

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 Communications 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, the “6th Science, Technology, and In-

novation Basic Plan” was approved by the Cabinet on March 26, 2021, and relevant governmental ministries and agencies are collaborating and cooperating to foster R&D in advanced fields, aiming to achieve a sustainable and resilient society that ensures the safety and security of citizens. Accordingly, the MIC is pushing ahead with measures in the fields of AI, quantum technology, remote sensing, space and others.

The NICT is promoting fundamental and foundational research and development in five key areas (advanced electromagnetic wave technology¹, innovative networks², cybersecurity³, universal communication⁴, and frontier science⁵) 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

For Beyond 5G, the MIC announced the “Strategy for Realizing Next-Generation Information and Communication Infrastructure to Support AI Society - Beyond 5G Promotion Strategy 2.0 -” on August 30, 2024 in view of the progress of measures implemented by the public and private sectors and a shift to the phase aimed at social implementation and overseas deployment and of the environmental changes and issues, such as the explosive spread of AI systems. Based on this strategy, the ministry has been pressing forward with measures including R&D, international standardization, social im-

plementation and overseas deployment.

Moreover, the Information and Communications Council has been conducting studies on the R&D fields and issues to be prioritized by the national government and the NICT in the ICT field and on the measures to promote the deployment of the R&D results based on the “6th Science, Technology and Innovation Basic Plan” and the NICT’s medium- to long-term targets for the next term, while paying attention to recent social changes, technological progress and market trends.

2. Beyond 5G

On September 30, 2021, the MIC consulted the Information and Communications Council on the “Strategy for Information and Communication Technology towards Beyond 5G,” and an interim report was compiled 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.

Based on this interim report, 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.

Furthermore, following the compilation of the final report on June 18, 2024, the MIC announced the “Strategy for Realizing Next-Generation Information and Communication Infrastructure to Support AI Society - Beyond 5G Promotion Strategy 2.0 -” on August 30, 2024 to support companies in the private sector in implementing measures including those for R&D, international standardization, social implementation and overseas deployment.

¹ R&D into fundamental and basic technologies for advanced data collection and high-precision observation by using various sensors as well as the promotion of standardization and the diffusion and social implementation of R&D results

² R&D into fundamental and basic technologies for connecting terrestrial and satellite networks in a multilayered manner to respond to the explosive increase of communication volume as well as promotion of standardization and the diffusion and social implementation of R&D results

³ R&D into cybersecurity technologies to protect social systems from rapidly increasing cyberattacks and as well as promotion of standardization and the diffusion and social implementation of R&D results

⁴ R&D into fundamental and basic technologies for the creation of new knowledge and value by the use of artificial intelligence and others as well as the diffusion and social implementation of R&D results.

⁵ R&D into advanced and basic technologies for the creation of innovations as well as the diffusion and social implementation of R&D results.

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

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) enacted and enforced in December 2022, establishing a permanent fund at the NICT in March 2023 as a successor 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 fosters research and development projects for social implementation and overseas deployment; the “Element Technology 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 (Act No. 131 of 1950).

In particular, for the “Social Implementation and Overseas Deployment-Oriented Strategic Program,” which is the major target of the fund project, based on the interim report made by the Information and Communications Council, “all photonics network technology⁶,” “non-terrestrial network (NTN) technology⁷,” and “secure virtualization and integration network technology⁸” are regarded as priority technology areas. Also, the program is divided into two categories: “business strategy sup-

port type” to intensively support research and development projects that have social implementation and overseas deployment strategies and commitments; and “common infrastructure technology establishment type” for the national government to lead the development of technologies in cross-industrial common infrastructure or cooperation domains necessary for the early realization of social implementation and overseas deployment.

In FY2023, 17 major research and development projects were adopted in the Social Implementation and Overseas Deployment-Oriented Strategic Program (business strategy support type) and others based on the “Appropriate Evaluation of Business Aspects of the Innovative Information and Communication Technology (Beyond 5G (6G) Fund Project)” (announced on March 10, 2023), which was compiled by the “WG on Innovative Information and Communication Technology Project Business Evaluation”⁹ under the Information and Communications Council (Information and Communication Technology Subcommittee on Technology Strategy). Also, support started to be provided to international standardization activities to be conducted as part of the projects. Furthermore, in FY2024, new initiatives for Beyond 5G were launched in the Social Implementation and Overseas Deployment-Oriented Strategic Program (common infrastructure technology establishment type) through the effective use of the fund, including the development of common infrastructure technology for inter-operator cooperation in all-photonics networks.

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

The MIC has been promoting R&D in the priority technology field including all-photonics network technology through the Innovative Information and Communication Technology (Beyond 5G (6G)) Fund project. Also, the ministry is working for the international standardization of the R&D results by supporting companies promoting the social implementation and overseas deployment of their R&D results through the fund project in conducting international standardization activities.

In order to make achievements in international standardization activities, companies need to regard international standardization as part of their business strategy and strategically work on standardization based on management’s commitment. Based on this recognition, the MIC set the “Requirements for Supporting International Standardization Activities” (announced on March 18, 2024) to be met for companies conducting international standardization activities through the fund project to receive support from the ministry and has been supporting these companies that meet the requirements. The requirements for support were set based on the “Ap-

proach to Support for International Standardization Activities through the Innovative Information and Communication Technology (Beyond 5G (6G)) Fund Project” (announced on March 8, 2024), which was compiled based on discussions by the “Innovative Information and Communication Technology Project Business Evaluation WG” under the Technology Strategy Committee of the Information and Communication Technology Subcommittee of the Information and Communications Council. Specifically, companies are required to (1) conduct activities under a system led by top management based on the business strategies; (2) regard international standardization as part of the business strategies; and (3) conduct specific activities for international standardization. In FY2024, the MIC supported nine entities in conducting international standardization activities from among those implementing R&D projects under the Social Implementation and Overseas Deployment-Oriented Strategic Program (business strategy support type).”

Furthermore, in preparation for Beyond 5G, the “Beyond 5G New Business Strategy Center” was estab-

⁶ Technology for the end-to-end transformation of a wired network into an optical network by the use of photonics-electronics convergence technology to realize ultra-high-speed, ultra-low-latency and ultra-energy-efficient communication infrastructure

⁷ Technology for seamless HAPS and communication satellite connection across land, sea, air and space to establish communication infrastructure in non-residential areas and to make information infrastructure redundant in case of large disasters

⁸ Technology to transform hardware into software to build highly flexible communication infrastructure to meet user needs, thereby ensuring safe and highly reliable communication environment for users

⁹ Changed the name of the WG from “Innovative Information and Communications Technology Project WG” (February 22, 2024)

lished in December 2020 to strategically promote international standardization and intellectual property activities under corporate management strategies and through industry-academia-government collaboration. The Center has been conducting a range of activities to develop leaders for 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 “Leader Forum,” and awareness-raising and information dissemination seminars for companies, especially for their management and business departments, known as the “New Business Strategy Seminar.” Additionally, a new industry collaboration activity, “XG Ignite,” bridging information and communication technologies, digital domains and various other fields and industries, has been conducted since FY2023.

Additionally, in order to advance international standardization activities from the early stages of research and development, the MIC has been fostering international joint R&D with research institutions of countries and regions that can generate synergy effects with Japan as its reliable strategic partners. Specifically, in 2025, international joint R&D was started with the European Commission for the AI-based autonomous operation and control of wireless networks based on the “Japan-EU Digital Partnership” (May 2022) under the Innovative Information and Communication Technology

(3) Initiatives for the diffusion and expansion of Beyond 5G systems

Beyond 5G Promotion Strategy 2.0 expects that the next-generation information and communication infrastructure to support the AI society of 2030s will be a low-latency, energy-efficient, high-quality, flexible and low-cost infrastructure. To meet this expectation, it is essential to establish and sophisticate all-photonics network technologies, for which Japan has strengths, towards social implementation and full-scale utilization.

The MIC has been conducting R&D to build an ultra-high-speed, ultra-low-latency and energy-saving communication infrastructure by using all-photonics network technologies under the Innovative Information and Communication Technology (Beyond 5G (6G)) Fund project. In addition, for social implementation and full-scale utilization of developed technologies by around 2030, it is necessary to enable a range of stakeholders to

(4) 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 concept¹⁰, has been steadily increasing. In addition, Japan’s telecommunications industry has been making efforts as a whole, with KDDI joining the forum

(Beyond 5G (6G)) Fund project “Element Technology and Seed Creation Program.” Moreover, based on the Letter of Intent for Cooperation in Communication Technologies signed by the Minister for Internal Affairs and Communications of Japan and the Minister for Education and Research of the Federal Republic of Germany in May 2023 as well as on the results of the 7th Japan-Germany ICT Policy Dialogue held in June of the same year, the two sides started to conduct international joint R&D on digital twin technology for all-photonics networks in 2025.

In April 2024, the “Beyond 5G Promotion Consortium” and the “5th Generation Mobile Communications Promotion Forum (5GMF)” were integrated into the “XG Mobile Promotion Forum (XGMF)” to enhance the promotion structure for next-generation mobile communications and further accelerate efforts toward the social implementation of Beyond 5G technologies. The XGMF has been conducting studies based on the future technological trends of Beyond 5G and its use scenarios as part of its activities and announced the “Beyond 5G White Paper version 4.0” in December 2024.

Furthermore, in October 2024, in cooperation with XGMF, the Association of Radio Industries and Businesses, and the University of Tokyo, MIC held the “5G International Workshop,” “Local 5G International Workshop” and “5G/6G International Conference” as 5G/6G Special Day events at CEATEC 2024.

actually test and verify the technologies for commercialization and other purposes at an early stage. The earlier establishment of such a verification environment is expected to help Japan speed up the technology, product and service commercialization cycles leveraging Japan’s strengths and enable the early social implementation of all-photonics networks ahead of other countries. Moreover, it will help Japan enhance its international competitiveness through the overseas deployment of commercialized technologies, products and services.

Against this backdrop, the MIC decided to build an innovation hub for various stakeholders to conduct tests and verification activities for commercialization step by step and aims to start the full-scale establishment and expansion of the hub in FY2026 after formulating a development plan for it within 2025.

in March 2023, following Rakuten Mobile’s participation.

In March 2023, NTT East and West commenced commercial services for “IOWN 1.0,” which is an all-photonics network that achieves ultra-low latency, and in 2025 offered the services to Expo 2025 Osaka, Kansai pavilion

¹⁰ The “Innovative Optical and Wireless Network (IOWN) concept” is led by NTT to create an affluent society rich in diversity by optimizing society as a whole and as individuals, for which photonics-based innovative technologies will be utilized to realize high-speed large-volume communication beyond the limitations of conventional infrastructure and provide a vast amount of computing resources to build networking and information processing infrastructure including terminals.

ions and event facilities at the Yumeshima venue. Also, KDDI and SoftBank announced the introduction of all-photonics networks into their core networks.

Regarding non-terrestrial network (NTN) technologies such as low-earth orbit satellites and high-altitude platform station (HAPS) technologies, SoftBank is promoting the utilization of HAPS through the “HAPS Alliance,” aiming to integrate various communication technologies into a single system to provide ubiquitous

B Initiatives towards social implementation

Various private sector entities and organizations are advancing efforts towards social 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 fact, in June 2023, Tokyu Land Corporation agreed to collaborate with NTT and its affiliates on new urban

C Initiatives towards overseas expansion

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-photonics 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. Subsequently, in August 2024, an all-photonics network was opened, connecting Chunghwa Tele-

communication on land, at sea and in the air. Space Compass and NTT DoCoMo have been implementing measures for the launch of HAPS services in 2026. To this end, they announced that they had succeeded in data communication demonstration experiments in Kenya in February 2025. Also, in February 2024, Rakuten Mobile announced a plan to provide domestic services using satellite-to-mobile direct communication in 2026 in collaboration with AST SpaceMobile.

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

com’s data center to NTT’s Musashino R&D Center over a distance of about 3,000 km. Additionally, in February 2024, Fujitsu announced joint discussions with Chunghwa Telecom to build all-photonics networks based on the IOWN concept in Taiwan. Subsequently in August 2024, the company opened an open APN laboratory, aiming to expand its all-photonics network business in Europe. In the optical field, Japanese companies have been expanding their share of major transmission equipment in the global market, particularly in North America.

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 generative AI¹¹, which can automatically generate images and text based on learned data, began to gain popularity worldwide, intensifying the competition in the development of generative AI. In Japan, the development of generative AI has become active in numerous companies in the private sector, academia, and other entities. Simultaneously, the utilization of generative AI in a wide range of industrial sectors is progressing, showing signs of bringing about a major transformation in society.

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

The NICT has accumulated one of the largest collec-

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 member of AI core related centers, 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 and brain-inspired mechanisms.

tions of language data in Japan through years of research

¹¹ In 2022, generative AI systems, such as Stable Diffusion (capable of converting text to images) and ChatGPT (capable of automatic text generation) were released.

and development in AI technology. In addition, in July 2023, it prototyped a large language model (LLM) based on high-quality Japanese data created from the language data, demonstrating expertise in constructing high-quality language data for learning, which is required for LLM development. Leveraging the data and expertise possessed by the NICT, efforts are underway to enhance Ja-

pan's LLM development capability by preparing large-scale and high-quality Japanese-centric language data for learning required for the development of LLMs and providing LLM developers in Japan with access to the data. Additionally, research and development efforts are being made for technologies to support the verification, analysis and improvement of LLM generated text.



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/r07/html/datashu.html#f00400>

(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 communication. The NICT’s multilingual translation technology, utilizing the latest AI technology, has achieved practical-level translation accuracy for 21 languages, in anticipation of use by foreign visitors to Japan and foreign residents in Japan,

and for 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 40 private services have been deployed through technology transfer¹², utilized by government agencies and in a wide range of fields such as disaster prevention, transportation, and healthcare.



Figure (related data) Multilingual translation technology

URL:<https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r07/html/datashu.html#f00401>

(Data collection)

In anticipation of Expo 2025 Osaka, Kansai, Japan, to further advance NICT’s multilingual translation technology, the MIC formulated the “Global Communication Plan 2025” in March 2020. Based on this plan, the MIC is working on the establishment of a computing environment for the NICT to conduct AI research and develop-

ment at the world’s top level and has been conducting research and development since FY2020 to achieve “simultaneous interpretation” that goes beyond the conventional short-sentence 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/r07/html/datashu.html#f00402>

(Data collection)

In FY2025, a translation engine developed by the NICT was utilized at Expo 2025 Osaka, Kansai, Japan for simultaneous interpretation in 30 languages through a translation app and at seminars. Furthermore, the MIC

is collaborating with Global South and other countries for the demonstration and evaluation of LLMs that support multiple languages.

4. Quantum technologies

(1) Trends in quantum security network policy

Quantum technology is an innovative technology that has the potential to bring about transformative and discontinuous advances in future society and the economy, and it is also of critical importance from the perspective of economic security. In response, countries and regions such as the U.S., Europe, and China have formulated promotion strategies for quantum technology and are implementing strategic initiatives, including the promotion of research and devel-

opment, the establishment of research hubs, and human resource development.

In order to lead global innovation in quantum technology ahead of the rest of the world, Japan formulated the Quantum Technology Innovation Strategy (decided by the Integrated Innovation Strategy Promotion Council in January 2020), which comprehensively organized a wide range of initiatives spanning from research and development to social implementation across various tech-

¹² 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

nological fields, including quantum computing, quantum software, quantum security and quantum networks, and quantum measurement and sensing / quantum materials. Subsequently, in light of expanding international investment and other developments, Japan formulated the Quantum Future Society Vision (decided by the Integrated Innovation Strategy Promotion Council in April 2022), the Quantum Future Industry Creation Strategy (decided by the Integrated Innovation Strategy Promo-

tion Council in April 2023), and the Promotion Measures toward the Creation and Development of the Quantum Industry (reported by the Quantum Technology Innovation Council in April 2024). Through these initiatives, Japan aims to strengthen its technological development capabilities by promoting research and development, while also advancing the development of a broad range of human resources related to quantum technology.

(2) Research and development of quantum cryptographic communication technology

With the practical realization of quantum computers, there are concerns that cryptographic systems currently in widespread use may become compromised. In response, the MIC, in collaboration with NICT, private-sector companies, universities, and other stakeholders, is promoting research and development on quantum cryptographic communication technologies and related technologies that can reliably detect eavesdropping based on the physical properties of quantum mechanics.

In addition, in line with the government-wide strategy, MIC established a Quantum Security Hub at NICT in fiscal year 2021 as a core base under the Quantum Technology Innovation Strategy in the field of quantum security and quantum networks, and is undertaking a broad range of initiatives, including the promotion of social implementation through the construction and utilization of testbeds, as well as human resource development.

A Research and development for the social implementation of quantum cryptographic communication

Quantum Key Distribution (QKD) technology, which transmits encryption key information on photons, is utilized for quantum cryptographic communication, and for its practical use, it is necessary to increase the communication speed, extend the communication distance and expand the communication area. In order to meet these major challenges, the MIC has been working on the research and development of long-distance link technology and relay technology for terrestrial quantum cryptographic communication for five years since FY2020. In FY2025, the MIC decided to start conducting R&D into technologies to further increase the speed of quantum cryptographic communication networks and

sophisticate these networks, and large-scale networking technologies for the early social implementation of these networks. In addition, through the Space Strategy Fund established at the Japan Aerospace Exploration Agency (JAXA) in March 2024, technologies for quantum cryptographic communication devices that can be mounted on small satellites will be developed based on the technological development theme of “developing and demonstrating satellite quantum cryptographic communication technologies.” Through these measures, the MIC will continue to work for the early establishment of global quantum cryptographic communication networks.

B Establishment of quantum cryptographic communication testbeds and promotion of social implementation

In Japan, NICT has been engaged from an early stage in research and development of the elemental technologies for quantum cryptographic communication. For the purpose of demonstration and verification of quantum cryptographic communication, NICT established the quantum cryptographic communication testbed known as the “Tokyo QKD Network” in 2010, and has continuously operated it since then. Based on the long-term operational experience of the Tokyo QKD Network, the basic specifications for quantum cryptographic communication equipment were formulated and adopted in 2020 as international standards (ITU-T Y.3800 series), and these specifications possess

a high level of international competitiveness.

In addition to applications for information exchange among critical domestic institutions, quantum cryptographic communication is also expected to be deployed in commercial services such as finance and healthcare, and there is a strong demand for its early practical implementation. Accordingly, since FY2021, the MIC has been developing a quantum cryptographic communication testbed that enables demonstrations of network configurations, including route control, in a multi-node architecture connecting multiple sites, including private-sector entities, and is working to accelerate social implementation through usage verification in real-world environments.

C Research and development for the realization of a quantum internet

The quantum Internet, which enables stable long-distance communication while preserving quantum states, is expected to serve as a foundational communication technology underpinning the utilization of a wide range of quantum technologies, including secure communications and distributed quantum computing. Accordingly, since FY2023, the MIC has initiated research and development aimed at realizing a quantum Internet,

including the development of technologies such as quantum entangled photon sources and quantum memories, as well as the integration of highly precise phase synchronization technologies—such as those based on optical clocks—with quantum networks, and research and development to establish fundamental and core technologies including multi-party quantum communication and quantum communication protocols.



Figure (related data) Image of communication network of quantum cryptographic at the global level
 URL:<https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r07/html/datashu.html#f00403>
 (Data collection)

5. Remote sensing technologies

At the NICT, research and development of remote sensing technology is 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 elucidation 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 a Multiparameter phased array weather radar (MP-PAWR) capable of high-speed and high-precision three-dimensional observation of rain clouds and promoting the utilization of its data. Other efforts include the R&D of 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, ground-based water vapor and wind LiDAR technology using eye-safe infrared pulse lasers capable of simultaneously observing water vapor and wind, and satellite-based cloud and precipitation observation technology.

At Expo 2025, Osaka, Kansai, Japan, three-dimensional observations of cumulonimbus clouds and other rain clouds in the Osaka area will be conducted by using two Multiparameter Phased Array Weather Radars (MP-PAWR), and the results will be analyzed by a supercomputer and others to provide highly accurate weather forecast information that has never been available before to the Japan Association for the 2025 World Exposition as well as to visitors to the Expo.



Figure (related data) Demonstration of the provision of "highly accurate weather forecast information" at Expo 2025 Osaka, Kansai, Japan
 URL:https://www.soumu.go.jp/main_content/001003941.pdf

6. Space ICT

Among space activities, space communication is a field that provides a large market and is expected to grow further. Space communication is being increasingly utilized during disasters, on isolated islands, at sea and in mountainous areas in Japan, with its importance growing for national security and resistance against disasters. Also, outside Japan, various companies are working on the development of new technologies and services for space communication. For Japan to increase its independence and autonomy in space communication, it is necessary for Japanese communication service providers and manufacturers of communication devices and other related equipment to have sufficient international competitiveness. Based on this recognition, the MIC is implementing measures to sophisticate commu-

nication and radio use in space. Specifically, the ministry is pushing ahead with R&D and demonstration projects through the Space Strategy Fund for the provision of satellite optical communication-based data relay services and for frequency-sharing technologies aimed at the integrated operation of satellite communication and terrestrial network systems.

While solar radiation following the occurrence of solar flares could hinder radio communication and satellite positioning, the NICT makes space weather forecast 24 hours a day, 365 days a year. Furthermore, the institute is developing space environment data acquisition equipment to be mounted on the next-generation geostationary meteorological satellite (Himawari-10).