Section 3 Trends in radio policy

1. Summary

(1) Initiatives so far

Radio waves are a finite and scarce resource that is widely used to provide essential services for the public, such as mobile phones, police, and fire services. As a shared national asset, it is necessary to ensure their fair and efficient use. Specifically, radio waves have the characteristic of causing interference when the same frequency is used in the same area, making it impossible to use them indiscriminately. Therefore, a system to ensure proper use is required. Additionally, the way radio waves propagate and the amount of information they can transmit vary depending on the frequency band, necessitating the use of each frequency band for suitable purposes. Furthermore, since radio waves can propagate across national borders depending on their power, international agreements and coordination are necessary for their use.

The Radio Act, established in 1950 to replace the old Wireless Telegraphy Act, which stated "Wireless telegraphy and wireless telephony shall be managed by the government," aims to promote public welfare by ensuring the fair and efficient use of radio waves. Since then, Japan has promoted the private use of radio waves, which are now indispensable to the public.

The MIC has been working on various initiatives, including the allocation of frequencies under international cooperation, licensing of radio stations, radio wave management to ensure a good radio wave usage environment free from interference and disturbances, research and development to expand radio wave resources, and technical testing for the effective use of radio wave technology.

(2) Future challenges and directions

In the era of digital transformation, where advanced technologies such as IoT, big data, and AI, as well as digital technologies necessary for the "new normal," are integrated into various industries and aspects of daily life to solve national issues and achieve further economic growth, radio waves are an indispensable infrastructure.

In this era of digital transformation, it is expected that the radio wave utilization industry will further develop, and the demand for radio wave use will expand dramatically. Given that radio waves are a finite and scarce national asset, there is a growing need to promote their fair and efficient use.

Additionally, with the continued increase in traffic for land mobile radio stations, such as mobile phones, maintaining a comfortable radio wave usage environment for mobile phones and other devices is crucial. This includes not only the more effective use of currently utilized frequencies but also the sharing of frequencies used for other purposes and the exploration of unused frequencies such as terahertz bands, making frequency allocation a significant challenge.

Furthermore, it is important to maintain a good radio wave usage environment while adapting to changes in the situation surrounding radio wave use. To achieve this, it is necessary to advance initiatives such as radio wave monitoring and test purchases of wireless equipment to respond to new radio wave uses and changes in the distribution of wireless equipment.

2. Radio policy toward expansion of digital businesses

(1) Examination of promoting effective use of radio waves for expanding digital business

With the advancement of technology, the use of radio waves has proliferated and evolved across all spaces and socio-economic activities, including land, sea, air, and space, becoming a source of innovation. Therefore, it is crucial to leverage radio waves as a growth foundation for the digital society, thereby expanding business opportunities further.

In light of this, the MIC has been holding the "Radio Wave Policy Roundtable for Expanding Digital Business" since November 2023. This council aims to discuss the future vision of radio wave utilization and set new goals and implementation strategies for effective use of radio waves to expand digital business. The council is considering future visions such as "Evolved Businesses Spreading Worldwide," "a Truly Rich and Exciting Life," and "a Reliable Society without Unforeseen Risks." To achieve these visions, the main perspectives include: (1) measures to expand the use of radio waves in all kinds of space, including land, sea, air, and universe, starting with NTN (Non-Terrestrial Networks); (2) transitioning, reorganizing, and sharing radio waves for flexible use amid increasing demand and frequency congestion; (3) establishing a safe, secure, and stable environment for using wireless networks as infrastructure; and (4) examining the spectrum user fee system to ensure the appropriate use of radio waves, which is the source of expanding digital business **(Figure 2-2-3-1)**. The roundtable plans to compile its findings by around the summer of 2024. Based on these findings, the MIC intends to implement the necessary institutional arrangements and other measures.

Figure 2-2-3-1 Future image discussed in the Radio Policy Roundtable for Expanding Digital Business

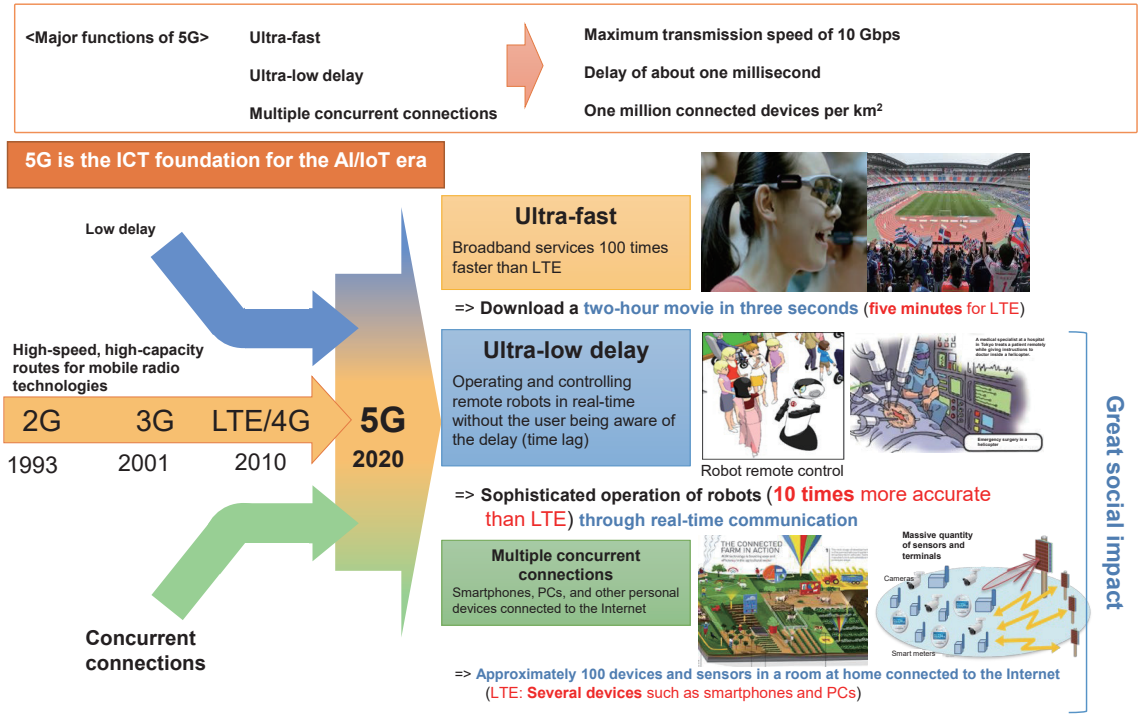
3. Spread and development of 5G and B5G

(1) Promotion and deployment of 5G based on the Infrastructure Development Plan for a Digital Garden City Nation

A Formulation of the "ICT Infrastructure Regional Deployment Master Plan"

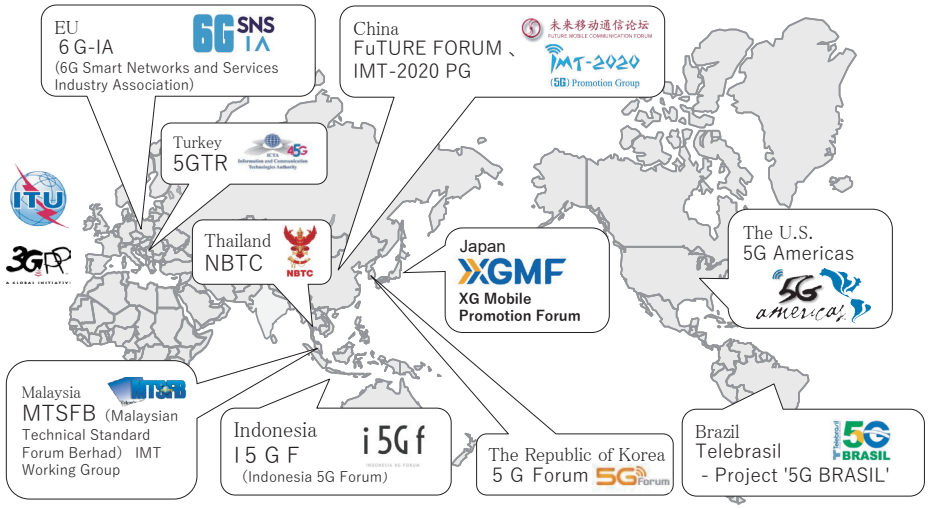
5G not only offers "Ultra-high Speed" as an evolution of 4G but also enables "Ultra-low Latency" for smooth operation of robots and other devices in remote areas, and "Massive Simultaneous Connections" where numerous devices can connect to the network simultaneously **(Figure 2-2-3-2)**. Therefore, 5G is highly anticipated as an essential infrastructure for realizing an IoT society where all "Things" are connected to the internet. In practice, various initiatives utilizing 5G are progressing in different regions and fields, such as autonomous driving of tractors, product inspection using AI-based image analysis, and remote control of construction machinery.

Figure 2-2-3-2 Features of 5G



The MIC recognizes 5G as a global economic and social foundation and actively contributes to the International Telecommunication Union (ITU) activities for 5G international standardization while strengthening international cooperation with Europe, the U.S., and Asian countries **(Figure 2-2-3-3)**. Additionally, to deploy ICT infrastructure nationwide as early as possible, the MIC formulated the "ICT Infrastructure Regional Deployment Master Plan" in June 2019, with revisions in July and December 2020, integrating support measures for ICT infrastructure development and 5G utilization promotion.

Figure 2-2-3-3 Promotion organization of 5G in each country and region



B Formulation of the "Infrastructure Development Plan for a Digital Garden City Nation"

In December 2021, Prime Minister Kishida announced the goal of raising the 5G population coverage rate to 90% by the end of FY2023 to realize the Vision for a Digital Garden City Nation. Following this, the MIC requested mobile phone operators to actively develop more 5G base stations and submit plans for the number of 5G base stations and 5G population coverage rates by FY2025. Based on the plans submitted by each company, the MIC formulated and published the "Infrastructure Development Plan for a Digital Garden City Nation" on March 29, 2022, as a follow-up to the "ICT Infrastructure Regional Deployment Master Plan." This plan was revised on April 25, 2023, considering changes in social conditions.

The infrastructure development plan aims to achieve a world-class 5G environment through a two-phase strategy: Phase 1 involves nationwide development of the 5G foundation (4G/5G parent stations), and Phase 2 involves regional deployment of child stations to expand area coverage nationwide **(Figure 2-2-3-4)**. Specifically, Phase 1 aims to make 4G available in all residential areas and deploy parent stations nationwide in almost all areas with demand for 5G. Phase 2 aims to achieve a 5G population coverage rate of 95% nationwide and establish 5G base stations in all municipalities by the end of FY2023, and 97% nationwide and at least 90% in each prefecture by the end of FY2025. As of the end of FY2022, the nationwide coverage rate was 96.6%, achieving the target one year ahead of schedule. Additionally, the plan sets a coverage target for non-residential areas, aiming for a 99% (100% for highways) coverage rate of roads (highways and national roads) with 4G/5G by the end of FY2030. To achieve these targets, the MIC has been working on specific measures such as allocating new 5G frequencies like the 2.3GHz band, providing subsidies for 5G base station development in disadvantaged areas through the "Mobile Phone Area Development Project," supporting tax measures, and promoting infrastructure sharing **(Figure 2-2-3-5)**.

Furthermore, to implement wireless and IoT solutions tailored to regional needs in a way that residents can experience their convenience, the MIC aims to flexibly combine various wireless systems, including local 5G, to develop regional digital infrastructure and promote the practical application of advanced solutions utilizing this digital infrastructure. Specific measures include promoting the development of digital infrastructure for social implementation of autonomous driving and drones in collaboration with relevant ministries, agencies, and local governments, as outlined in the interim summary of the Digital Lifeline National Comprehensive Development Realization Conference's Early Harvest Project.

Figure 2-2-3-4 Image of deployment of 5G

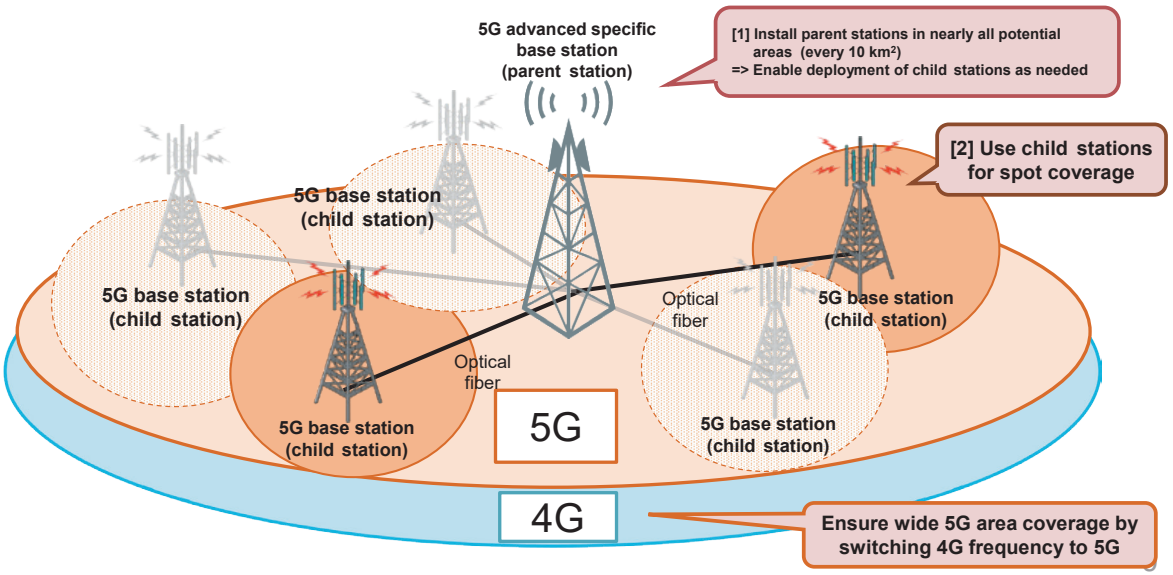
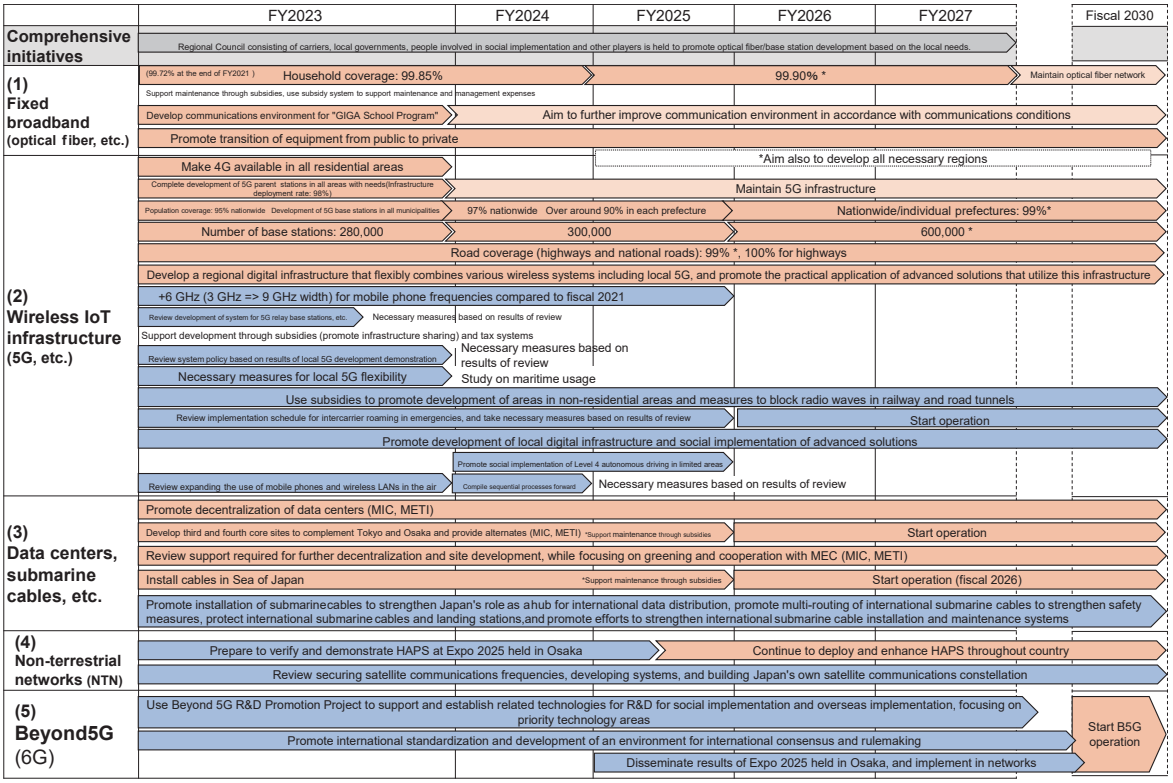


Figure 2-2-3-5 Infrastructure Development for a Digital Garden City Nation (roadmap)



(2) Beyond 5G

The next generation of information and communication infrastructure, "Beyond 5G (6G)," is expected to become the foundation for all industries and social activities in the 2030s. In June 2020, the MIC compiled the "Beyond 5G Promotion Strategy - Roadmap to 6G" and has been promoting this strategy in collaboration with relevant ministries and agencies[1].

4. Promotion of advanced radio use system

(1) Advancement of wireless LAN

Wireless LAN, standardized by the IEEE (Institute of Electrical and Electronics Engineers), is globally used and embedded in devices such as smartphones and tablets. Access points are installed in public places like sta-

[1] Refer to Section 7 "Trends in ICT technology policy" in Chapter 2, Part 2 for more information on efforts related to Beyond 5G.

tions, airports, tourist spots, commercial facilities, and schools, making it an essential communication infrastructure for the public. It is utilized not only in offices and homes but also in outdoor services, school education, and ensuring communication in disaster-stricken areas.

The MIC continuously examines the advancement of wireless LAN, considering the implementation status in other countries and domestic needs. Recently, there has been a global trend towards expanding the frequency bands available for wireless LAN. This aims to enable stable, high-speed, and large-capacity communication even in highly congested environments. In response to this trend, in 2022, regulations were established to allow the use of the 6GHz band in addition to the 2.4GHz and 5GHz bands. Furthermore, technical conditions for introducing the next-generation wireless LAN standard (IEEE 802.11be), which enables low-latency and ultra-high-speed communication, were discussed, leading to amendments in the Ordinance Regulating Radio Equipment (Radio Regulatory Commission Rules No. 18 of 1950) in December 2023. The expansion to the 6GHz band and the realization of the latest technology IEEE 802.11be are expected to create new services and applications in scenarios requiring real-time operations, such as AR (Augmented Reality)/VR (Virtual Reality)/MR (Mixed Reality) services, e-sports, and the control of robotic arms in factories **(Figure 2-2-3-6)**.

Additionally, the expansion of the use of drones and other devices utilizing wireless LAN technology has increased the demand for outdoor and aerial use of wireless LAN-equipped devices. However, there is a shortage of frequency channels available for outdoor use. Therefore, since 2023, discussions have been underway to expand the use of the 5GHz band for outdoor applications, with plans to proceed with regulatory considerations towards implementation by FY2024.

Moreover, to realize a wireless LAN system capable of accommodating future increases in mobile communication traffic and diverse usage needs, efforts are being made to further expand the 6GHz band, including its use outdoors, while considering coexistence with other wireless systems.

Figure 2-2-3-6 Examples pf new possible applications in the advanced wireless LAN

(2) Non-Terrestrial Networks

Non-Terrestrial Networks (NTN), such as High Altitude Platform Stations (HAPS) and satellite communications, extend mobile communication networks beyond the ground to include the sea, air, and space. These networks are useful for efficiently covering remote islands, maritime areas, and mountainous regions, as well as ensuring redundancy in communication networks during emergencies such as natural disasters.

The MIC is promoting initiatives to facilitate the early domestic deployment of NTN and related services based on the "Infrastructure Development Plan for a Digital Garden City Nation" (formulated in March 2022 and revised in April 2023).

Specifically, for HAPS, the MIC is advancing domestic regulatory frameworks through research and development support and technical demonstrations. The ministry is also working on international deployment in collaboration with relevant government agencies and through demonstrations at events such as the Osaka-Kansai Expo in 2025. Additionally, efforts are being made to secure frequencies for HAPS. At the World Radiocommunication Conference 2023 (WRC-23), held from November to December 2023, Japan led discussions resulting in the allocation of the 1.7GHz, 2GHz, and 2.6GHz bands for global use, and the 700MHz band for use in Region 1 (Europe, Africa), Region 2 (the Americas), and 14 countries in Region 3 (Asia), including Japan, for HAPS as mobile phone base stations.

Regarding satellite communications, the MIC has been establishing the necessary regulatory frameworks for the introduction of satellite constellations, which operate numerous non-geostationary satellites to provide high-speed, large-capacity communication services. The ministry continues to promote the allocation of frequencies and the establishment of necessary regulations to enable direct communication services between mobile phone terminals and satellites.

(3) Advanced road traffic systems

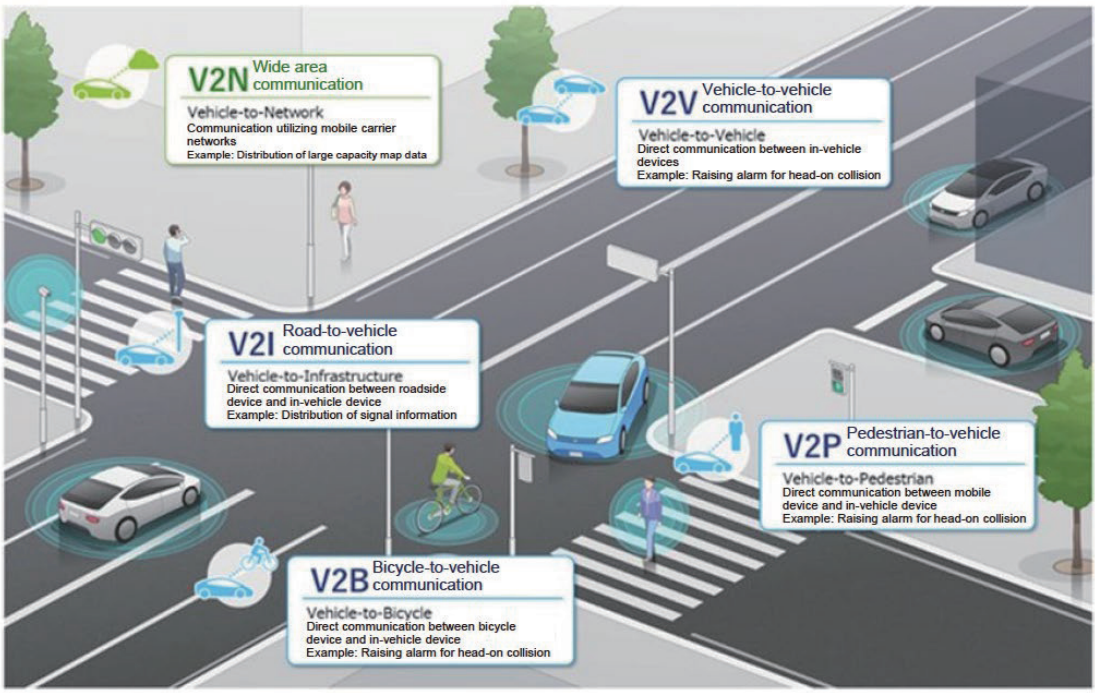
Intelligent Transport Systems (ITS) use information and communication technology to connect people,

roads, and vehicles, contributing to safer and more comfortable movement of people and goods by reducing traffic accidents and congestion.

The MIC has allocated frequencies and established technical standards for systems such as VICS (Vehicle Information and Communication System), ETC (Electronic Toll Collection System), in-vehicle radar systems, and the 700MHz band advanced road traffic systems. The ministry has also promoted the widespread adoption of these systems.

Globally, particularly in Europe and the U.S., there are ongoing demonstrations and implementations aimed at realizing autonomous driving. For advanced autonomous driving, such as merging and diverging support, V2X (vehicle-to-everything) communication, which exchanges information with surrounding vehicles and roadside infrastructure in addition to in-vehicle sensors like cameras and radars, is expected to play a crucial role **(Figure 2-2-3-7)**.

Figure 2-2-3-7 Image of communication by V2X



In Japan, the practical application of the 700MHz band advanced road traffic system as a V2X communication system has been progressing since 2015, ahead of the rest of the world. However, globally, the 5.9GHz band is being used for V2X communication systems. Therefore, to allocate the 5.9GHz band for V2X communication, the "Study Group on 'Next-Generation ITS Communication' for the Autonomous Driving Era" was established in February 2023. In August of the same year, an interim report was issued, stating that "considering international frequency harmonization and interference with existing radio stations, the allocation of up to 30MHz bandwidth in the 5,895MHz-5,925MHz range for V2X communication will be considered." Based on this interim report, the MIC has allocated 20.5 billion yen in the FY2023 supplementary budget for "Promoting Digital Infrastructure Development for the Social Implementation of Autonomous Driving" and will work with relevant government agencies to conduct demonstrations of autonomous driving trucks on the Shin-Tomei Expressway and other locations.

Additionally, to contribute to the international standardization and overseas deployment of Japan's ITS technology, the MIC is involved in submitting input to ITU-R reports and recommendations, disseminating information at international conferences such as the ITS World Congress, and promoting the spread of Japanese technology in Asia, including India.

(4) Public Safety Mobile System (Formerly: Public Safety LTE)

In Japan, major public institutions individually develop and operate wireless systems specialized for their respective operations, making inter-agency communication challenging. These systems are primarily voice-based due to constraints on available frequencies and development costs.

In countries like the U.S. and the UK, agencies responsible for public safety, such as fire departments and police, are adopting shared mobile communication networks that utilize the same communication technology as mobile phones. These networks enable high-speed data communication, including voice, image, and video transmission. Such Public Safety networks, using mobile phone technology, are expected to ensure inter-agency communication during terrorism or major disasters, facilitating smoother rescue operations. Additionally, using globally standardized technology offers benefits such as reduced equipment costs.

Since FY2019, the MIC has been collaborating with relevant agencies to examine the functions required for a public safety network in Japan and has conducted demonstrations. During the 2024 Noto Peninsula Earthquake, the demonstration terminals of the Public Safety Mobile System were utilized in the disaster area, confirming their usefulness.

From April 2024, some telecommunications operators have started providing communication services compatible with the Public Safety Mobile System. This system is expected to become an effective means of information sharing among public safety agencies during disasters **(Figure 2-2-3-8)**.

Figure 2-2-3-8 Major function of the Public Safety Mobile System

Major functions of public safety mobile system

Terminal image

Function items	Major functions of public safety mobile system
Communication line	**Multi carrier lines** (2 carriers are available) **Easily connected communication line** comparing to normal ones
Voice communication function	**Voice telephone using 070,080,090 (emergency call is available)**
Preferential connection	**Preferentially connected telephone in emergency is available** ※ ※The number of provided lines is limited.
App	**User organizations can select and download publicly available app**
Others	Can use the Internet and mails etc. the same as normal mobile phones

(5) Spatial transmission wireless power transfer system

The spatial transmission wireless power transfer system transmits power over a distance of several meters without wired connections through radio wave transmission and reception. It is expected to be used for powering sensor devices in factories. This system allows for low-power supply without the need for charging cables or battery replacement, improving convenience and enabling flexible installation of sensor devices. It is anticipated to contribute to the realization of Society 5.0 through the utilization of IoT.

The MIC has been examining the practical application of this system, including frequency sharing with other wireless systems, radio wave safety, technical conditions, and the establishment of smooth operational coordination mechanisms. Based on these examinations, regulatory measures were implemented in May 2022 to allow indoor use of the system under certain conditions in the 920MHz, 2.4GHz, and 5.7GHz frequency bands as on-premises radio stations.

5. Promotion of expansion of radio systems overseas

To ensure the safe and secure use of radio waves, the role of technologies and systems, including radio wave monitoring systems, has become increasingly significant. This importance is recognized not only in Japan but also in various foreign countries, particularly in Southeast Asian nations where the use of radio waves is rapidly expanding. Therefore, it is a crucial task for Japan to contribute internationally by deploying its advanced radio wave systems overseas, while also fostering Japan's wireless infrastructure and services into internationally competitive and promising businesses, thereby further boosting the domestic economy.

From this perspective, Japan is strategically promoting initiatives in cooperation with both the public and private sectors to globally expand radio wave systems in fields where Japan has strengths, focusing particularly on Asian countries. Specifically, to ensure that highly efficient frequency utilization technologies, which align with Japan's frequency circumstances, are established as international standards, the "Frequency International Harmonization Promotion Project" is being implemented. This project aims to secure the international superiority of these technologies through the overseas deployment of radio wave systems, conducting demonstration experiments both domestically and internationally, and facilitating human resource exchanges at the user level of the technology.

Moreover, considering the global demand for safe, secure, and highly reliable ICT infrastructure, the MIC plans to intensively promote the overseas deployment of 5G network solutions by Japanese companies using Open RAN and vRAN over the next three years. Leveraging the achievements of domestic 5G deployments, including local 5G, the ministry is advancing the openness of 5G by proposing 5G models tailored to specific needs.

Additionally, to promote the Open RAN ecosystem in Japan with an eye on overseas expansion, a testing and certification center "Japan OTIC" was established within the Yokosuka Telecom Research Park in December 2022 by multiple domestic telecommunications operators. This center conducts tests and certifications in

compliance with O-RAN Alliance standards, and the first certification was issued in June 2023. Various training sessions to promote the use of Japan OTIC are also being held regularly.

Furthermore, starting from FY2024, the MIC is conducting technical tests related to an interoperability verification environment that can simulate the networks of multiple domestic and international telecommunications operators.

6. Development of radio wave usage environment

(1) Promotion of measures for electromagnetic environment protection for human health

The MIC is promoting the establishment of an environment where radio waves can be used safely and securely.

Specifically, to ensure that radio waves do not adversely affect human health, the MIC has formulated the "Radio Wave Protection Guidelines[2]" and established part of these guidelines as safety standards concerning the strength of radio waves under the Radio Act. These standards reflect the results of long-term investigations into the safety of radio waves[3] and are aligned with international guidelines. To date, no causal relationship has been confirmed between radio waves below these safety standards and health effects. The MIC continues to raise public awareness about the safety of radio waves through telephone consultations, explanatory meetings, and the distribution of leaflets[4].

Additionally, to prevent the impact of radio waves from radio equipment on medical devices, the MIC conducts annual "Research on the Impact of Radio Waves on Medical Devices[5]." In FY2023, the MIC investigated the impact of radio waves from mobile phone terminals in the 2.3GHz and 3.4GHz-3.5GHz bands, as well as wireless LAN in the 6GHz band, on implantable medical devices (such as pacemakers and defibrillators). They also examined the impact of radio waves from mobile phone terminals in the 3.7GHz, 4.5GHz, and 28GHz bands on in-hospital medical devices (such as general-purpose infusion pumps) and home medical devices (such as personal dialysis machines). The findings from these investigations have been compiled into the "Guidelines for Preventing the Impact of Radio Waves from Various Radio Equipment on Implantable Medical Devices[6]." Furthermore, as the use of radio waves in medical institutions progresses, the MIC is conducting on-demand explanatory sessions for medical professionals on the proper management and precautions for using medical telemetry, mobile phones, and wireless LAN to ensure safe and secure use of radio waves. Since FY2017, the MIC has been implementing radio wave shielding measures for medical facilities through the "Subsidy for the Promotion of Wireless System Utilization," creating an environment where mobile phones can be used safely and securely in medical facilities.

(2) Promotion of measures against electromagnetic interference

With the proliferation of various electrical and electronic devices, it has become increasingly important to protect radio usage from unwanted radio waves emitted by various devices and equipment. To this end, the "Radio Wave Utilization Environment Committee[7]," established under the Information and Communications Technology Subcommittee of the Information and Communications Council, conducts research and deliberations on measures against electromagnetic interference. The committee also contributes to the deliberation of international standards at the International Special Committee on Radio Interference (CISPR: Comité International Spécial des Perturbations Radioélectriques). Based on the recommendations of the Information and Communications Council, the MIC promotes the standardization of measures to eliminate interference with radio equipment and prevent disruptions to electrical and electronic devices caused by unwanted radio waves.

In terms of international activities related to the CISPR, Japan is actively leading the technical discussions to ensure that leakage radio waves from wireless power transmission systems for electric vehicles (EVs) do not interfere with existing radio stations, amidst the full-scale examination of international standards for wireless power transmission systems used in EVs, multimedia equipment, and home appliances.

Additionally, following the "Regulatory Reform Implementation Plan" (approved by the Cabinet on June 16, 2023), the MIC established a system in December 2023 to relax the installation requirements for broadband power line communication (PLC) equipment, which is connected only to power lines maintained and operated by general transmission and distribution operators. Simultaneously, the MIC expanded the scope of type approval for high-power IH cookers, which are increasingly being used, by establishing a system in December 2023.

[2] Radio wave protection guidelines: https://www.tele.soumu.go.jp/j/sys/ele/medical/protect/
[3] Radio wave safety research at the MIC: https://www.tele.soumu.go.jp/j/sys/ele/seitai/index.htm
[4] Radio wave safety efforts: https://www.tele.soumu.go.jp/j/sys/ele/index.htm
[5] Research study on the effects of radio waves on medical devices: https://www.tele.soumu.go.jp/j/sys/ele/seitai/chis/index.htm
[6] Guidelines for preventing radio waves from devices from affecting implantable medical devices, etc.: https://www.tele.soumu.go.jp/resource/j/ele/medical/guide.pdf
[7] Radio Use Environment Committee: https://www.soumu.go.jp/main_sosiki/joho_tsusin/policyreports/joho_tsusin/denpa_kankyou/index.html

(3) Prevention of radio wave interference and disruption

As the use of new radio waves, such as the fifth-generation mobile communication system (5G), expands, the MIC is working to monitor radio waves, eliminate interference, and strengthen measures against non-compliant radio equipment (non-compliant equipment) to maintain a favorable radio wave utilization environment.

Specifically, to prevent general consumers from purchasing and using non-compliant equipment, which would constitute a violation of the Radio Act (illegal establishment of a radio station) and cause significant interference and other disruptions, the MIC purchases widely sold radio equipment from the market, including online sales, and measures whether the strength of their radio waves complies with the standards for "Extremely Low-power Radio Stations[8]" as defined by the Radio Act. The results are published annually as part of the "Radio Equipment Test Purchase Program[9]" to provide information for consumer protection.

For radio equipment found to be non-compliant and publicly disclosed, the MIC requests the sellers to handle only radio equipment that meets technical standards and to refrain from selling non-compliant equipment. Furthermore, in FY2020, the MIC formulated the "Guidelines for preventing the distribution of wireless devices that do not conform with technical regulations" to clarify the responsibilities of manufacturers, importers, and sellers of radio equipment, as well as the voluntary efforts of internet shopping mall operators, thereby promoting measures to suppress the distribution of non-compliant equipment.

[8] Weak radio equipment: https://www.tele.soumu.go.jp/j/ref/material/rule/
[9] Tested from FY2013. Result of wireless equipment purchase tests: https://www.tele.soumu.go.jp/j/adm/monitoring/illegal/result/