quantum measurement/sensing/quantum materials, etc.), and are working to create innovation through a comprehensive approach involving industry, academia, and government, from basic research to technology verification and talent development.

(2) Research and development of quantum cryptographic communication technology

In the era of quantum computers, where the security of modern cryptography is at risk, quantum cryptography that can reliably detect eavesdropping based on the physical properties of quantum is required. The MIC is promoting research and development of quantum cryptographic communication technology (quantum key dis-

tribution technology) in collaboration with the NICT. Based on the government’s overall strategy, a “Quantum Security Base” was established at the NICT in FY2021, and efforts are being made to promote social implementation, talent development, and a wide range of activities through the construction and use of test beds.

A Research and development of long-distance and networked quantum cryptographic communication

To realize the social implementation of quantum cryptographic communication, extending the communication distance is a major challenge. Therefore, the MIC has been working on the research and development of long-distance link technology and relay technology for ground-based quantum cryptographic communication since FY2020. In addition, research and development for the use of quantum cryptographic communication in se-

cure satellite communication networks has been underway since FY2018, and in FY2023, a demonstration test of cryptographic key sharing technology between the International Space Station (ISS) and the ground was conducted. Efforts will continue to advance research and development for the construction of a global-scale quantum cryptographic communication network.

B Establishment of quantum cryptographic communication test beds and promotion of social implementation

The NICT has been conducting research and development of quantum cryptographic communication technology from an early stage, and has been operating the “Tokyo QKD Network”, a quantum cryptographic communication test bed, since 2010 for the purpose of verifying the principles of quantum cryptographic communication. The basic specifications of quantum cryptographic communication equipment, based on the long-term operation results of the Tokyo QKD Network, were adopted as international standards (ITU-T Y.3800 series) in 2020, and have high international competitive-

ness.

Quantum cryptographic communication is expected to be deployed not only for information exchange between important domestic institutions, but also for commercial services such as finance and healthcare. Therefore, the MIC has been working on the construction of a wide-area test bed for quantum cryptographic communication that can conduct network configuration verification since FY2021, and is accelerating social implementation through the use of practical environments.

C Research and development for the realization of a quantum internet

A quantum internet, which stably realizes long-distance communication while maintaining quantum states, is expected to serve as the foundation for various quantum technologies, such as secure communication and distributed quantum computing. Therefore, the MIC

has started research and development of essential technologies to realize a quantum internet that maintains quantum states and achieves stable long-distance quantum communication from FY2023.



Figure (related data) Image of communication network of quantum cryptographic at the global level

URL: <https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00411>
(Data collection)

5. Remote sensing technologies

At the NICT, research and development of remote sensing technology are being conducted to observe conditions such as rainfall, water vapor, wind, and the earth's surface with high temporal and spatial resolution. This is aimed at early detection and understanding of the development mechanisms of sudden atmospheric phenomena such as linear precipitation zones and localized torrential rainfall, as well as rapid assessment of damage situations during disasters.

Research and development efforts include the deployment of dual-polarization phased array weather radar

(MPPAWR) capable of high-speed and high-precision three-dimensional observation of rain clouds and promoting the utilization of its data. Other efforts include technology to estimate the amount of water vapor in the atmosphere using the propagation delay of digital terrestrial broadcasting waves, wind profiler technology capable of observing wind speed in the upper atmosphere, and ground-based water vapor and wind LiDAR technology using eye-safe infrared pulse lasers capable of simultaneously observing water vapor and wind.



Figure (related data) Deployment of a network for observing water vapor in linear precipitation zones - A challenge to improve the accuracy of short-term rainfall forecasts

URL: <https://www.nict.go.jp/press/2022/06/29-1.html>

6. Space ICT

Based on the Basic Plan for Space Policy under the Basic Act on Space (Act No. 43 of 2008), the MIC is promoting research and development related to space development and utilization, including the following:

- (1) Research and development of radio and optical hybrid communication technology for small satellite constellations and the use of unused frequency bands for space networks to effectively utilize frequency resources and realize future ultra-wide-band satellite communication systems;
- (2) Research and development to establish the foundational technology for satellite-based quantum cryptography and to realize a quantum cryptography network using satellite networks;
- (3) Research and development of terahertz wave-based lunar water and energy resource exploration technology to contribute to the international space exploration program proposed by the U.S. (Artemis program);
- (4) Research and development of satellite communication systems for the Technology Experiment Satellite 9 and optical communication technology capable of 10Gbps-class ground-to-satellite and inter-satellite data transmission;
- (5) Development of space environment monitoring sensors for 24/7 manned operation for space weather forecasting and for the successor to the

Himawari geostationary meteorological satellite, which involves observing and analyzing the ionosphere, magnetosphere, and solar activity; and

- (6) Research and development of foundational technologies such as optical amplifiers to further enable high-speed, high-capacity, and long-distance satellite optical communication technology in conjunction with the practical application of satellite optical communication technology.

Furthermore, to maintain and strengthen the independence of Japan's space activities and to strongly support the efforts of private companies and others in advanced technology development, technology demonstration, and commercialization, the Japan Aerospace Exploration Agency (JAXA) established the Space Strategy Fund in March 2024 as a focal point for academia, industry, and government. Going forward, in collaboration with relevant government ministries (the Cabinet Office, the MEXT, the METI), the aim is to accelerate the commercialization of private companies targeting the space-related market, expand access and utilization of space by academia, industry, and government, and actively engage in and strategically collaborate on cutting-edge technology development by a wide range of players.

7. Supports for ICT startups

Based on the “Startup Development Five-year Plan” (decided by the New Capitalism Realization Conference in November 2022), the MIC is implementing the “Startup and Budding Researchers Support Program” to foster next-generation industries through the creation and utilization of advanced ICT, with a division of roles between the public and private sectors, providing comprehensive support from seed research and development to business implementation.

Through public solicitation, individuals or startups aiming to start businesses or expand them are selected to receive research and development funding for ICT-

related projects. Additionally, leveraging the results of the “INNO-vation Program” implemented for 10 years until FY2023, the ministry is providing comprehensive support in collaboration with support organizations nationwide and across various fields, promoting joint public-private support.

Furthermore, to enhance the ripple effects of the measures, the MIC is promoting initiatives under the name “ICT Startup League,” in collaboration with willing private companies and others, to support private sector activities and industry revitalization.